Pigs, People, Pathogens:
Health and Multispecies Relations in Central Uganda

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Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where states otherwise by reference or acknowledgment, the work presented is entirely my own.

Signed:

Rebekah Grace Thompson

Date: 17/07/2019

Abstract

This thesis describes the convergence of health and sickness in pigs and people in central Uganda. Drawing on thirteen months of ethnographic research, the chapters of this thesis trace diseases along the pig supply chain as they move from pig bodies on farms, into carcasses in slaughterhouses, meat in pork joints, and into human bodies in clinics and hospitals. Throughout this thesis, I argue that while the health of people was often dependent upon the lives of pigs, the development of beneficial relationships between pigs and people masked the emergence of pathogens which had the potential to threaten lives. One such pathogen was the neglected zoonotic parasite, *Taenia solium* taeniasis/cysticercosis (TSTC). With a focus on TSTC, I show how people along the supply chain did not always understand pig and human sickness in terms of pathogens. I suggest, therefore, that the visibility of pathogens along the supply chain is contingent upon networks that create and sustain their existence. Central to my argument is the concept of enactment, or the notion that objects, diseases, and bodies are not fixed, stable entities but are instead made through practices. While previous studies have considered enactments of objects, diseases, and species in specific locations, I ask whether it is possible to coordinate enactments across different species bodies and across vastly different spaces. This question has significance for the 'One Health' agenda – an interdisciplinary response to diseases shared between humans, animals and the environment. My findings suggest that the current 'One Health' framework in Uganda works on an assumption that pathogens are ontologically singular and made visible in the same way by pig supply chain actors, veterinarians, and doctors. I argue that if different enactments are not coordinated in order to make the same disease visible, then 'One Health' interventions could continue to neglect an array of neglected zoonotic diseases.

Lay Summary

This thesis explores the health and sickness of pigs and people in central Uganda. Drawing on thirteen months of ethnographic research, this thesis traces different diseases along the pig supply chain as they move from pig bodies on farms, into carcasses in slaughterhouses, meat in pork joints, and into human bodies in clinics and hospitals. Throughout the thesis, I illustrate how positive relationships between pigs and people simultaneously allowed for the spread of certain diseases. The most central disease to this thesis is the neglected zoonotic parasite, *Taenia solium* taeniasis/cysticercosis (TSTC), more commonly known as the pork tapeworm. In an attempt to control the spread of TSTC, international veterinarians working in Uganda advocated a 'One Health' framework, which brings together human, animal, and environmental practitioners in order to address global health challenges. My research suggests that the 'One Health' framework is based upon an assumption that different people are able to make the same pathogen visible and therefore treatable across different species bodies. In Uganda, this was not the case. The chapters of this thesis, illustrate how along the pig supply chain, peoples' understanding of sickness was based upon the presence of corresponding signs and symptoms. For people working along the pig supply chain, signs of TSTC were not considered to be signs of sickness. This was despite the practices of veterinarians, who attempted to create a link between TSTC as a pathogen and its corresponding signs on the outside of pigs' bodies. Unlike veterinarians, doctors were not able to diagnose TSTC as a specific pathogen in humans and this meant that doctors treated signs of TSTC in humans symptomatically. As a result, doctors never linked signs and symptoms of a 'serious sickness' in humans with cysts contained within pigs' bodies and pork meat. My findings suggest that adopting the current 'One Health' approach could, in practice, leave pathogens such as TSTC entirely neglected within human bodies.

For Bless, Hope, and Destiny

Contents

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Through it all, Atif Hashmi has been the greatest companion. Atif, your love for life is infectious and has inspired everything that I do.

List of Figures

Acronyms and Abbreviations

ASF	African swine fever
CAHW	Community animal health worker
DVO	District Veterinary Officer
FAO	Food and Agriculture Organization
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
ILRI	International Livestock Research Institute
KCCA	Kampala Capital City Authority
KIC	Kampala Imaging Centre
MAAIF	Ministry of Agriculture, Animal Industry, and Fisheries
MDA	Mass Drug Administration
NCC	Neurocysticercosis
NDA	Uganda National Drug Authority
OIE	World Organisation for Animal Health
STH	Soil-Transmitted Helminth Infections
TASO	The AIDS Support Organization
TSTC	*Taenia solium* Taeniasis/Cysticercosis
UGX	Ugandan Shillings
VWB	Veterinarians Without Borders
WHO	World Health Organisation

Glossary of Luganda Terms

amasavu	fat (cooking)
boda boda	motorbike taxi
ebisale by'essomero	school fees
egonda	soft
ewooma nnyo	very delicious
enene	fat (body)
enkoyne	stunted
enfaana	tapeworm
ensimbu	seizure
endwadde	sickness
eddwaliro	hospital
embizzi	pig
gomesi	a traditional Buganda dress
kuembeera	to live
kulabika bulungi/bubi	to look good/bad
kyabulabe nnyo	very dangerous
lufula y'embizzi	pork slaughterhouse
matooke	plantain
marua	millet beer
mchele	rice (also description of white lumps in pork)
mukene	Lake Victoria sardines
njoka	generic term for intestinal worms
nyama ya embizzi	pork
nyama	meat
obulamu	health/life/wellbeing
obulamu obulungi	good health/good life
omusujja	fever/malaria/African swine fever
omulalu	madness
omwoyo omubi	bad spirits

okulaba	to see/to look
olubutu	stomach
sente	money
sente za mangu/ sente mangu mangu	quick money
sillimu	HIV/AIDs
yabwe	a type of fever
waragi	alcohol/spirit/gin

Introduction

‘Come for pork. Come to a place where the air smells like pork’, the conductor shouted as he leaned out of the open window of the minibus. It was the morning of June the 3rd, a Ugandan public holiday and I had joined a queue of passengers waiting to board a steady stream of minibuses. As I waited, I watched touts rapidly filling buses bound for Namugongo Shrine, a sacred site commemorating the lives of thirteen Catholic Ugandan Martyrs burnt to death on orders from the Kabaka (King) Mwanga of Buganda in 1886.

As we weaved through the dense traffic that morning, the driver rhythmically honked the horn of the bus. At the same time he blared the radio from which, between interludes of dancehall and hip-hop, the presenter described how millions of people were trekking from all over East Africa. The pilgrims, the host excitedly exclaimed, were journeying from Northern Uganda, Kenya, South Sudan, and the Democratic Republic of Congo. Out of the window and lining the roads, throngs of pilgrims carried bundles of belongings on their heads. In their hands, they clutched empty jerry cans and plastic bottles to collect Namugongo’s renowned holy water. As the minibus drew closer to the shrine, military tanks, metal barriers, and masses of people began to block the road. Armed police circled the vehicles and shouted at the passengers inside to get off the bus.

Joining the back of the queue, I started walking through the mounds of bags, shoes, and second hand clothing that covered the grassy banks separating people’s homes from the road. Between the merchandise, pigs tethered to trees and snorting from the slats of open pickup trucks watched as the crowd inched slowly towards the entrance. As the sun began to rise, music boomed from static black speakers and the smell of barbeques and roasting pork began to fill the air.

Semanda, an owner of an informal slaughterhouse and pork joint in the centre of Kampala, was waiting for me a short distance from where I had left the minibus. Taking a separate path from the crowd, we made our way behind the lines of houses to a space in which to prepare meat to sell on the roadside later in the day. As we walked, Semanda chatted incessantly about his recent pork sales and how his youngest child was in hospital with malaria. He stopped only to curl his toes over the end of his broken flip-flop, squeezing his toes together to temporarily hold the Y-shaped strap in place.

Semanda had worked in the pork business for over thirty years and had established an extensive network of pig farmers, brokers, and traders that spanned across the districts of Uganda's central region. Early that morning Semanda and his nephew had collected five pigs from a farmer in Mukono, one of two districts neighbouring Kampala. The route that Semanda had taken that morning was similar to the one I had taken throughout 2015, tracing epizootic and zoonotic diseases as they travelled from live pigs on smallholder farms into pork carcasses and meat in slaughterhouses and pork joints.

As we approached Semanda's pickup truck, five Large White pigs began to softly grunt. As we peered into the back, one boar started to pace up and down, his grunts becoming increasingly agitated. Semanda reached in and affectionately patted the boar's back. I waited for the boar to calm down before asking Semanda how he had selected the pigs that morning. He pulled himself up onto the wheel of the truck and gestured towards the pigs, 'When I pick the pig it has to have a good weight. It has to be healthy. So I first watch it eat. If it eats normally that is good. I can also see by the way it walks. If it is sick, it walks slowly and side-to-side but look at this one it is big and strong. Look how it kicked my hand'. Semanda jumped down to reveal a deep cut that stretched from the base of his thumb to his index finger. 'A sick pig could not kick me like that', he remarked.

Semanda picked up a machete and a knife and slid the metal together. As he sharpened the knives, he shouted to his nephew to catch the boar with a rope. With a few harsh tugs, Semanda's nephew dragged the pig off the truck and towards an open rubbish dump. In an attempt to silence the boar's frantic screams, Semanda calmly walked over and using the handle of his machete hit it hard on the head. The boar was left silently writhing in the mud while Semanda handed his nephew the machete to finish the slaughter.

After the pig had been left to bleed, Semanda's nephew rolled it onto two large banana branches and with steaming hot water and a metal cup worked the pig's body into a pork carcass (Figure 1). As his nephew worked, I asked Semanda if he thought that his customers could fall sick from the pork he was preparing. He grinned, rested his hand on his nephew's shoulder and responded, 'The sickness of pigs is for pigs; the sickness for humans is for humans. I have been working with pigs for thirty-two years and I have never seen someone fall sick from pork. There is no sickness in pigs – pigs bring money not sickness'. After Semanda's nephew finished preparing the meat, he swilled out the hollow carcass and threw the intestines into the bush to be eaten by the dogs. Later that day, as Semanda roasted and sold pork on the roadside, he eagerly looked out towards the crowds and explained how with the number of pilgrims it was definitely his time to make money.

I met Semanda a week later at his pork joint in Kampala. As soon as I entered, he ecstatically began to recount how over the two days at Namugongo he had slaughtered ten large pigs and in the process had generated between two and three million Ugandan shillings (UGX) (approx. £428-643). As we spoke, Semanda described how his biggest responsibility was to provide for his family. He detailed how with the money he would be able to pay off the annual school fees for all ten of his children. As Semanda slowly chopped marinated meat into edible chunks, he enthused, 'I love pigs. They have brought me all my money and benefits…everyone here just wants a good life. Money for their family, their children to go to school. They want to make their life and the life of their family better. Nothing you can tell me is better than pigs for that'.

On every occasion that I met Semanda the passion he had for his pork business was palpable. That evening as we reflected on his pork sales at Namugongo, Semanda offered me a skewer of freshly roasted pork and asked, 'Don't you think this pork is the tastiest meat in the whole world?' As I finished eating, he popped open a bottle of Fanta, sat down and concluded, 'It is my hope that you can now see why I love everything about pigs'.

Figure 1. Semanda's nephew preparing the carcass at Namugongo. Photo by author.

Obulamu and Endwadde: Health and Sickness in Central Uganda

On the many occasions I spent time with Semanda, he never once looked for or spoke of specific pathogens in a pig's body. Instead, he would highlight visible signs of health, such as the pig's size, ability to eat, and its strong kick. My conversations with Semanda echoed many of those that I had across the farms, slaughterhouses, and pork joints of central Uganda. For Semanda, pigs (*embizzi*) and pork (*nyama y'embizzi*) made money, growing his business and in turn creating a better future and 'good life' (*obulamu obulungi*) for his family. As for many butchers and slaughterhouse workers, the pigs Semanda slaughtered had to be visibly healthy. This was because customers demanded a particular quality and taste, with pork consumers asserting that healthy pigs produced the tastiest pork.

Along the pig supply chain, health and hope for the future were often discussed together and my interlocutors actively strove to cultivate bodies, be it pigs or their own, in order to make such futures a reality. When asked how do you know a pig or a person is healthy, people would always respond with a variation of the verb *okulaba* (to look/see)*,* for example, *soka olabe* (first look) or *ndaba* (I look). People regularly cited visible signs of a healthy body as, having an appetite, energy, and being strong enough to work and generate money. As an urban pig farmer in Kampala once clarified, 'I, myself, can look at a pig and see. I just look at it with my eyes and say this pig looks good, it is healthy'. In line with this, my interlocutors attempted to transform their bodies and the bodies of their pigs into something that was perceived to be good looking, (*kulabika bulungi*) or into something that was living in a good condition, (*embeera ennungi*). This was because something that looked good would be physically capable of generating money and in turn cultivating a good life. Aesthetically, a good-looking body transcended ideas of beauty, with attractiveness incorporating health, strength, and the physical capacity of the body to provide into the future.

For my interlocutors, ideas about health translated into ideas about wellbeing and living a good life. This could be expressed in Luganda with the word for health, *obulamu,* also the word for life and wellbeing more generally. The question '*obulamu?*' therefore simultaneously asks; how is your health and how is your life? This general idea of health and wellbeing has been noted by other anthropologists working throughout East Africa and includes but is not limited to, *obulamu* amongst the Nyole (Whyte 1997), *akijar* amongst the Iteso (Meinert 2009), and *ngima* amongst the Luo (Onyango-Ouma et al. 2004). Throughout this thesis, I extend this idea of health and wellbeing as intrinsic to life to include both human and animal bodies. In Uganda, a healthy body was productive beyond sustaining the life of an individual, with healthy people and pigs both providing for and therefore ensuring the health and wellbeing of the entire family. This was why, as will be described in chapter one, when symptoms of African swine fever (ASF) appeared in pigs, they were indicative of much more than the onset of a disease or the presence of a virus in the pig's body. Instead, reddening ears and a pig's inability to eat represented a crashing future and a potential lack of wellbeing for the family.

In contrast to a good-looking, healthy body, my interlocutors would also often highlight signs and symptoms of sickness. People would often comment that bodies were in a bad condition (*embeera embi,* lit. to live in a bad condition) or looked bad (*kulabika bubi),* when they lost weight, were unable to walk or eat or when they had poor quality hair, skin, and eyes. As a pig farmer stated, ‘You can see when someone is not healthy. You can see weakness, tiredness, people will walk very slowly or breathe heavily. The skin will be rough and the eyes will be yellow and dirty’. That people would describe sickness, was also reflected linguistically in Luganda, with the word *endwadde* used interchangeably for both sickness and symptom. Symptoms and the visibility of them therefore came to represent sicknesses. This becomes clear when considering that the words for malaria and fever are both *omusujja*. Thus, outside of the clinic, people regularly identified and treated malaria based solely on the presence of a symptom – fever.

When bodily signs and symptoms of sickness were present, people made treatment choices in an attempt to prevent them from becoming serious. If people decided the sickness was serious enough to go to the hospital or clinic, then they would expect the doctor to transform the symptom into a sign of a treatable pathogen. If treatment was subsequently available and if the treatment could prevent signs and symptoms of sickness, then people considered the pathogen as something that people could ‘live with’. In Luganda, there are different ways of conveying how a person ‘lives with’ something. The verb root is ‘to live’, ‘to stay’, or ‘to be’ (*okubeera*). If something were visible outside of the body, for example, a child (*omwana*) or a pig (*embizzi)*, one would say *kubeera ne.* If, conversely, something could be ‘lived with’ inside the body, without causing symptoms, then one would say *kubeerawo*. People would use this word in relation to bodies infected with human immunodeficiency virus/ acquired immune deficiency syndrome (HIV/AIDS), as long as the body did not display symptoms that could be interpreted as a sign of the disease. As a pork consumer once asserted on the topic of living with HIV, ‘Now someone can have HIV and have the same body as me. They have no rashes, they are not too slim. They look healthy and it is just very difficult to know if someone is sick’. While HIV/AIDS was previously associated with wasting bodies (Thornton 2008; Whyte 2014), alongside the rise of antiretroviral drugs (ARVs) and, in Uganda, increased pork consumption, it has become something people can live with without outward bodily signs. HIV positive individuals are therefore avoiding 'aesthetic stigma' (cf. Edmonds 2008), through caring for the virus and their bodies in particular ways.

Considering bodies without signs and symptoms of sickness as healthy has, nevertheless, implications for diseases that creep invisibly within bodies (cf. Lowe & Münster 2016). This becomes evident when tracing the lifecycle of the zoonotic parasitic disease, *Taenia solium* taeniasis/cysticercosis (TSTC). Evidence from historical accounts suggest that TSTC infections have occurred since time immemorial (Singh & Prabhakar 2002). Although descriptions of 'measly pork' have circulated since the Archaic period of Greek history, it was not until the second half of the 19th century that the complete lifecycle of TSTC, as a distinct disease, was confirmed by German pathologists (Brutto & García 2015). TSTC has two stages to its lifecycle, a larval, intermediate stage and an adult, definitive stage. The intermediate stage occurs in the primary host, pigs, and causes porcine cysticercosis. Humans become infected with taeniasis, a tapeworm, when they ingest infected raw or undercooked pork. The tapeworm is then able to reside in the small intestine for years and during this period, many carriers are asymptomatic (Croker 2015). Eggs, which are only visible under the microscope, or gravid proglottids of the tapeworm are passed in faeces and have the ability to survive in the environment for months. Humans can become accidental hosts if they consume the eggs, which then migrate to muscles, the brain, liver, and other tissues. If cysts localize in the human brain this results in neurocysticercosis (NCC), the most common cause of adult onset epilepsy in endemic areas (Nash et al. 2013).

Controlling TSTC in Uganda is complicated by a lack of research and information on infection rates, particularly for human cysticercosis and NCC. In humans, it is very difficult to achieve a diagnosis for NCC without the assistance of specialized medical equipment such as Magnetic Resonance Imaging (MRI) or Computer Tomography (CT) scans. A recent study conducted in three northern districts of Uganda did find that out of the three hundred epileptic patients screened, seroprevalence of TSTC was up to 15% (Alarakol et al. 2017). In line with the findings above, there have also been several reports of misdiagnosis of the parasite in humans. For example, a 2005 study in Moyo district in Northern Uganda found that out of the study's twenty-one onchocercomas believed to be caused by onchocerciasis, seven were in fact cysts of *T. solium* (Katabarwa et al. 2008).

With the parasite identified in human bodies, it is certain that it will also be in pigs. Accordingly, studies conducted in Busia, the eastern border town between Kenya and Uganda, established that out of the 343 pigs sampled, 171 tested positive for porcine cysticercosis (Thomas et al. 2016). Moreover, a study comparing rural and urban pig farms in Mukono, Masaka, and Kamuli found an overall prevalence of the parasite at 12.2%, with 15.9% of pigs positive within urban Mukono (Kungu et al. 2017). As TSTC creeps along the pig supply chain, these prevalence studies, while limited, are valuable for demonstrating that the parasite is present in pig and human bodies throughout Uganda.

For a large portion of its lifecycle, TSTC remains contained within bodies. This meant that for people along the pig supply chain, it did not affect the aesthetic associated with being healthy, as it did not cause symptoms or signs of sickness. Despite remaining invisible (T. *solium* eggs) and contained within bodies (porcine cysticercosis and taeniasis), TSTC can in its final stages reach the human brain and cause seizures. Unlike cysts in pigs and tapeworms in humans, my interlocutors consistently described seizures as a clear symptom of sickness, serious enough to warrant hospital treatment. This was because those who suffered from seizures often lost their ability to provide for the family and in turn increasingly lost hope for the future. Although all my interlocutors knew of seizures (*ensimbu*) and had often witnessed either a family member or friend having a seizure, sudden onset seizures were often considered the result of malaria/fever (*omusujja*) or if deemed untreatable, bad spirits and witchcraft.

In central Uganda, bodily signs and symptoms came to frame what was sick, how serious that sickness was and the ensuing treatment regime. In accordance, sicknesses which had known biomedical or herbal treatments such as, worms and HIV, caused little uncertainty in regards to the future and the cultivation of a good life. Treatment, and particularly treatment deemed to have efficacy, came to represent a form of hope for the future (Livingston 2012; Mattingly 2010). Nevertheless, it was when doctors could not identify diseases in the clinic or when treatment failed, as was often the case with seizures, that people reconsidered the aetiologies behind symptoms.

Drawing on work by scholars in Science and Technology Studies (STS) (Law & Lien 2012; Lien 2015; Mol 2002; Woolgar & Lezaun 2013), in this thesis, I show how people along the supply chain did not always understand pig and human sickness in terms of pathogens. I suggest, therefore, that the visibility of pathogens along the supply chain is contingent upon networks that create and sustain their existence. I argue that in order for specific pathogens to become visible, multiple people have to believe in their existence (Kirksey 2015; Latour 2000). It is only once networks and relationships between people and a pathogen are established, that signs of a pathogen become visible on the outside of bodies. In light of this and due to the fact that for the majority of its lifecycle TSTC remained hidden within bodies, I illustrate how in Uganda, doctors never enacted TSTC as a pathogen that was treatable. This meant that people working along the pig supply chain also did not enact signs of TSTC as signs or symptoms of a treatable sickness. This leads to the question of how to prevent and treat invisible diseases in bodies that are, for Ugandan pig supply chain actors, visibly healthy.

Integrated Responses: One World, One Health

In order to address the host of human diseases shared with animals [1], researchers and policymakers have increasingly begun to advocate a One Health approach (Gibbs 2014). While interdisciplinary collaboration between human, animal, and environmental health is not novel (Murray et al. 2014),

[1] Diseases shared by humans and animals are estimated to make up between 60% (Taylor et al. 2001) and 70% (Chomel et al. 2007) of all infectious diseases.

during the early 2000s, the looming threat of an H151 avian influenza pandemic spurred an international response from organizations, most significantly the World Health Organization (WHO), the World Animal Health Organization (OIE) and the Food and Agriculture Organization (FAO). Despite the variation in how diseases spread, One Health has been promoted as a unifying approach to preventing and controlling diseases, both pandemic and neglected (Bardosh 2016: 7). The term has since been adopted into global research and policy networks, with multiple international agencies embracing the approach with 'great enthusiasm' (Gibbs 2014: 85).

The ways in which One Health has been appropriated around the world became clear during my fieldwork and in particular during discussions with veterinary scientists at the International Livestock Research Institute (ILRI). In Uganda, ILRI veterinary scientists, almost all of whom were trained in Europe or America, claimed that pig production was vital to 'fighting poverty' and 'global protein deficiency'. As pig production rapidly expanded in Uganda, ILRI staff claimed that its benefits could only be realised alongside the reduction of zoonotic and epizootic diseases. In response, ILRI created interventions designed to promote a disease free and 'productive' pig supply chain. These interventions, ILRI staff would claim, were based upon the concept of One Health. It was not only ILRI who advocated a One Health approach. When I told a Minister at the Ministry of Agriculture, Animal Resources and Fisheries (MAAF), the title of my research project, she excitedly replied, 'This is a One Health project, right, you must be following a One Health framework?' This inquiry by the minister as well as the constant discussion around One Health at ILRI prompted many questions. The most pressing of which for this thesis is: how do global scientific ideas that propose to provide an integrated response to zoonotic diseases translate into the everyday management and control of TSTC in Uganda?

During interviews, all the staff at ILRI, veterinarians (both government and private) and government employed meat inspectors had extensive knowledge of TSTC and its lifecycle. Studies documenting the prevalence of porcine cysticercosis across Ugandan farms (both urban and rural) and within

Uganda’s only formal pork slaughterhouse, *Wambizzi,* bolstered this veterinary knowledge (Kungu et al. 2017; Nsadha et al. 2014a; Thomas et al. 2016; Waiswa et al. 2009). Veterinarians in turn attempted to make TSTC and its lifecycle visible. This was most often through interventions which were created to educate and sensitize actors along the pig supply chain. To demonstrate, one intervention focused on ‘breaking the lifecycle’ (Figure 2), with the distribution of posters throughout farms, butchers, and slaughterhouses. However, in this thesis, I illustrate how control efforts that were led only by veterinarians and focused on pigs and pork did not create or sustain networks that allowed for the enactment of TSTC in human bodies. This potentially allowed *T. solium* tapeworms and NCC to remain contained within human bodies in clinics and hospitals. As an exasperated veterinary epidemiologist at ILRI once exclaimed, ‘They (actors along the pig supply chain) even think onset epilepsy is because of witchcraft’. Yet, I will illustrate how Ugandan doctors were actually reinforcing this idea.

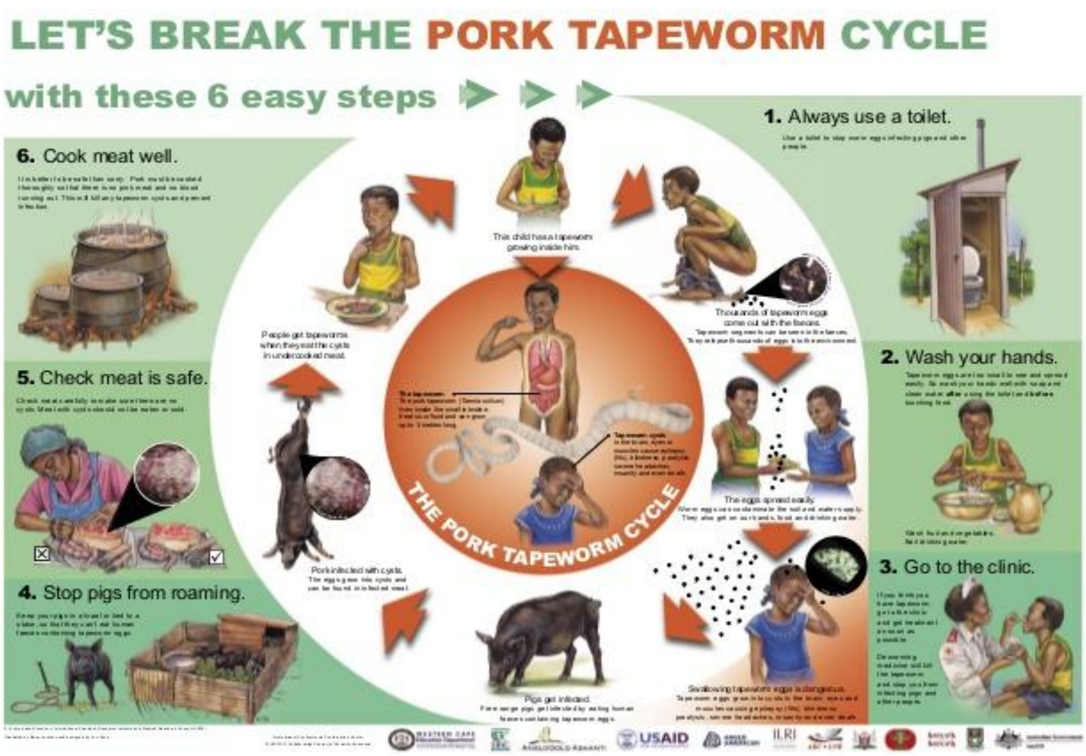

Figure 2. ‘Let’s break the pork tapeworm cycle’ poster. (International Livestock Research Institute; Medical Research Council 2005).

In Uganda, I never observed doctors diagnosing the specific *T. solium* tapeworm or cysts in human brains. Firstly, because they did not believe that they were going to find the pathogen in human bodies and secondly, because often they did not have access to the facilities required to diagnose TSTC in human bodies. This leads to the question of whether TSTC is actually rare in human bodies in Uganda. My findings suggest that TSTC and particularly the final stage of the lifecycle NCC, was too expensive and difficult to diagnose with current technologies. This meant that doctors shifted the responsibility of TSTC control to veterinarians as evidenced by claims that, 'The vets are doing a good enough job' (as expressed by a neurologist from Kampala's leading medical imaging centre).

The way in which doctors considered TSTC to be a veterinary issue to be controlled and treated in pigs, meant that once *T. solium* tapeworms or cysts infected humans they were very rarely diagnosed. Doctors within both public and private hospitals did not expect cysts to be the cause of adult onset epilepsy and they did not have reliable or low-cost access to diagnostics that could potentially prove otherwise. Instead, doctors would symptomatically treat seizures, typically using antimalarial medication or the anti-epileptic drug, carbamazepine. While I am not arguing that all adult onset seizures were caused by NCC, I observed that seizures which did not respond to medication, were never linked to pathogens or conditions such as NCC by doctors. That doctors did not link seizures to diseases other than malaria had implications for controlling TSTC more generally. As will be discussed in chapter seven, when doctors did not link seizures to pathogens, this in turn suggested to individuals and their families that their seizures were not treatable within the hospital. As a pork butcher in Kampala once commented, 'It is very difficult to get rid of that problem [seizures] once it comes. I know that problem is also there in rich families. It means that doctors do not have that medicine'. This uncertainty around the causes and treatment of seizures, in turn led patients to stop seeking medical treatment and search for other aetiologies of the seizures such as failed social relationships. This becomes clear in chapter seven, in which seizures that doctors could not treat became signs of problematic relationships between people that had resulted in the use of witchcraft.

Through following patients suffering from seizures, it became apparent that when people were seriously sick they first attempted to treat the sickness symptomatically. This was because a treatable condition alleviated uncertainty around providing for the family into the future. A diagnosis, however, involved doctors also recognising and articulating to patients that a pathogen may be the cause of their symptoms. Consequently, despite the One Health agenda advocating the mapping and treatment of pathogens, I will illustrate the ways in which pathogens themselves are not enacted in the same way across different species bodies. In Uganda, TSTC was associated with pig bodies leaving the condition entirely neglected within hospitals, contained within human bodies and invisible to doctors and their patients. Throughout this thesis, I illustrate how the shifting of TSTC to pigs' bodies resulted in only veterinarians enacting TSTC as a pathogen. This had a spiralling effect, entrenching an idea amongst farmers, butchers, and slaughterhouse workers that signs of sickness in pigs would only ever cause sickness in pigs and not in humans.

In order to untangle the ways in which the health and sickness of pigs and humans converged in central Uganda, in the next section I provide an overview of the pig supply chain. Through doing so, I set the foundation for understanding why people in Uganda are choosing to specifically rear and trade pigs and/or pork and the potential implications this could have for the spread of zoonotic diseases.

Pigs, Pork, and Zoonotic Diseases

The role of livestock has been and continues to be a major topic amongst Africanist anthropologists. From Evans-Pritchard's description of care and exchange of cattle amongst the Nuer (1951) through to Jeske's (2016) comparison of cattle and cars as sources of wealth in South Africa, the ways in which livestock have been produced, exchanged, and embedded within social relations has been central to many ethnographies based within Africa. The literature on livestock, however, focuses predominately on cattle with other stock such as sheep, goats, and pigs often side-lined or overlooked entirely.

The importance and focus on cattle in East Africa has been attributed to their ability to act as a particular form of wealth in pastoral societies (Spencer 1998). Anthropologists have described how cattle are not merely economic commodities, exchangeable at will or easily transformed into a cash equivalent (see Evans-Pritchard 1951; Ferguson 1985; Hutchinson 1996). Instead, cattle are a sign of wealth and prestige, particularly amongst men, with the ability to shape and define social relations. As Evans-Pritchard's account of the Nuer in South Sudan highlights, social relationships are formed through the exchange of cattle during marriages. Evans-Pritchard argues that it is this use of cattle as bridewealth that 'gives them their supreme value in Nuer eyes' (1951: 90). This assertion highlights how cattle were not reared for individual gratification or personal wealth but were instead reared by the Nuer to be publically recognised and socially acknowledged (cf. Graeber 2011: 76). In a context that traditionally values cattle, it is important to consider why Ugandan farmers are increasingly rearing pigs.

Pig keeping is a relatively recent livelihood strategy in East Africa. Although limited, historical records suggest intensive pig keeping began at the turn of the twentieth century in the highlands of western Kenya (Porter et al. 2016). During this period, British settlers imported pigs from the Seychelles which were then reared in the large maize growing areas able to sustain industrial pig populations (ibid). While records do exist on pig farming in Kenya, there is little recorded knowledge regarding the history of pigs, pig rearing, and pork consumption in Uganda. This is in part attributable to a lack of research, with for example, the International Livestock Centre for Africa (ILCA), excluding pigs from all research projects during its years of operation (1974 - 1994) (Blench 2000). This historical absence of pigs in livestock research is reflected in contemporary Ugandan politics where pigs are scarcely recognised by the Ugandan government (Tatwangire 2014). To demonstrate, cattle feature throughout the Ugandan Agriculture Sector Development Strategy and Investment Plan 2010/11– 2014/15, while pigs are mentioned just twice. Thus, unlike cattle, pig rearing does not feature as a priority enterprise and this means that the needs of actors working within the Ugandan pig sector are also largely neglected.

Despite remaining marginal in government agendas, the Ugandan pig sector has rapidly grown over the last thirty years. Livestock censuses show that the number of pigs in Uganda has rapidly grown from a recorded 15,668 in 1959 (Masefield 1963) to more than three million in 2008 (UBOS 2009). Moreover, the central region, which encompasses Mukono, had the highest number of live pigs at an estimate of 1.3 million (ibid). Alongside this sharp increase in the number of pigs, studies by animal scientists have started to recognise pigs as an important source of income for smallholder farmers throughout Uganda. These studies highlight, in particular, how pig rearing has become a significant 'pathway out of poverty' particularly for smallholder farmers (Ampaire & Rothschild 2010; Randolph et al. 2007).

Pigs in Uganda should not like cattle before them be reduced to a commodity with their only value being their potential to generate money. While farmers would make comments such as, 'pigs are good for poor people', it was not because pigs simply produced money but instead that money from pigs could be used for very specific purposes. Pigs were often described as better for quick money (*sente za mangu* or *sente mangu mangu*), with many of my interlocutors claiming that it was pigs' rapid growth that made them preferable over other livestock such as cattle. As one farmer stated, 'I am in love with pigs. If you give me cows now, immediately, as soon as you start walking away, I will sell them for pigs'. Despite many farmers claiming to raise pigs for quick money, in practice pigs were also reared in order to store wealth. Using animals as stores of wealth follows what James Ferguson (1985) describes in Lesotho as the Bovine Mystique. The Bovine Mystique, Ferguson argues allowed men to accumulate a particular type of wealth and social prestige through rearing cattle. In Lesotho, pastoralists did not rear cattle as an economic good. Instead, cattle acted as a special type of property, one that could not be easily converted back into cash. This Ferguson contends, was a way in which cattle could operate as a ‘retirement fund’ (ibid: 663), a source of wealth that could not be contested by women and close kin.

Like the cattle farmers of Lesotho, pigs in Uganda acted as stores of wealth for the family albeit for a shorter amount of time. Yet, unlike in Lesotho, pigs in Uganda were not embedded in kinship relationships or exchanged as bridewealth and this meant farmers could sell them with ease. In discussions around pig money, it became clear that for farmers, money generated from selling pigs was distinguished from other types of money, for example money for food or money for the house. As Parker Shipton argues, the Luo of Kenya classify money as belonging within certain spheres (1989: 9). Accordingly, the source of money determines its end use. This understanding of money is similar to that of pig money in Uganda. Pig money was used almost exclusively to cover emergency costs (unexpected medical bills, bailing people out of prison) or more commonly for paying annual school fees (*ebisale by’essomero*). Pigs became responsible for the family particularly as schooling was perceived as a transformative experience, especially when children became proficient English speakers (cf. Meinert 2009: 8). Transforming a pig’s body into a fat body, consequently transformed the lives of the family. Farmers described pigs as the perfect animal for storing money for the future while simultaneously representing a highly accessible source of cash during times of emergency. Pigs were important to Ugandan farmers exactly because they embodied this dual source of wealth.

Increasing numbers of pig farmers have in turn generated a network of traders and brokers who transport pigs to butchers and slaughterhouses throughout Mukono and Kampala. These, often informal networks, provide a wealth of jobs particularly in urban areas where pork consumption has also rapidly risen. In urban districts, pork consumption has been reported as very high (above 750 kg/km2 per year), exceeding the consumption rates of other meats such as beef (Tatwangire 2014). As a manager at the only formal pork slaughterhouse in Uganda, *Wambizzi*, claimed, ‘There are just not enough pigs to meet the Ugandans demand for pork. Ugandans love this meat’. Ugandan leading daily newspapers corroborated the manager's claims through running stories entitled, 'Uganda leads pork consumption in Africa' (Kushaba 2016). In order to ensure the maximum amount of sales, butchers had to provide their customer with a particular taste. Throughout Ugandan pork joints, consumers were involved in an iterative, requalifying process over what counted as quality meat. In Mukono and Kampala, customers could discern the taste of pork based on its visual appearance. This filtered back into the informal supply network, with visible abnormalities cut out of pork before being sold for consumption.

The rapid increase in pork consumption within Uganda has implications for the spread of zoonotic diseases. It should be noted that TSTC is not the only zoonotic disease associated with pigs. Bacteria such as *E coli, Salmonella* and *Campylobacter,* parasites such as *Ascariasis* and *Trichinella* and viruses such as Hepatitis-E are shared between pig and human bodies. TSTC is, however, the only disease of those listed above to be classified by the WHO as one of eight neglected zoonotic diseases (NZD). These eight are a cluster of the most significant NZDs which are cited as globally causing in the region of 2.4 billion cases of human illness and 2.2 million deaths per year (Grace et al. 2012). TSTC has, moreover, been described as an eradicable disease, due to its simple lifecycle and inexpensive disease control tools (Schantz et al. 2003). In response, Bardosh et al. (2014) have argued that control strategies for TSTC should be split into biomedical and behavioural. The first involves approaches such as the mass treatment of pigs and humans with anthelmintics, while the latter consists of changes in pig management, improvements in food safety, and hygiene practices.

In this thesis, I conversely argue that the control of TSTC will not be achieved solely through the implementation of mass treatment regimens or educating people who work along pig supply chains on behavioural changes. Instead, I argue emphasis should be placed on recognising how different enactments of bodily signs and symptoms leads to the invisibility of certain diseases. This approach is twofold; first, it involves documenting how veterinarians, doctors, and supply chain actors understand and enact health and sickness and then it explores where these understandings overlap and diverge.

In order to make this argument, my conceptual framework draws on work by multispecies ethnographers, anthropologists working on signs and symptoms, and literature from Science and Technology Studies (STS). I link these three bodies of scholarship to show that although in biological terms zoonotic diseases are shared between human and animal bodies, how pathogens are enacted and made visible in practice varies radically across different spaces and in different species bodies.

Multispecies Worlds

Anthropologists are at the forefront of a new theoretical paradigm that understands relationships with other species as questioning the foundation of human-ness (Haraway 2008; Kirksey & Helmreich 2010; Nading 2013). In an effort to move away from anthropocentrism in anthropological research, multispecies ethnographies have contributed to novel ways of thinking about human interactions with other species. In particular, multispecies ethnographers are working on destabilising long held distinctions between humans and nonhumans and society and nature (Wilkie 2015). They are doing so in an attempt to understand the ways in which 'lively beings including microbes, fungi, humans, plants, animals, cyborgs and aliens [are] always relationally entangled rather than taxonomically neat' (Haraway 2008: 330).

In line with this emerging literature, there have been calls for situated scholarship that explores and connects the myriad of multispecies relationships (Kirksey & Helmreich 2010). Work in this thesis aims to contribute to this growing field by questioning how individuals in Uganda lived their lives with both pigs and with a range of different pathogens (viruses, bacteria, and parasites). I develop the current multispecies literature by showing how healthy human bodies were entangled with and shaped by the lives and health of different species – both those that lived inside and outside of the human body. Through doing so, I argue that in Uganda, humans are able to productively live with other species as long as the species in question does not affect the *obulamu* (health/wellbeing/life) of the individual or family as a whole.

Although the rise of multispecies ethnography does provide a new perspective from which to understand multispecies relationships, it is still important to note that how people have lived with animals has been a constant feature of ethnographic research. From Evans Pritchard's account of cattle and the Nuer (1951) to Geertz's description of cockfighting in Bali (1973), animals have often played a central part of anthropologists' analysis. In these cases, however, animals act as a lens through which to observe humans, never as a point of interest in and of themselves (Mullin 2002). Nevertheless, in line with a multispecies logic, anthropological enquiries are increasingly understanding animals as active participants in people's lives. From work on pets and companion species (Haraway 2003; 2008; Porter 2018), through to livestock (Campbell 2005; Wilkie 2005) and animals used in scientific research projects (Candea 2010; Svendsen 2017), there has been a marked shift towards understanding animals as 'parts of human society rather than just symbols of it' (Knight 2005:1).

The work of Donna Haraway (2003; 2006; 2008), has been particularly influential in multispecies scholarship. In her initial work on dogs and humans, Haraway (2003) developed the term 'companion species', discussing how dogs and humans have mutually co-evolved, often coming together in asymmetrical and complicated ways. Building on this in her subsequent book, *When Species Meet*, Haraway (2008) presents a multitude of encounters with non-human others, drawing attention to the 'contact zones' within which they meet. As a consequence, Haraway strongly dispels the notion of human exceptionalism, and argues, most frequently through the case of dogs, that humans are bound within knots of interspecies relationships. While the focus of Haraway's work is largely limited to canines in America, her accounts provide insight into the types of complex interactions and mutual relationships that emerge when species meet. Drawing directly on the work of Haraway, Agustin Fuentes (2010) describes another type of 'contact zone' shared between humans and macaques in Bali, Indonesia. As Fuentes highlights, humans, and primates are ‘co-participants in active, inclusive ecosystems, ecosystems made of interacting niches’ (ibid: 603). Through his examples, Fuentes illustrates how macaques and humans equally participate in and shape joint ecologies. Through doing so, he rejects the dichotomies of domesticated and wild or natural and unnatural and instead places emphasis on how relationships between species are fluid and evolving with different species mutually sharing, constructing, and destroying niches together.

Humans do not only cultivate shared worlds with pets and wild animals. The interactions that occur in contact zones are also evident in human relationships with livestock. Livestock are often reduced to their economic function, meaning that human-livestock relationships are often considered to be purely instrumental (Harbers 2010). However, despite being reared to be sold, killed and often eaten, relationships with livestock can be both loving and caring. This is clear in the work of Campbell (2005) who shows how Tamag-speaking communities in Nepal generate a ‘kinship’ of affectivity, needs, and responsibilities’ with their livestock (ibid: 78). This, he argues, has led to an awareness that one may give more attention to their animals than they do their human kin. As livestock require active care, when individuals are unable to provide that care, relationships between species can fall apart. This is evident in the work of Maia Green (2017) who describes how farmers cared for their cows in south-eastern Tanzania. Green describes how farmers showed ambivalence towards dairy cows, which were distributed through development projects. This was because dairy cows could not be easily inserted into existing farming systems and thus livestock care as dictated by development projects did not match the capacity of households to provide it. In Tanzania, living with and caring for dairy cows required a reconfiguration of relations, at home, at the market, and with the cows themselves. Green’s analysis demonstrates how livestock cannot be reduced to technological objects or economic machines which can be easily inserted into farming systems. Instead, she demonstrates the centrality of care in farmers’ relationships with their livestock.

Caring for and sharing our lives with other species opens up space for the potential spread of diseases. In response, medical anthropologists are highlighting the importance of ethnographic research in an attempt to understand the experience, spread, containment, and treatment of diseases shared between human and animal bodies (Brown & Kelly 2014; Fuentes 2010; Keck & Lynteris 2018; Lowe 2010; Singer 2014; Porter 2013). The health implications of multispecies mingling are particularly evident in Thom van Doreen's (2014) description of vultures in North India. In his account, van Doreen describes the consequences that a declining vulture population has on human health. Vultures have a high resistance to various pathogens, including anthrax, and are able to strip infected carcasses clean within hours. However, in North India, numbers of vultures are rapidly declining as cattle treated with the anti-inflammatory drug, diclofenac, are unintentionally poisoning the birds. The absence of vultures has left room for fast breeding scavengers including dogs to proliferate. The consequence of a decreasing vulture population on human health is profound, with both anthrax and rabies rates rising (Mudur 2001; van Dooren 2014). As van Doreen postulates, 'Dead vultures, dead cattle, dead people all *matter* in the interactions that produce possibilities for life and death' (2014: 59). Thus, as human health is bound within interspecies knots, any process of unknotting has significant consequences for the health of all species involved.

As humans and animals negotiate challenges in order to survive and thrive together, biosecurity measures are simultaneously problematizing interspecies relationships in an attempt to prevent the spread of diseases. The logic guiding biosecurity measures is to disrupt and dismantle the 'contact zones' in which humans and animals live together. The literature on biosecurity measures demonstrates how the ensuing narratives, technologies, and practices aim to reconfigure the relationships between humans and animals (Blanchette 2015; Fearnley 2015; Hinchliffe & Bingham 2008; Keck 2015). Unsurprisingly, biosecurity measures often do not materialise in practice. This is particularly the case in backyards and smallholder farms, where a range of species constantly meet and share their lives together (Fearnley 2015; Lowe 2010; Porter 2013). In line with this growing body of anthropological literature on biosecurity measures, this thesis considers the ways in which interventions and policies that attempt to reconfigure interspecies relationships are negotiated in practice. It further argues that biosecurity measures do not take into consideration the way in which microbes can be beneficial for human and animal lives. For example, Hinchcliffe et al. show how in UK pig farms, microorganisms were important 'in the making of *healthy* as well as diseased bodies' (2016: 112). Veterinarians, in turn, shared pig bodies with microorganisms, patching together the lives of naïve pigs with the lives of pathogens through procedures such as covering naïve pigs in muck. This example demonstrates that health is not about the complete absence of pathogens (as advocated by biosecurity measures) but instead dependent upon the incorporation, recognition, and openness to microbes as part of life.

In line with this reasoning, a nascent literature is beginning to consider microbes and their relationships with other 'lively entities' (van Dooren, Kirksey & Münster 2016). As Heather Paxson and Stefan Helmreich note, the microbe has moved from 'a sign of peril to being also one of promise' (2014: 165). Accordingly, multispecies ethnographers are no longer defining microbes as inherently pathogenic but instead recognising microbes as essential to healthy foods, bodies, and the environment (Benezra et al. 2012; Lorimer 2017; Paxon & Helmreich 2014). While there is growing recognition of microbial lives, the notion that microbes or parasites can shape human health is not a novel one. Over two decades ago, Wenzel Geissler (1998) discussed how in Kenya, worms were perceived as necessary to human life as the 'action of the worm in the stomach has its place in the overall process of life' (ibid: 74). In a similar vein, Mark Nichter (2008) noted how in India, 'worms of life' were deemed necessarily for the health of children due to their ability to churn food and consume waste within the body. More recently, Jamie Lorimer (2017) has addressed the importance of hookworms for the health of humans. His account highlights the implications of 'missing microbes' for the human immune system in the United Kingdom. Across the globe, the presence or absence of worms has significant implications for the health of the body, particularly the bodies of children. Despite a focus on understanding microbes and parasites as an essential part of bodies, not all of them are beneficial for health. This is why as

Hinchcliffe et al. note, microbes are 'categorically slippery' (2016: 126). While some are necessary to a healthy life, others have the potential to cause pandemics.

Building on the literature outlined above, this thesis demonstrates how in central Uganda, the health of people along the pig supply chain was often dependent upon the lives of pigs. I show, however, that beneficial relationships between pigs and people masked the emergence of pathogens which had the potential to threaten lives. In Uganda, people had different relationships to species depending on whether they lived inside or outside of the body. Pigs, on the outside, were 'lived with' (*kubeera ne*) and the health of pigs was intrinsically linked to the health, life, and wellbeing (*obulamu*) of the family. This was why a stunted pig (*embizzi ekonye,* lit. to be stuck) represented disease, neglect, and an inability to provide for the family. If, conversely, a species was able to live within the body without causing signs or symptoms of sickness, then it did not threaten a good life into the future. This had implications for the way in which people perceived HIV (chapter five) and worms (chapter six), both of which were deemed possible to 'live with' (*kubeerawo*) and still be healthy. Accordingly, worms (*njoka*) and HIV (*siliimu*) did not threaten the body in the same way as a sickness like malaria (*omusujja*). These observations highlight how in Uganda, pigs, worms, and HIV were all enacted by people along the supply chain as species that could be lived with as long as they did not outwardly affect the health of the individual or the family. It was only once symptoms and bodily signs of sickness appeared, that the species in question threatened the future.

Signs and Symptoms

Medical anthropologists have long focused on how humans interpret bodily signs and symptoms. In this work, it is noted that a conventional distinction made by clinicians is to distinguish between subjective symptoms and objective bodily signs (Fainzang 2011; Risør 2011). Within a clinical setting, signs are indices, natural evidence that doctors observe in order to diagnose specific diseases. Symptoms on the other hand, refer to a patient's self-report or subjective representation of sensations (ibid). Anthropologists have also discussed this distinction in terms of disease (pathology) and illness (a person's experience of disease) (Kleinman 1980; 1988; Young 1982).

The ability of doctors to transform patient's symptoms into pathological signs is both historically and culturally located (Foucault 1973). In *The Birth of the Clinic*, Foucault illustrates how from the late 18th century there was a significant shift in how physicians deciphered clinical signs. Foucault illustrates how early clinical medicine was premised upon a nosological table, which allowed medical practitioners to translate and decode individual symptoms in order to yield the true nature of the disease (ibid: xviii). In contrast, physicians in the clinic shifted medicine from being organised around a nosological scheme to making pathological processes visible within the body. Under the clinical gaze, symptoms became signs – signs of an underlying pathology concealed within the depths of the body (ibid: 125). Through his work, Foucault provides an important conceptual framework for ways of seeing, illustrating how Western medicine has developed an ability to identify specific diseases contained within sick bodies. As Foucault articulated, 'As soon as one used the ear or the finger to recognise on the living body what was revealed on the corpse by dissection, the description of diseases, and therefore therapeutics took a quite new direction' (ibid: 202). There are, nevertheless, limits to the clinical gaze that Foucault describes. This is particularly evident in hospital settings with limited access to laboratories and biomedical diagnostic facilities. As Joanna Crane (2013: 85) noted in her research on the HIV/AIDS epidemic in Uganda, Ugandan clinicians impressed American physicians as they were able to practice medicine without the technologies American physicians had come to rely on. However, the American physicians remained uncomfortable regarding the accuracy of a diagnosis based upon clinical observations alone. In another hospital context, Alice Street similarly observed how doctors in Papua New Guinea often made diagnoses based solely upon the symptoms of 'generally sick' patients (Street 2014: 92). These studies underscore the potential limits of the clinical gaze, as well as highlighting how essential laboratories and diagnostic facilities have become in allowing doctors to access and know the inside of the human body.

Within the clinic, doctors base their treatment choices on their observations of bodily signs and symptoms which become a sign of pathology. Yet, this does not account for symptoms for which there are no pathological signs. In her paper on functional disorders and 'symptomization' in Denmark, Mette Risør (2011) explores what happens when doctors find no objective sign despite patients' symptoms. Risør demonstrates how symptoms become subordinate to signs in the eyes of the physician and this leaves patients without a specific diagnosis or treatment. Without a diagnosis, doctors leave people with no choice other than to interpret and treat their symptoms outside of the clinic. Like Risør, Sylvie Fainzang similarly argues that, 'we must consider the process which makes a bodily sign acquire the status of a symptom in the subject's eyes, whether it is acknowledged by a health professional or not' (2011: 41). Fainzang demonstrates how the process of self-examination and self-diagnosis starts from identifying a sign, transforming that sign into a symptom and the symptom into a pathological sign. Unlike Foucault (1973), these accounts place emphasis on patients', not doctors', ability to transform symptoms into pathological signs.

Work that considers signs and symptoms of disease is largely limited to hospital contexts and human bodies. As historians of medicine have noted, the history of medicine has largely excluded animals, with an assumption that a history of medicine is a history of *human* medicine (Kirk & Worboys 2011: 561; Woods et al. 2017). Nevertheless, during the same period of time that the human clinic was born (Foucault 1973), the first veterinary school was also opened at Lyons in France, and shortly after, in 1791, the first veterinary college in England was founded (Wilkinson 1992). Historical evidence suggests that veterinary medicine arose from the economic need to be able to effectively use animal bodies or as the Odiham Agricultural Society claimed at the time; the control of animal diseases would directly benefit 'the most important branches of national commerce, such as wool and leather' (Rando 2009: 530). Since this period, veterinarians, like doctors, have developed a gaze in order to locate diseases deep within the bodies of animals. For instance, John Law describes the way in which veterinarians come to know and diagnose diseases in animals as the 'trained eye' (2010: 61). In Law's account, a UK based veterinarian articulated how he knew whether an animal was in a 'good condition' through looking for signs of health and ill-health; 'the state of the feet, lameness, the condition of the animal's coat, whether it is alert or not, whether it is grazing with others' (ibid).

There are parallels between the gaze of the doctor and the gaze of the veterinarian as both produce knowledge about bodies. However, animals, unlike humans, cannot articulate their individual symptoms nor can they challenge the authority of the clinical gaze. While animals cannot express symptoms in the same way as humans, in Uganda people understood symptoms to be social rather than individual. In accordance, medical anthropologists working in Uganda have documented how symptoms in humans are not confined to an individual's subjective experience, as friends and family can also interpret them. For instance, in their book of women in Kamwokya, Kampala, Wallman et al. (1996) describe the ways in which women assess symptoms of sexually transmitted infections. Wallman et al. observe that women have 'specialized knowledge of disease symptoms, determining when family members are ill and what care they should be given' (ibid: 3). Similarly, Lotte Meinert and Susan Reynolds Whyte argue that in Uganda, 'sensations and symptoms are socially shared, as well as individual, experiences' (2017: 20). Through their account of PTSD or *cen* in Northern Uganda, they argue that 'symptoms of trauma and *cen* were recognised mainly by family members' (ibid: 22). This was because the person who suffered was often unable to articulate the symptoms of their trauma. Outside of the Ugandan context, Nichter (2008) makes comparable claims about socially shared symptoms through the case of children. He argues through cases from South India and the Philippines, that when children 'do not have the vocabulary to express the sensations they feel, it is mothers who have to interpret what is troubling a child…mothers monitor the health of their children through touch, smell, sight, and sound' (ibid: 174). These accounts all highlight how symptoms should not be considered as just individual experiences, as symptoms can be expressed and articulated by those who are not suffering. Like babies, animals are unable to express their own subjective experience of sickness and cannot articulate specific sensations or sites of pain. In relation to the work of Foucault (1973), this would mean that animals could only present clinical signs, signs that could only be interpreted by medical professionals. However, in Uganda, owners articulated their pigs' symptoms commenting on, for example, behaviour that was not usual in their animals such as increased tiredness or pain when walking. While people cannot directly know the subjective experience of babies, nonverbal persons, or animals, people outside of clinics can interpret symptoms as signs of sickness and subsequently decide whether treatment is necessary or not.

The ways in which people transform symptoms into signs of sickness informs treatment regimes. As Susan Reynolds Whyte discusses in her ethnography, *Questioning Misfortune,* in Bunyole, eastern Uganda, 'troubles…are a normal part of life and you deal with them symptomatically' (1997: 25). This 'symptomatic idiom' focuses on the phenomenal aspect of a problem and attempts to change characteristics which are unpleasant. Whyte states that in Bunyole, treatment choices are often based upon the symptomatic idiom as people considered it easier to treat symptomatically than attempting to identify underlying causes. In Bunyole, people's conditions were evaluated as they developed and it was only when sickness could not be treated symptomatically, that people moved from a symptomatic to an aetiological idiom. In this switch, symptoms became indicative of problematic relationships rather than signs of a disease (ibid: 26). In her account, Whyte highlights how central symptoms are to treatment choices, with the aetiology of sickness dependent upon whether symptoms were treatable or not. This, nevertheless, simultaneously suggests that sickness will always produce a sign or symptom.

Signs and symptoms draw attention to the sick body. This implies that without signs and symptoms, the body is healthy. In accordance with this assumption, Plugge and Kohn write, well-being is 'in general, synonymous with my noticing nothing about my body' (Plugge and Kohn cited in Leder 1990: 82). From a phenomenological perspective, individuals only become aware of the body when it ceases to function. In this sense, it is signs and symptoms of sickness that evoke explicit awareness of the body. As Drew Leder (1990) argues in his book, *The Absent Body*, the body is usually 'disappeared', as a healthy body does not make itself obvious. As the body is commonly disappeared, direct experiences of the body are skewed towards times of 'dys-appearance' – the explicit awareness of the sick body. As Leder writes, 'when sick, the body changes, exhibiting novel sensations and altered capacities' (ibid: 89). Such assertions do not, however, take into consideration what happens to the body when there are limited or no clear symptoms or signs of sickness. Symptoms of diseases do not always manifest immediately and others, like TSTC, are asymptomatic for large parts of their lifecycle. The implications of diseases that do not draw direct attention to the body becomes clear in Lowe and Münster's (2016) account of Elephant Endotheliotropic Herpesvirus (EEHV). EEHV has the ability to creep through bodies and spaces, remaining dormant and not causing signs of sickness until it suddenly and violently takes over elephants' bodies. Through their accounts, Lowe and Münster coin the term 'viral creep' to describe the largely silent but often lethal trajectory of the virus. In regards to another virus, Susan Reynolds Whyte similarly argues that as in Uganda bodily signs have come to determine the presence of HIV, the Ugandan AIDS education campaign have placed emphasis on 'the impossibility of *seeing* who is infected (and thus the necessity of being ever careful)' (emphasis in original Whyte 1997: 219).

While some diseases draw explicit attention to the body through signs and symptoms, others do not. Moreover, while a medical professional could enact a sign as a sign of a specific pathogen, others could enact the same sign as not a sign of disease at all. In line with the One Health agenda, it becomes important to ask whether doctors and veterinarians are interpreting and enacting signs and symptoms of pathogens in the same way across both human and animal bodies. If not, I argue this could have significant implications for the visibility of diseases.

Enactments and Coordination Work

Taking a lead from scholars in STS, this thesis considers the way in which bodily signs and symptoms are enacted as signs of sickness or disease across different species bodies. This builds on established literature on ontological enactments, which documents how actors bring objects into being as opposed to them having an inherent meaning or form (Esbjörn-Hargens 2010; Law & Urry 2003; Law & Lien 2012; Mol 2002; Woolgar & Lezaun 2013). The literature cited above diverges from the working epistemological assumption that the world is grounded in a single order and that people have different perspectives of that order (Law & Lien 2012). Instead, empirical studies of ontology focus on documenting how 'objects come to be in a relational, multiple, fluid, and more or less unordered and indeterminate (set of) specific and provisional practices' (ibid: 365).

Central to the STS turn towards ontology is the work of Annmarie Mol (2002). Set in a Dutch hospital, Mol's book *The Body Multiple*, adopts a 'praxiographic' appreciation of reality. Mol illustrates through the disease atherosclerosis, how diseases are neither fixed nor stable but instead shaped through practices. Mol does not, therefore, reduce atherosclerosis to a singular disease that can be known objectively by doctors. Instead, she shows how atherosclerosis is made as a disease in different clinical settings. Mol charts, for example, how atherosclerosis comes into being in a completely different way under the microscope than it does during the surgery of a leg (ibid: 35). This in turn means that atherosclerosis as a disease in the pathology laboratory is not the same disease as atherosclerosis in the surgical theatre. As Mol emphasises, atherosclerosis as a disease is constantly *being done* (ibid: 32), and this makes it visible, tangible, and knowable, although in radically different ways.

It is not just diseases that are made through practices – animals can also be enacted. This becomes clear through Mol and Law's paper on the 2001 outbreak of Foot and Mouth, in which the authors start the paper by asking, 'what is a sheep?' (2008: 58). Adopting an ontological framework, the authors argue that different people could enact a sheep as, a veterinary sheep, an epidemiological sheep, an economic sheep, or a farming sheep. Sheep are not a fixed entity and this means that a farmer who rears a flock of sheep enacts an entirely different animal to a veterinarian who enacts a sheep as a potential host of a virus. Through their examples, Mol and Law place emphasis on the fact that, 'you cannot learn what a sheep is by staring at a picture' (ibid: 65). They instead draw attention to the multiple practices that bring certain types of sheep into reality.

Although people enact diseases and animals in multiple ways, they never become plural. Bodies are never fragmented or as Mol articulates, enactments are always 'more than one-but less than many' (2002: 55). The reason that enactments can be multiple but not plural is a result of what Mol describes as 'coordination work' (ibid: 70). In the hospital, Mol demonstrates how various enactments of atherosclerosis come together and coincide to form a single diagnosis which doctors can then treat. As Mol writes, 'The various realities of atherosclerosis are balanced, added up, subtracted. That, in one way or another, they are fused into a composite whole' (ibid). If, however, enactments of atherosclerosis do not coincide or facts contradict one another, then more weight will be given to one enactment of the disease over the other (for instance, laboratory findings over a patient's subjective complaints) (ibid).

Coordination work is not the only term used by scholars describing the way in which multiple enactments come together to form a whole. Comparable to Mol (ibid), Law and Lien (2012) argue that in order to enact a vaccinated salmon on a Norwegian Atlantic salmon farm a 'choreography of practices' has to take place. To demonstrate, the first practice of vaccinating a salmon is anaesthetising the fish. The whole process of enacting a vaccinatable, passive salmon is dependent upon multiple practices, the first of which is maintaining the right level of anaesthetic in the water. If this practice fails and a worker adds too much anaesthetic to the water, then the fish will become too floppy to handle. In accordance, the authors argue that enacting a vaccinatable salmon, 'takes effort, work, continual redoing, and is more or less precarious' (ibid: 368). It is therefore not surprising that every choreography is fragile and open to failure (ibid; Brives 2013).

Coordination work or the idiom of choreography describes the practical work that allows for the cultivation of commensurate worlds. Literature so far on coordination work and choreography of practices has been in single spaces like a hospital or a salmon farm. It is also often concerned with enactments of singular objects, diseases, or species whether that is black bin bags (Woolgar & Lezaun 2013), or anaemia (Mol & Law 1994), salmon (Law & Lien 2012; Lien 2015), or sheep (Mol & Law 2008). This thesis therefore deviates from previous work on the enactment of single species in fixed locations. It instead asks whether it is possible to coordinate practices that enact disease across species and in multiple different spaces. Is it, for instance, possible to align the practices of doctors in hospitals in Kampala to practices of veterinarians on pig farms fifty kilometres away in central Mukono?

The enactment of a singular pathogen across species is exactly what is advocated through a One Health approach. One Health works on an assumption that pathogens are ontologically singular and enacted and made visible in the same way regardless of species. To illustrate, a recent One Health pilot study for TSTC in Laos aimed to treat taeniasis in humans through the mass administration of albendazole while simultaneously treating and vaccinating pigs for porcine cysticercosis [2] (Okello et al. 2016). This means that a One Health approach presents a particular version of disease, one in which all symptoms and signs are enacted in the same way to make the same pathogen visible and in turn treatable. In this thesis, I will show that in Uganda, practices that enacted TSTC as a pathogen were not being sustained across different species bodies. In Uganda, it was only veterinarians who enacted signs of TSTC as a pathogen. However, doctors in hospitals while having knowledge of TSTC, never enacted it as a pathogen located within Ugandan bodies. This meant that in humans, the pathogen existed independently from any observers who could bring it into reality.

[2] A vaccine for porcine cysticercosis is not currently available in Uganda, yet one is being trialled in Eastern Uganda (2017 interview ILRI). Treatment for porcine cysticercosis is reported as a single dose of Oxfendazole 30 mg/kg (Okello et al. 2016). Not one farmer interviewed acknowledged or had previously used this drug.

This leads to the question of whether something can exist independently from the enactments that make it a reality. Eben Kirksey (2015) asks a similar question when considering whether 'new species' are entirely dependent upon other beings, things, and apparatuses in order to be brought into existence. Kirksey demonstrates, through a microbe called a chytrid, the attention and routine that is necessary in order to enact a new species in the laboratory. He argues that undescribed chytrids are dependent upon scientists whose practices include, among others, isolating them, learning what they like to eat, and caring for them in the laboratory (ibid: 761). Beyond the practices of humans, undescribed chytrids are also dependent upon needles, petri dishes, and the journals which publish results naming them as a new species. As Kirksey concludes, 'Praxiographically studying species illuminates how some kinds of critters, like chytrids, come into being as they intra-act with humans, as they are isolated and stabilized by our technologies and practices' (ibid: 776). In his account of the specific chytrid, *batrachochytrium dendrobatidis*, Kirksey shows how it was the naming of the species that led other scientists to start researching it as a unique species. This research in turn allowed for conservation projects to develop with new techniques of preventing its spread. Thus, as people came to believe in the chytrid's existence, this shifted and shaped the networks that sustained its existence.

In order for things to exist, people have to develop, nurture, and entrench networks. People are, as Latour argues, 'many participants…gathered in a thing to make it exist and maintain its existence' (Latour 2004: 246). As Latour (2000) further argues through the case of Ramses II, we can only say the pharaoh died of tuberculosis three thousand years after his death because French scientists (and all their equipment) made this a fact. As Latour states:

> Existence is not an all or nothing property but a relative property that is conceived of as the exploration of a two-dimensional space made by association and substitution…an entity gains in reality if it is associated with many others that are viewed as collaborating with it. It loses in reality if, on the contrary, it has to shed associates or collaborators (ibid: 257).

Through proposing this argument, Latour highlights how before Robert Koch discovered the tubercle bacillus, the bacillus had no real existence as it was not incorporated into networks that allowed people to know it. Latour's argument illustrates how facts are bound within networks of associations. These associations, to human and nonhuman entities, allow things to become more and more real as relationships and connections develop. This means that the existence of things is relative and dependent upon local conditions and activities, which in turn make them visible. Conversely, if networks of association do not create connections to sustain the existence of a pathogen, then it becomes invisible.

Diseases do not always become instantly visible to multiple actors. As Grisotti and Dias de Avila-Pires argue in relation to *Angiostrongylus costaricensis,* a zoonotic parasite spread by the mucus secretions of slugs and land snails in Brazil, it is possible 'that the illness was known to science, but unknown to a large number of doctors and to epidemiological surveillance services' (2011: 886). As a result, signs of the parasite were inconsistent and rates of diagnosis constantly changed. As hardly any patients presented with all the characteristic signs and symptoms of the disease (ibid: 879), the visibility of the disease was dependent upon doctors interpretation of signs and symptoms. Medical professionals therefore have to recognise signs and symptoms in order to enact them as a specific pathogen. The prolonged time it takes for associations to be built, which in turn allow doctors to enact signs and symptoms as specific pathogens becomes clear in Delaporte's (2012) account of Chagas disease. Chagas disease, also known as American trypanosomiasis, was first described by the Brazilian researcher Carlos Chagas in 1909. While Chagas identified the parasite *Trypanosoma cruzi* he was unable to clinically specify the disease. In accordance, he conflated the signs of the parasite with 'parasitic thyroiditis' (ibid: 61). It was not until 1935, when Cecilio Romaña, a physician from Argentina, described the characteristic sign of the disease as unilateral palpebral edema (swelling of the eyelids) that American trypanosomiasis existed as a distinct malady (ibid: 133). This sign, also known as Romaña's sign, made it possible to enact a sign of the disease as a distinct pathogen as opposed to a disorder of the endocrine system (ibid). As Delaporte claims, there is 'nothing automatic about the identification of a new pathology: the way in which a morbid entity is recognised depends on the structure of medical perception. In every period there are perceptual thresholds that define the limits of the medical gaze' (ibid: 9). Through his account, Delaporte shows how Romaña drew together the different elements of the disease into one characteristic sign. This led to the visibility of a distinct disease and a substantial increase in the number of diagnoses made by doctors.

Drawing on the work of Delaporte (2012), Kirksey (2015), and Latour (2000), I argue that in Uganda, only certain signs of diseases were enacted consistently as pathogens. For example, HIV was enacted as a virus by among other things, doctors, CD4 testing technology, rapid diagnostic tests, prevalence statistics, the government, donors, specialist clinics, and TV and radio programmes (see Thornton 2008; Whyte 2014). This network of associations in turn allowed HIV as a virus to become real to people working along the pig supply chain. Consequently, people enacted the signs and symptoms of HIV as a virus and would often speak about the 'virus' within their body. Knowing the virus allowed people to live with HIV and care for their body in order to avoid developing symptoms which indicated that they were sick. Unlike HIV, TSTC was not enacted by doctors as a pathogen in human bodies. While international veterinarians had the ability to carry out sampling of pigs and initiated interventions on farms and in pork slaughterhouses and butchers premises, in humans, there were no networks of association to bring TSTC into existence in clinics and hospitals. Instead, in humans, doctors enacted worm infections as soil-transmitted helminths and seizures remained as seizures, never a cyst contained deep within the human brain.

Through bringing together multispecies ethnographies, literature on signs and symptoms and scholarship from STS, I show the complexities of attempting to coordinate different enactments of signs and symptoms into a single pathogen. From this, I argue that the One Health agenda should shift its premise from interdisciplinary collaboration to cultivating the types of associations that make diseases a reality in both human and animal bodies. It is only once diseases are being enacted within multiple species bodies that coordination work can be done to align different enactments of diseases. Without doing so, I illustrate how One Health interventions could unintentionally, reinforce and neglect, neglected diseases such as TSTC.

Tracing Diseases

The original idea for this research started at the International Livestock Research Institute (ILRI) in Nairobi, Kenya. While conducting research for my Master's project, I was informed of ILRI's research on TSTC in Uganda. The original ILRI project shaped many of my initial ideas, including the sites in which my research would be based. When I began fieldwork, I intended to trace ILRI scientists as they conducted research on farms across Uganda. This included the locations, Kamuli (eastern Uganda), Masaka (central/west Uganda), and Mukono (central Uganda). As part of my initial project, I also intended to observe the introduction of ILRI's novel pen-side diagnostic kit, designed to diagnose TSTC in pigs. My project was initially concerned with understanding the work of international veterinary scientists and novel technologies for diagnosing neglected zoonotic diseases.

At the end of January 2015 and the first week of my research in Uganda, I visited ILRI and learnt that the diagnostic test for TSTC would not be introduced for at least six months. This deadline was extended throughout my research and still, three years later (2018), trials for the diagnostic test have not begun in Kampala. As I reflected on my project, I noticed that ILRI staff placed emphasis on recognising the process under which pigs moved from 'farm to fork'. I quickly adopted a similar approach, thinking through the lifecycle of TSTC and the actors capable of interrupting or facilitating its transmission. In order to build a comprehensive account, I shifted my fieldwork to the peri-urban to urban supply chain that stretched between Mukono and Kampala. Although originally I had not intended to research the infection in humans, as I studied the lifecycle of TSTC, I began to question what happened to the zoonotic pathogen once it was eaten. This was the starting point in recognising the importance of tracing food borne diseases into human bodies.

Ethical clearance for my research was granted by the ILRI Institutional Research Ethics Committee (IREC). ILRI IREC is accredited by the National Commission for Science, Technology and Innovation (NACOSTI) in Kenya. All my interlocutors gave informed consent and in an effort to protect their identities, all the names I use in this thesis are pseudonyms. During my research, I was affiliated to ILRI Uganda and the institution assisted in the practicalities of my day-to-day research. Throughout my research, I regularly visited the ILRI office in Kampala in order to feedback and discuss my fieldwork. I attended and presented my findings during ILRI team meetings and I accompanied two international veterinarians as they conducted research and training sessions. Once I had completed my fieldwork, I produced a thematic report for ILRI, which was published as a working paper (Thompson 2017). This early coding of my data, in order to produce the report, allowed me to create a solid structure for the chapters that follow.

During my research, the importance of tracing diseases as they travelled in bodies became increasingly apparent. From conducting this research, I argue that when researching zoonotic diseases, methodological importance should be placed on tracing the animal and human bodies through which pathogens travel. This is in line with anthropologists who have ‘followed the thing’ and have described the lives of among other commodities, Coca-Cola (Foster 2008), sugar (Mintz 1986), and second hand clothing (Hansen 2000). Tracing the lifecycle and spread of TSTC required a multi-sited, ‘participant observation on the move’ approach. In practice it involved months of motor biking between farms, asking why farmers chose to farm pigs. It involved watching different farmers as they fed their pigs, birthed piglets and injected medications. In Kampala, days were filled walking between pork joints, asking butchers how they marketed their meat, and tracing pork back to slaughtering sites. Tracing a food borne zoonotic disease does not end at the consumption of the product. Accordingly, in order to understand human infections of TSTC, I observed Mass Drug Administration programmes in schools and asked laboratory technicians and doctors how they diagnosed and treated worms in the clinic. Finally, I followed cases of epilepsy from rural farms to clinics and hospitals in urban Mukono and Kampala. I will discuss next the specific details of this ‘on the move’ approach.

Methods

As part of Uganda’s decentralization policy, Mukono district has its own local government. It was in one of the local government offices where I first started my research in Mukono. An international scientist at ILRI had directed me to the government veterinary office, where I met the District Veterinary Officer (DVO) and Joseph, a government employed veterinarian. The DVO and Joseph suggested three sub-counties in Mukono that I should visit, Goma, Kyampisi and Mukono Central. Throughout the course of my research, these sites were extended to include Nama and Ntenjeru.

Figure 3. Mukono District Administrative Map with Kampala directly West. (Higher Local Government Statistical Abstract 2009: x).

I spent the first month (January 2015) of my research shadowing Joseph. As we travelled from farm to farm, Joseph translated many of the interviews from Luganda into English. After a week of accompanying Joseph and reflecting on my notes, I noticed that farmers' claimed to deworm their pigs at least every three months and to always treat or cull sick animals. Jasper, a *boda boda* driver in Kampala laughed as I explained these early findings to him. As Jasper who drove me three evenings a week to my Luganda lessons dropped me off, he told me that farmers would of course claim to follow the correct treatment regimes in front of a white, European researcher and a Ugandan veterinarian. Jasper continued, asserting that I needed to keep practicing Luganda and find another research assistant who was not involved with the government or ILRI. The potential social desirability effect of Joseph and myself, may have limited the validity of farmers' answers. In response, I switched focus, researching instead Joseph's understandings of pigs' bodies and his relationship to farmers. Farmers' responses to questions were in turn recorded as a response to Joseph as a veterinarian.

During the process of shadowing Joseph, he introduced me to other veterinarians such as Robert the meat inspector (chapter four). Joseph also knew the manager of the Mukono International Clinic (MIC) (chapter six) and during my first month, he facilitated access to the laboratory through introducing me to Okot the laboratory technician. Shadowing Joseph illuminated the way in which certain actors have the power to shape the answers given by informants. Despite being recommended by a veterinary scientist at ILRI, Joseph was not an appropriate research assistant. He did, however, act as an important early gatekeeper, introducing me to a vast network of actors across Mukono district.

Due to the limitation of the results yielded from working with Joseph, I spent two mornings a week with him in the following two months. The remaining time was spent on different farms accompanied by my research assistant Ben (my relationship with Ben is discussed at length in the next section). Over the course of the research conducted on farms, I conducted in-depth semi-structured interviews with thirty farmers. Alongside the interviews, I observed farmers' day-to-day pig farming practices and deworming techniques. Farmers also allowed me to accompany them to veterinary drug shops and to clinics when they themselves fell ill. I also conducted multiple semi-structured interviews with the Mukono DVO and three government contracted veterinarians. I further interviewed and observed the practices of two community-based animal health workers – often referred to as 'local vets' – and three veterinary drug shop workers.

Moving from live pigs on farms, I spent the following three months in pork joints. I located multiple pork joints across Kampala and Mukono. I also traced two pork joint owners in Mukono back from an ILRI led butcher training.

During the training, ILRI veterinarians advised butchers on invisible pathogens, hygiene measures, and producing pork fit for human consumption. During time spent in pork joints, I observed meat butchering processes and preservation techniques. I also spent time interviewing pork consumers, eating shared plates of meat, and playing pool often late into the evening. In pork joints, eating pork was a way of gaining trust and rapport. Buying half a kilo of pork to share with interlocutors was often an easy route into asking why people ate pork and what specific qualities in pork they desired.

Through spending time in pork joints, I began to trace pork back to slaughterhouses and slaughtering sites. This led me to the government recognised *Wambizzi* slaughtering facility, five informal slaughtering sites in Kampala and numerous backyard slaughters across Mukono. In addition, I attended martyrs' day at Namugongo, an event that lasted three days. Many of my interlocutors mentioned Namugongo in interviews, as it was a time in which many pigs were slaughtered and large quantities of pork was eaten. In slaughterhouses and when viewing backyard slaughters, I asked workers about their slaughtering techniques, ideas about sickness, and the trading of pigs and pork. In *Wambizzi,* I also observed and interviewed meat inspectors and managers.

The final two months of the year (November-December 2015), were spent in hospitals, clinics and laboratories interviewing doctors and laboratory technicians on human deworming practices and diagnostics for neurocysticercosis. In MIC the laboratory technician, Okot, had trained in Kampala. Okot had classmates who worked in Mulago, Uganda’s national referral hospital. In Mulago, I conducted interviews with doctors and laboratory technicians discussing the prevalence of *T. solium* tapeworm infections as well as what diseases doctors believed warranted hospital admission. During the entire research period, I also conducted single interviews with staff at the Kampala Capital City Authority (KCCA), staff at the International Livestock Research Institute (ILRI), staff at The AIDS Support Association (TASO), principal veterinary officers from the Ministry of Agriculture and laboratory technicians at Astel Diagnostics.

I returned to Uganda for six weeks at the beginning of October 2017. This was in order to conduct further research with traders as they brought pigs to slaughterhouses and delivered meat to pork joints. During this period, I also made every effort to return to all previous interlocutors to ask follow up questions and to discuss issues that had arisen in the writing up period.

Throughout this thesis, I have included a number of pictures taken from across the sites. All informants have given explicit consent for their pictures to be included. Nevertheless, I have taken care to obscure the majority of their faces. All of the pictures included were printed in Kampala and taken back to my informants, often within a week of them being taken. These photographs, and many others that have not been included, became an important part of my research process. After returning with photographs, informants trusted that I would come back and I was not conducting a fleeting interview. More often than not, once informants were given a photograph they would be willing to engage in longer conversations, developing ideas, and providing richer accounts and access to sites. The photographs that I have included not only visually capture aspects of my research; they also represent an important process through which I built trust and ongoing relationships with my interlocutors.

The photographs I have selected are presented in order to complement my written data. The meanings I have derived from them are presented in the captions. As Pink (2007) notes, photographs in ethnographic research have no single meaning. Instead, they are re-appropriated and given new significance in each context in which they are used. Accordingly, the pictures included have different meanings for my interlocutors, than they have for myself or for another viewer. This became clear when during my research, the house of one of my interlocutors flooded and the water ruined many of his possessions. During my next visit, the man ran inside his house and brought out the visibly spoiled photograph. He asked if I could print another explaining that it was the only one he had of him and his friends at work. What for me represented a group of workers slaughtering a pig had an entirely different meaning for him. Through subsequently asking what these pictures represented to my informants, they developed the way in which I came to understand my multiple research sites and the interactions and activities that occurred within them.

Speaking Luganda and Research Assistants

The role of language and the integration of Lugandan concepts are central to the argument I make in this thesis. There are many words in Luganda that do not directly translate into English. Mol questions through the example of the Dutch word *Lekker*, whether we should, 'transplant terms rather than translate them' (2014: 108). Likewise, many Lugandan terms I use to build my argument, cannot be directly translated or captured through the use of a single English word. In an attempt to integrate Luganda effectively, I studied the language throughout my research and intensively during my first three months in Uganda. After the first three months, I was able to explain my research to new informants and ask a number of questions in Luganda. Learning Luganda was beneficial beyond translation. Speaking Luganda also facilitated access to sites and in particular pork joints and informal slaughterhouses. Across many of these sites, owners were often concerned that I was a spy for Kampala Capital City Authority (KCCA). Speaking Luganda was therefore a way of quickly building rapport. As soon as I was able to, I always introduced my research in Luganda even if I knew that the subsequent interview was going to be conducted in English.

Despite learning Luganda, I was always accompanied by a paid research assistant, Ben. Ben had moved to Kampala in his late teenage years, living in what he described as the 'slum'. He had worked throughout his twenties as a handyman and guard for expatriate families living in Uganda. From his pay, he had saved enough to buy a motorbike and when I met him, he was working as a *boda boda* driver, stationed a short walk from my house. A month prior to starting my research, Ben had moved his wife and two young daughters from their village home in Kayunga to a small, one bedroomed house in the suburbs of Kampala. He would often comment that the main reason for moving his family was for his daughters to get a good education in the city. Despite the burden of school fees, his daughters quickly started learning and speaking English. For him, their ability to speak English was the most important part of their education.

Ben’s parents were originally from Arua in the North of Uganda and had moved to Kayunga district in the central region of the country before he was born. As a result, he spoke his mother tongue Lugbara, as well as the majority language of Uganda’s central region, Luganda. Through schooling and his jobs, he was also fluent in Swahili and English. Ben had lived and worked in different parts of Kampala and had a natural ability to quickly build relationships. Immediately after my first day of research with Ben, I realised that many of the power dynamics that had surrounded my research with Joseph were no longer apparent. Ben had no formal background in social research, he did not assume knowledge, pose interview questions to catch interviewees out or provide knowledge if they gave what he considered to be an ‘incorrect answer’.

A large percentage of Ben’s extended family lived throughout Mukono and many members of his family became my interlocutors. His mother, sisters, brothers, uncles, aunts and cousins became important gatekeepers throughout the district, introducing me to farmers, local vets, pork joint owners, and slaughterhouse workers. These same family members would also cook me lunches and dinners and let me sleep in their houses on nights when it was too late to get back to Kampala. It was over these afternoons and evenings in which I chatted at length about life in Uganda and learnt how, as a woman and a wife, to quickly pluck chickens and to steam *matooke* in banana leaves.

Ben visited all of the sites that are documented in the chapters that follow. He accompanied me before dawn as we made our way to slaughterhouses and in the evenings on trips back from the farm. He spent days walking between pork joints in Kampala and hours watching deworming of both pigs and humans. He would call me to tell me about adverts on the radio which ranged from pig farming training sessions to where to find the best herbal remedies. Over breakfast, lunch, and dinner, Ben and I would often reflect on research questions, the answers we had been already given, and start to cluster the themes that were emerging. As we did this we would consider translations and specific words that were being frequently used as well as other relevant questions.

Working with Ben led me to question the role of research assistants in the production of ethnographic knowledge. There is limited anthropological literature that discusses the role of research assistants despite the central role they play in framing and shaping research (Gupta 2014; Middleton & Cons 2014). As Lyn Schumaker highlights, this means that research assistants are generally invisible in the finished work of anthropologists (2001: 12). As Middleton and Cons write, 'More often than not, discussions of research assistants are limited to footnotes, formal acknowledgements, or references to companions along for the ethnographic ride' (2014: 282). Although Ben did not write this thesis, his knowledge of Uganda, his access to sites, his ideas over potential interviewees and his reflections on my research questions and findings transformed the direction of my research. In line with Temple's assertion that the use of translators, 'is not merely a technical matter that has little bearing on the outcome. It is of epistemological consequence as it influences what is "found"' (1997: 614), I am highly aware that my perspective of Uganda and of the pig supply chain more generally was greatly influenced by the presence of Ben.

With importance placed upon the individual autonomy of the anthropologist, research assistants are not foregrounded in ethnographic work (Middleton & Cons 2014). Through neglecting to incorporate the work of research assistants into their work, anthropologists privilege their own voice and interpretations. Gupta (2014) postulates that the use of a native research assistant may be accompanied with a degree of postcolonial guilt. However, I argue that without highlighting the roles that research assistants play in shaping and interpreting data, this postcolonial guilt will only perpetuate. Throughout the chapters that follow, I do not explicitly mention Ben. Nevertheless, I wish to make it clear that he was very much part of the process through which I recorded and eventually came to interpret and analyse my data.

Chapter Overview

The chapters of this thesis trace diseases along the pig supply chain as they move from pig bodies on farms, into carcasses in slaughterhouses, meat in pork joints, and into human bodies in clinics and hospitals. Beginning on pig farms, in chapter one, I show how for Ugandan pig farmers a healthy pig body was a fat pig body. I demonstrate how pigs provided for and therefore transformed the lives of farmers' families and their pursuit of a good life into the future. This meant that farmers cared for their pigs in specific ways. Farming practices used to transform pigs' bodies ranged from feeding pigs waste to allowing them to free-roam in order to eat as much as possible.

On pig farms, farmers described the virus, African swine fever (ASF) as the most threatening disease to their pigs. In response, veterinarians assumed that training and educating farmers on biosecurity measures would stop the spread of the disease. Veterinarians, particularly those at ILRI, claimed that adopting internationally recognised biosecurity measures would mean that pigs remained pathogen free. These measures included sty-rearing pigs and culling infected pigs. In the veterinarians' eyes, these practices would ensure that pigs remained healthy.

Farmers' version of what constituted a healthy pig body differed significantly from veterinarians. If farmers suspected ASF, they immediately sold the infected animal to traders. The money from the infected pigs could be reinvested into the farm and the family. From these observations, I argue that the risk of rearing a stunted pig, which was unable to provide for the family, was a greater risk to the wellbeing of farmers and their families than the potential pathogenic threat of ASF.

Chapter two illustrates another practice that pig farmers used in order to rear fat pigs – the administration of veterinary drugs. Building on the previous accounts of why pigs were important to farmers, chapter two explores how veterinarians and farmers enacted signs and symptoms of sickness differently. This chapter focuses predominately on the diagnosis of worms and deworming practices on farms. Farmers strove to rear healthy, fat pigs and in order to do so they relied on veterinary drug shops and local knowledge in order to treat their animals. In this context, veterinary diagnosis of specific pathogens had little value for producing pigs that were considered as healthy by farmers.

On farms, veterinarians attempted to make signs of internal worms visible on the external body of the pig. They indicated areas and signs for farmers to observe. Veterinarians would mention TSTC to farmers and yet, in practice, they could not enact signs of TSTC as they were not highly visible on pigs' bodies. This was because although the lifecycle of TSTC started on farms, cysts were contained inside the bodies of pigs. This meant that for farmers, TSTC was not a sickness. Consequently, the parasite did not threaten the future health and wellbeing of the farmer's family.

While pig farmers endeavoured to produce healthy, fat pigs, in chapter three, I discuss why traders desired fat, sick pigs. This was because for traders, sick pigs made profit. Sick pigs could be bought cheaply from farmers and then transformed in slaughterhouses into marketable meat. Traders and slaughterhouse workers never described pathogens in pigs as a threat to human health. In accordance, this chapter discusses how ideas about sickness and health travelled from farms into slaughterhouses. I illustrate how actors along the pig supply chain enacted similar versions of healthy and sick pig bodies. This was because they were aware of each other's inclusion in the same translocal network (Foster 2008). Traders and slaughterhouse workers, despite being spatially separated, knew that meat could always be transformed into something that was marketable to butchers. If a pig was too sick to take to the formal slaughterhouse, *Wambizzi*, where meat inspectors could condemn the meat, then traders delivered the sick pigs to informal slaughterhouses instead. Across informal slaughterhouses, practices to achieve marketable meat included cutting out abnormalities in meat and mimicking the *Wambizzi* meat inspector's stamp.

While traders and slaughterhouse workers did not believe sickness in pigs caused sickness in humans, in chapter four, I show how ILRI veterinarians attempted to construct zoonotic diseases as threats to human health. ILRI based their knowledge on samples taken across the country and understood certain pathogens as being contained within pigs' bodies and pork meat. Veterinarians' knowledge of zoonotic diseases also informed the practices of meat inspectors who worked across Kampala and Mukono. However, without diagnostics, meat inspectors were often unable to enact diseases such as TSTC, in the same way as ILRI veterinarians who analysed their findings in laboratories in Kampala. This chapter therefore shows that with limited slaughterhouse infrastructure and diagnostic facilities, pathogens can remain invisibly contained within meat. This allows pathogens to potentially travel into pork joints.

Despite veterinary attempts to make zoonotic diseases visible, butchers and pork joint customers did not understand pork as a disease risk. In chapter five, I illustrate why Ugandans chose to eat pork. I indicate how customers chose pork based upon its visual appearance and argue that aesthetically pleasing meat indicated to the consumer that the meat was pathogen free. Butchers strived to produce meat that looked good and this understanding of meat filtered back to the slaughterhouse (chapter three). Drawing on accounts of sickness and in particular HIV, in chapter five I also examine how the act of consuming pork transformed human bodies. In Uganda, HIV was known as a virus that could be managed and 'lived with' (*kubeerawo).* In accordance, I illustrate how through eating pork, people kept the virus satisfied within their bodies. This meant that they could live with HIV without it causing signs or symptoms of sickness. The way in which pork transformed sick bodies and cultivated healthy bodies provided hope for a better future when living with HIV.

HIV was not the only pathogen that could be 'lived with' inside the body. People also described worms as a generic sickness which did not often cause signs and symptoms of anything serious. This meant that they could also be 'lived with'. In chapter six, I illustrate how deworming regimens for humans, transformed worms into a generic sickness. Throughout Kampala and

Mukono, worms were not perceived to be a serious illness and in some instances, children were considered to need temporary worm infections in order to become healthy adults. Worms were only considered dangerous when seen outside of the body and therefore in excess. A worm that was contained ‘quietly’ inside the body was normal, while a worm that produced symptoms that affected the body, whether it be visibly or audibly, was perceived to need treatment.

In this context, doctors rarely diagnosed specific worms. Worms were instead transformed into a generic infection that could be easily treated – this was the same whether people decided to use traditional medicine, biomedicine from the clinic or free medication from Mass Drug Administration programmes. The tapeworm, *T. solium,* as an often asymptomatic pathogen, was therefore rarely discussed across any of these spaces. This in turn allowed it to remain potentially contained within bodies and untreated. From a biomedical perspective, this facilitated the final stage of the TSTC lifecycle, neurocysticercosis (NCC).

Following the lifecycle of TSTC through to its definitive, human host, chapter seven examines NCC and its main symptom, adult onset seizures. In this chapter, I illustrate the ways in which people who suffered from seizures (and their family members) searched for a cause. All of my interlocutors sought a diagnosis from doctors in the hope that a treatable pathogen would alleviate their condition. NCC could only be made visible through brain imaging technologies. Access to these technologies was limited as well as prohibitively expensive for many of my interlocutors. This meant that doctors would rarely attempt to diagnose a pathogen like NCC in the hospital. Seizures that could not be treated by doctors suggested to my interlocutors that the true cause of their condition was rooted in social relationships. This meant that treatment could only be found outside of the hospital.

Along the pig supply chain, the health of people was often dependent upon the lives of pigs. However, the development of beneficial relationships between pigs and people masked the emergence of pathogens which had the potential to threaten lives. One such pathogen was TSTC. As networks that allow TSTC to exist in pork meat and humans were not in place, the pathogen could potentially creep along the supply chain until it reached the human brain. I, therefore, conclude chapter seven by discussing the positioning of a novel diagnostic for porcine cysticercosis. I argue that opposed to only being used to diagnose the pathogen in pigs' bodies, it is important to make TSTC visible in human bodies. This, I argue, would be the first step in creating an association between seizures in humans and a potentially treatable pathogen contained within pig and human bodies.

Chapter One

Pigs as Family: Pig Rearing Practices, Biosecurity Measures, and Outbreaks of African swine fever

In mid-January 2016, a leading daily Ugandan newspaper published two articles reporting outbreaks of African swine fever (ASF). Over the course of two days, the newspaper detailed the spread of the virus nearly 300 km from Kampala city to Mbarara district in the west of the country (Anyine 2016; Ainebyoona 2016). Exactly a year later, in January 2017, the newspaper again reported the death of hundreds of pigs across Masaka, a district in Uganda's central region (Mugenyi & Aliga 2017). As in 2016, senior Ugandan veterinarians were cited as advising farmers to adopt and implement certain biosecurity measures – to disinfect their boots with *Jik* (bleach), to stop pigs from free-roaming on farms, and to quarantine all their infected animals. Year after year, as the ASF virus sweeps across the farms and districts of Uganda, the same newspaper has published nearly identical reports. Hundreds if not thousands of pigs have died annually and yet veterinary advice has remained the same – disinfect equipment, build pigsties, quarantine and cull sick animals.

ASF, commonly referred to as *omusujja* [fever/malaria] in Luganda, is a highly contagious viral disease of pigs (Barongo et al. 2015). The disease was first identified by R.E. Montgomery in 1921 as 'East African Swine Fever' (Montgomery 1921) and current veterinary studies indicate that the virus continues to be a significant challenge for the Ugandan pig sector (Atuhaire et al. 2013; Chenais et al. 2017). Transmission of ASF occurs through three independent cycles, a tick-pig cycle, a sylvatic cycle, and a domestic pig cycle (Pietschmann et al. 2016). With free roaming pig rearing practices commonplace, outbreaks in Uganda are increasingly associated with the latter transmission cycle and ASF has been reported as endemic throughout the country (Atuhaire et al. 2013; Chenais et al. 2017; Muwonge et al. 2012). Once pigs are infected, the virus is found within all tissues and fluids, with signs and symptoms ranging from a high fever and loss of appetite to haemorrhaging of the internal organs (Barongo et al. 2015).

All of the pig farmers I spent time with in Uganda were smallholder farmers. In accordance, they owned between two and thirty pigs, with the majority rearing less than ten pigs at any time. Every farmer I interviewed claimed that they had either directly or indirectly experienced an outbreak of *omusujja* and that the sickness was an unavoidable consequence of being a pig farmer in Uganda. *Omusujja* was said to lurk within the dry environment, spreading through the wind, and trapped within the soil. As Benson, a pig farmer in Katosi concluded, ‘Pigs get sick like humans, there is a season for measles in humans and there is a season for fever in pigs. That is the dry season. The pigs can’t move, their ears turn outwards, and even the skin itself becomes red’. This understanding of *omusujja* meant that during the dry season many farmers believed that their pigs’ bodies were under constant threat of infection.

The notion that *omusujja* had no specific cause was reflected in its name, with *omusujja* also referring to malaria and general fever in humans. Although people did occasionally refer to ASF in English as swine flu or swine fever, when speaking in Luganda, farmers always used the term *omusujja.* When describing *omusujja*, most farmers would comment on the sudden reddening of a pig’s ears and stomach as the most recognisable sign. Other signs of *omusujja* in pigs included a lack of appetite, shaking, and an inability to move. All farmers knew that *omusujja* was not zoonotic and therefore not a threat to their own health. Nevertheless, all farmers described the sickness as a major challenge, which had a profound impact upon the *obulamu* (health/wellbeing/life) of their family.

Despite almost certain fatality and no known treatment or vaccine for ASF (Muhangi et al. 2015), the longer I spent working on smallholder pig farms, the more it became apparent that a large number of farmers were not adopting and integrating the biosecurity measures recommended by veterinarians. Contrary to veterinary advice, farmers continued to allow their pigs to free roam, did not observe quarantines or cull their diseased animals and restocked immediately after ASF outbreaks. As the Mukono District Veterinary Officer (DVO) once questioned:

> Why is it that when someone loses their pigs they restock straight away but they don't change anything? I have told farmers over and over again that for biosecurity you should wait six months before you restock your pigs, one month later they are farming again. Just think, ASF is devastating the pig industry but the pig numbers in Uganda are still increasing.

Like the DVO, veterinarians regularly shifted the blame of ASF outbreaks onto farmers' pig rearing practices. As during human epidemics in which governments have held individual groups accountable for failing to embrace health messages (cf. Briggs & Briggs 2003), in Uganda, smallholder farmers were as one veterinarian lamented, 'fuelling the epidemic's fire'.

In an attempt to understand why many Ugandan pig farmers were not observing biosecurity measures, this chapter draws attention to the ways in which pigs provided for and became part of farmers' families. Adopting a multispecies approach and paying close attention to the relationships constructed between species (Kirksey & Helmreich 2010; Nading 2013; Van Dooren, Kirksey, & Munster 2016), I suggest that in Uganda the health of the family extended beyond the human body. For the farmers with whom I worked, pigs provided for the family and had responsibilities for the future. This relationship between the health of a specific pig and the wellbeing of a farmer's family was why pigs were given affection and cared for in very particular ways.

In central Uganda, farmers most frequently claimed to rear pigs in order to provide for school fees and emergency future costs. This meant that pigs' bodies simultaneously acted as a dual source of wealth, embodying children's education as well as a highly accessible source of cash during times of emergency. A healthy pig was believed to provide financial security against unknown future events as well as securing the lives of farmers and their children into the next generation. This was why farmers endeavoured to produce fat pigs *(embizzi enene*), with stunted pigs (*embizzi ekonye,* lit. to be stuck) representing sickness, neglect and an inability to provide for the family.

In an attempt to transform pig bodies into fat, healthy bodies, the majority of farmers I visited adopted a series of pig rearing practices. This included, among others, allowing pigs to free roam when feeds became scarce.

Taking into account pig-farmer relationships, the second half of this chapter focuses predominately on why farmers allowed their pigs to free roam. I argue that the practices used by farmers to transform pigs' bodies were in tension with the biosecurity measures advocated by veterinarians. Following the logic of biosecurity, Ugandan veterinarians focused upon preventing infection by separating valued life from disease threats (Collier & Lakoff 2008; Donaldson 2008; Hinchliffe et al. 2016; Hinchliffe et al. 2013). This was why veterinarians instructed farmers to sty-rear their pigs as they assumed the major risk for farmers was the infection of their pigs with diseases. While veterinarians advocated practices that would keep pigs pathogen free, health for farmers was based on the aesthetic of a fat pig. For farmers, a stunted pig was a sick pig. This meant farmers adopted practices to ensure their pigs became and remained fat. The tension that emerged between veterinarians and farmers indicates the shifting reality of what constitutes a healthy pig body and how this in turn influences pig rearing practices and the adoption of biosecurity measures.

On pig farms, I never once observed farmers sample a sick pig or seek a diagnosis for ASF. Instead, the rapid reddening of a pig's body came to be a sign of the sickness *omusujja* and thus became emblematic of the potential loss of wellbeing for the whole family. Accordingly, this chapter ends by suggesting why farmers did not call veterinarians if they feared their pigs were infected with *omusujja*, as well as why they would neither implement a quarantine nor cull sick pigs. I conclude by arguing that farmers would rather call traders to come and buy their sick pigs, as the retention of some of the pigs' wealth was preferable to a complete loss and in turn lack of *obulamu* into the future.

Keeping Pigs

While many farmers reared sows for farrowing litters and others kept boars for servicing sows, the process of fattening piglets for sale was the most often described on the farms. This was because pigs that farmers were fattening for a specific point in time had the most responsibility in providing for the family into the future. In discussions around fattening pigs, farmers would make it clear that not all pig breeds fattened in the same way. As a result, farmers divided breeds into two major categories: the local pig and the exotic pig. The latter category, often selling for a slightly higher price as piglets, included breeds such as the Large White, Landrace, and Camborough. These pigs were praised for their fast growth and the large size of litters but were not considered by farmers to be particularly resilient to diseases. Local pigs, on the other hand, were smaller in size but were perceived by farmers to be less likely to die from diseases including ASF. A mix of exotic and local pigs produced a crossbreed, which many farmers considered superior. Farmers explained that crossbred pigs combined the resilience of local breeds whilst also producing litter sizes similar to exotic breeds[3]. As one farmer emphasised, 'Sometimes pigs get *omusujja* and they all die. Once that happened to me, all eight of my pigs died over two or three days. The pigs that died were from South Africa, they looked like *Bazungu* (European people). When they died I changed to a cross breed because I thought the cross breed would have much stronger blood'. The farmer's observation adds legitimacy to scientific studies conducted throughout African countries which suggest that domestic pig populations have an increased resistance to ASF (Haresnape et al. 1985; Penrith et al. 2013). Despite many farmers deeming local pigs to be more 'resistant' to diseases, ASF was still cited by all farmers as being a serious challenge in Uganda.

[3] Pigs have a short gestation compared to other livestock and many farmers would also comment on pigs' ability to produce multiple births in less than four months. This observation was made in comparison to cows, which have a gestation of nine months and often only produce one calf.

One such farmer was Mama Ajiyo. Mama Ajiyo had moved with her husband from Arua in Northern Uganda to find land and an income closer to Kampala. The longer I stayed with Mama Ajiyo, the more it became evident that her memories were etched onto the land surrounding her house. Walking to the farm one morning, she pointed nonchalantly into a small opening behind the compound, 'This is where I gave birth to nine of my eleven children and my husband is buried here next to my house'. Next to her husband's concrete grave one of her piglets grunted as it searched for food. 'My second son was shot in front of our house in 1975, after that I suffered three miscarriages all of them boys' Mama Ajiyo continued. 'When my fourth boy came I called him *'Hamna'* (nothing), I just didn't believe he would survive. Now he is the strongest of them all'. I had first travelled to Mama Ajiyo's farm with Hamna, who now had three children of his own. Hamna had grown up in the village, moving to Kampala when he was seventeen to find work. His wife, a primary school teacher, and their children remained in the same compound as his mother where he would visit them once a month.

When we reached the back of her house, Mama Ajiyo unwound the rope that tethered her favourite boar, Cobb, to a jackfruit tree. 'If we love Cobb and feed him well he will definitely grow fat', she commented as she walked him down the lane outside her house. I often accompanied Cobb, a stocky white and black local pig, and Mama Ajiyo as they took the same leisurely walk through the lines of towering maize, towards a plot of growing sweet potato. Mama Ajiyo was convinced that these walks and availability to food would ensure that Cobb grew big and as a consequence would sell at a higher price. As she asserted, 'Cobb is part of the family, like the dog. If we really love Cobb he should make us about UGX 400,000 (£85)' (Figure 5). Mama Ajiyo cared for Cobb like a pet. Cobb had a name, was given affection, taken on daily walks, and described by Mama Ajiyo as 'part of the family'. The care Mama Ajiyo gave Cobb contradicts literature on human-animal relationships, which suggests that people develop different kinds of relationships with production animals or that a relationship with a pet represents a 'fundamentally different relationship from livestock' (Russell 2007: 30).

Like Cobb and Mama Ajiyo, across the farms of Mukono, pigs and humans were entangled within one another's lives. Farmers did not rear pigs to be contained within buildings and pigs were often allowed to trot around plots of land and inside farmers' homes. Recognising the significance of relationships between farmers and pigs is central to my argument. In Mukono, farmers developed emotional bonds with their pigs, relationships that mimicked those with pets or 'companion species' such as dogs (Haraway 2003). Farmers would often claim that they loved their pigs or that pigs were 'family' and in particular 'like children'. As another urban pig farmer in Kampala articulated, 'Pigs are part of the family because they give you money…They are like children. They respond to their name. If you call your pig it will come nodding its head when it sees you'.

The relationships that farmers developed with their pigs were beyond instrumental and many farmers gave their pigs a name and some form of daily affectionate touch (Haraway 2008: 36). For instance, every time I visited a young farmer in Goma, he would encourage his Landrace boar to roll over and have his stomach scratched before being given his evening feeds (Figure 6). Pigs that had regular contact with farmers were also commonly given names. When asked why, one farmer who was fattening a Large White piglet called Gabon replied, 'Whenever you love something you have to give it a name'. Similarly, another farmer named all ten of his pigs after people that he knew, including his six-year-old Sow in memory of his mother, 'Meryl'. A pig that was loved and cared for was considered to grow into a contented and fat animal. A stunted pig, on the other hand, was a bodily reminder of a lack of care, bad farming practices, and diminished *obulamu* into the future.

Many of the pig farmers who I visited in Mukono would comment on the size of their pigs. Most often farmers would worry that their pigs were not growing and would claim that it was only through walks, access to regular feeds and affection that their pigs would ever grow to be healthy and fat. There is an abundance of literature on fat human bodies and the relationship between an individual's weight and their health (Brewis et al. 2010; McCullough & Hardin 2013; Sanabria 2016). While often fat is associated with negative health implications and alarmist discourses (Kulick & Meneley 2005), a fat body can also be a positive representation of care and affection. As Dahl writes, in Botswana there is a moral tone to a fat child's body in that fat bodies become a visible signifier of whether a child is being looked after and loved (2014: 631). In relation to pigs, a fat body was a sign of the *obulamu* of the family. A pig's body, like a child's body, visibly embodied hope for the future. This becomes evident when considering that on my first visit to one farm a farmer proudly showed off her fattest pigs, while on another the farmer reluctantly gathered his piglets while apologising that they were stunted. Later he asked me, 'What would you suggest to make a local piglet grow?'

While farmers considered pigs as family and frequently drew parallels between pigs and children, all farmers still categorised pigs as killable (cf. Haraway 2008). Pigs were *like* children in that they had responsibilities for the future and they required a specific type of care in order to grow. Yet, pigs were not like children, as they had to be killed in order to provide for the family. Despite pigs being raised for consumption, not one farmer interviewed had slaughtered or eaten their own pigs. Compared to poultry, slaughtering a pig was described as physically difficult and excess pork was hard to store post slaughter. Aside from the impracticalities of slaughtering a pig on the farm, farmers would also frequently comment on the moral implications of slaughtering their own pigs. When I asked about eating Cobb, Mama Ajiyo's son exclaimed, 'I can't slaughter him here. I feel bad to kill my own pig. I wouldn't even like to see how they kill him'. As with Mama Ajiyo's son, across the farms I observed that as affective relationships developed between pigs and farmers, the less likely the pig was to be slaughtered or consumed by the individuals themselves. With pigs described as part of the family, in order to justify their killing, farmers would strive to ensure that pigs had a good death in which the pig was sold to traders or butchers and slaughtered outside of the home.

Pigs were in constant demand throughout central Uganda and could be converted into an emergency fund within the space of a day. Pigs that were being fattened for sale were nevertheless, more regularly sold at specific, pre-planned points throughout the year[4]. This meant that these pigs were not often sold to cover basic needs such as buying food or clothing, nor were they slaughtered for family consumption. Instead, pigs that were being fattened were used to simultaneously store wealth for both the family's immediate and long-term future. Observing that pigs were given this responsibility indicates why farmers cared for them and gave them affection in the ways described above. Care for pigs translated as care for the family and this meant that the body of the pig became a sign of the *obulamu* of the family.

Figure 4. Mama Ajiyo's grandchildren with one of her pigs. Photo by author.

[4] In surveys conducted across Uganda, pig sales were most frequently reported during religious festivals and at the start of school terms (Dione el al. 2014).

Figure 5. Cobb on a walk. Photo by author.

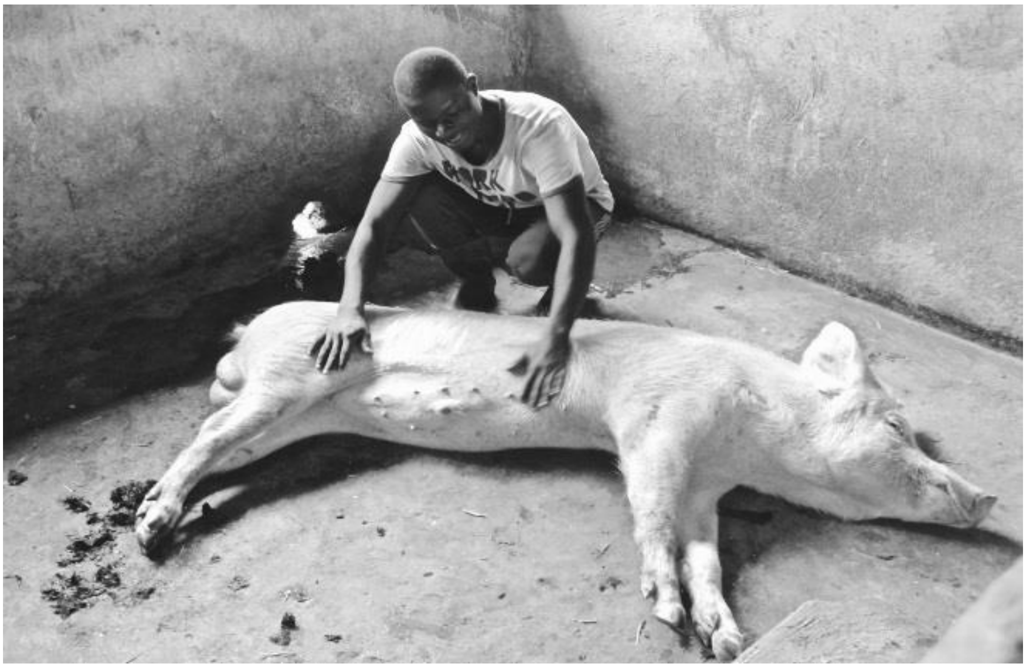

Figure 6. A farmer scratching his boar's stomach. Photo by author.

Rearing Pigs, Rearing the Future

On the edge of Lake Victoria, twenty-seven kilometres southeast of Mukono town, there is a small fishing village named Katosi. Travelling to the village through the long rainy season of September, the clouds, full and dark, contrasted with the vibrant green of the surrounding pine and eucalyptus forests. Unlike the previous months, the persistent rain had turned the narrow lanes into gushing rivers making the journeys slow and the steep descent into the village treacherous. Drawing closer to the village, free-roaming pigs ran here and there and between the lake and the largest primary school, a large open rubbish pit was crammed with grazing livestock.

The shore of the lake was lined with fishing nets glistening with drying sardines and fishermen ran back and forth frantically packing refrigerated trucks with Tilapia and Nile Perch. Every day, trucks full of fish were transported back to Kampala by road to be exported globally. The money generated from the fish meant that people from all over Uganda flocked to the lakeshores to find a job. Once on a bus journey to the village, a fellow passenger explained to me, 'There is too much money and too much happiness when the money from the fish comes. Every night there is partying, people are coming from different areas and no one knows their past, they come here to make money. They know on the lake they will always make money'. However, he concluded, 'Now there are so many people living in the village with HIV'.

During interviews, many of the farmers in the village reflected on how they themselves or members of their families had been diagnosed with HIV. One of these farmers was Mama Mukiza. Mama Mukiza lived directly opposite the primary school and was rearing two small black pigs in the yard at the back of her house. Mama Mukiza had been raising pigs for four years and as she explained:

> My children's father was a fisherman. I did not keep the pigs until he died. Pigs are not like other animals because they grow so fast. That means I can still take care of my children. Before my husband was the one working on the lake. Every day he made money. He provided

> everything for the family, food, house, school fees…he died from *siliimu* (HIV). He was thirty-five years old. Since his death, the pigs have really increased my income. The money from the pigs' means my four children can continue in school, now my first-born speaks English.

Or as Benson, another farmer from Katosi, similarly claimed:

> My pigs are changing the next generation. I have twelve children and I sell my pigs only for education. Now all my children are being educated. [His daughter who was helping translate had just returned home after finishing senior six]. See my daughter is speaking English with you; she went to a good school in Entebbe. I am a farmer but getting an education will change my family and the pigs are making that change.

Like Mama Mukiza and Benson, many farmers claimed to use the money from pigs to provide education for their children. Providing school fees (*ebisale by'essomero)* was a constant source of worry across the farms and in almost every other site along the pig supply chain. In accordance, pigs were described as the perfect animal for providing school fees as the process of fattening a piglet until sale took a little less than a year. As one farmer asserted, 'By eight or nine months they are ready for selling to traders. Per pig I can make around UGX 250,000 (£53) and I buy piglets for UGX 50,000 (£10)'. The speed with which pigs fattened meant that the selling and restocking of pigs for school fees was common across all the farms I visited.

In Uganda, children are educated for seven years at primary education followed by four years of secondary school. There are two additional years for advanced level. Students can then attend university, technical schools, or other training colleges for three to five years. While universal primary education was introduced in Uganda in 1997 (Ward et al. 2006), many farmers claimed to send their children to private schools as the quality of schooling was considered to be significantly better. In particular, private schools were considered to provide children with a better standard of English. As Lotte Meinert argues in her book on schooling, health and everyday life in Eastern Uganda, schooling as an experience has 'transformative significance', with the potential to alter life trajectories (2009: 8). Meinert highlights how schooling provides an 'opportunity to become a 'learned' person, to acquire the cultural capital it takes to develop a smart home, and a good life' (ibid: 64). Farmers in central Uganda also described the hope of schooling for transforming the future of their family's life.

Through rearing pigs, farmers were able to maintain their own individual lives as well as transforming the lives of the next generation (cf. Van Dooren 2014). Hence, unlike Natalie Porter who described how Vietnamese poultry farmers associated livestock production with rural livelihoods and 'rural backwardness' (2012: 74), in Mukono, pig farming was framed by farmers as progressive and lucrative. As Mercy a farmer from Goma sub-county affirmed:

> I used to work in town. I had a shop. If I had known about pigs before the shop I would never have opened that shop. I am not tied to one place like in the shop. As long as the pigs are fed I can take care of my family and pay for my children's education. I just leave the pigs eating and growing and I am able to do other things. I can do two things at once. But in a shop you have to stay. You have to open, close and be there all day for customers.

When I spoke with Mercy she was preparing to sell her pigs for school fees. She estimated that selling fifteen pigs would cover all her children's school fees. As she explained, 'Now I have three children at secondary school and two girls at university. Money from the pigs pays for all of their fees. When the children are at school, we restock the farm. It is a cycle and it works'. Mercy's comment illustrates the ways in which farmers in Mukono projected their aspirations for the future onto their pigs. As Deborah, who had been pig farming for over thirty years similarly summarised, 'I will never stop farming. After me, I want my daughter to continue pig farming. The money from the pigs took her to school, so without pigs there would be no English'. Almost every farmer articulated the power that pigs had to provide education and the transformation that this could have on the family.

While farmers were often fattening pigs for sale at specific, pre-planned points throughout the year, pigs could also be sold quickly in order for farmers to generate an emergency fund. Pigs were considered to be easier for immediate sale unlike other animals and in particular cows. As Benson explained, 'Pigs sell fast. If you want to sell a cow, it could take up to six months before you shift it. If you say you are selling a pig then people will be at your door in the morning'. The speed in which pigs could be sold led many farmers to claim that pigs were the best source of 'fast cash' or 'quick money' (*sente mangu mangu or sente za mangu*).

The way in which pigs were held responsible for paying emergency costs became clear within the first month of visiting Mama Ajiyo. Shortly after our first meeting, Mama Ajiyo's oldest son, Mawa, suffered from a stroke. When I returned to the farm he was paralysed, bed bound, and required around the clock care. Mama Ajiyo had called a family meeting to make arrangements for who was going to care for Mawa, as well as deciding how they were going to pay for his hospital bills. Mama Ajiyo gathered the family members in the house. As we sat down, four recently hatched chicks shuffled out from underneath Mawa's bed and started to quietly chirp. After gathering money from all those at the meeting, Mama Ajiyo explained:

> Mawa's stroke is a huge problem. We had to spend UGX 1.2 million (£257) – all the family's money. Now all the money we make goes into hospital care. The doctors said we have to give medicine for seven months and there are three types. Every time Mawa has to go from the village to Mulago (national referral hospital), that will be more money every month. When we get to Kampala, the doctor will see a different thing from the last time. This time they checked the heart as well. I didn't expect that and it cost UGX 60,000 (£12)… We have decided to sell the pigs and hope that it will cover all the costs.

Later that week, as we gathered sweet potato vines to feed the pigs, Hamna commented on the difficulties he had been having since Mawa's stroke. He twisted the vine around his fist and exhaled, 'Mawa has disturbed me a lot. It is difficult to work away from home because we need to be here with Mawa. Even in the night, every hour of the night, he is calling for help'. Hamna continued, 'I feel bad but now investing in the pigs has become so hard. I have given UGX 200,000 (£42) this month alone for hospital check-ups and my salary for a month is UGX 350,000 (£75). My small money could go towards building another cage for the pigs but now I have to get treatment for Mawa. There is just no money for the pigs'.

With little money left to pay for Mawa's health bills, Mama Ajiyo asked her neighbour to call a butcher from Mukono town to come and buy three of her six pigs. The remaining three were piglets that she decided to keep for fattening. The butcher arrived the following evening to collect the pigs in time for slaughtering the next morning. He hurriedly calculated the pigs' weight based on observations and informed Mama Ajiyo that two of her pigs were 40kg and that Cobb was 50kg. The butcher offered her UGX 500,000 (£107) for the three pigs, the equivalent of UGX 3,850 (83p) per kilo[5]. Although convinced that Cobb could make more, desperate for money, Mama Ajiyo accepted the offer. Despite losing money, out of all the pigs Cobb had sold for the most. As Mama Ajiyo asserted later, this was because she had really loved him. Without Cobb, Mama Ajiyo's son may not have received medical treatment and this would have put his life in jeopardy. Thus, the care Mama Ajiyo gave her pigs, ensuring they were healthy, contributed towards and sustained the *obulamu* of her family.

As has been discussed in this section, farmers understood pigs' bodies as simultaneously coexisting across multiple temporal scales. This meant that rearing a stunted pig was more risky than not being able to pay for school fees or periodic emergencies. Through avoiding risks in an attempt to rear pathogen free pigs, farmers believed that they would become vulnerable to the effects of a stunted pig body – a body that negatively represented the health and wellbeing of their family. Farmers recognised that a healthy pig body was a sign of healthy human bodies and educated children. This suggests why farmers prioritised practices that ensured the rapid growth of their pigs.

Omusujja

As aspirations for the future grew with pigs' bodies, when pigs suddenly died hope for the future was also lost. As Deborah explained, 'Pigs are great; they grow fast so you get money fast. That's why it's so bad when your pigs die. You are just watching your money dying. It's almost like a child dying'. Or as

[5] Pork sells from slaughterhouses at a set price of UGX 9,000 (£1.90) per kilo.

Rose, who had lost five of her pigs the previous year to *omusujja* explained, 'When my pigs died I felt very bad. I had made plans for school fees. I had said I will sell the pigs in August. When you plan for these things and then *omusujja* comes, you have no way out. You just have to start again'.

Like Rose, *omusujja* was perceived by farmers to be a major threat to their pigs. All farmers knew the sickness was highly contagious, recounting how it would spread quickly once it caused symptoms in pigs. Veterinary professionals were rarely called to diagnose infected pigs, as waiting for a diagnosis could result in the pig dying. Moreover, if ASF was diagnosed then the pig would be culled. Instead, if multiple pigs displayed signs of *omusujja* – reddening skin, a lack of appetite, and an inability to stand or move – then farmers would often attempt to quickly sell their pigs to traders in order to retain some security over their future. However, if traders knew that farmers were panic selling their pigs then they demanded cheaper prices. This meant that if a single pig became unwell, there was no know outbreak in the area, or it was outside of the dry season, then many farmers would wait, observing their herd for the first signs of collective sickness. The way in which farmers decided whether their pigs were infected with *omusujja* becomes clear through the following case of Amos.

After a morning at the slaughterhouse, I waited as Amos collected a bucket of water and meticulously washed his hands and boots. He first splashed the water over the top of his white wellington boots and then squeezed the remainder through his soapy, cupped hands. I had previously spent time with Amos in an informal slaughterhouse located in a valley of central Kampala. Amos both reared and slaughtered pigs and that day after a morning at the slaughterhouse, he had invited me back to his urban pig farm.

It was late October and the rains had become so heavy that standing, stagnant water surrounded Amos's house and the adjacent pigsty. Around the entrance to his house were chickens, rabbits, and ducks. In the corner, his dog was nursing a litter of eight puppies. After he finished washing, Amos explained that all of his animals lived very peacefully together, 'The chickens sleep with the dogs and the piglets, rabbits, and ducklings sleep in with me'. Amos went inside his house and bought out a large plastic box, he bent down and pulled out a piglet. He affectionately cradled the piglet in his arms and explained, 'I let this one sleep in my house because I sold its mother'. He continued, 'She had only given birth to this one piglet and then she stopped eating'. Since slaughtering the piglet's mother, Amos had been bottle-feeding it milk and keeping it in his bedroom to make sure it was warm. Amos put the piglet down and it trotted off to drink the puddles that covered his neighbour's backyard.

Every day before feeding his pigs, Amos cleaned their sty. The sty, which was connected directly to the side of his house, was also slightly elevated and constructed to hang over the stream running behind. Amos ordered two young girls playing next door to collect water from the stream while he brushed the excrement from the pigsty back into the water. The roof of the sty had been hurriedly assembled with stacks of corrugated iron and dried reeds. The ensuing gaps meant that water had poured into the sty gathering in the cracks in the floor and filling the troughs. 'This rain is disturbing me a lot' Amos lamented. It took him over thirty minutes to clean the sties of excess water.

Amos had been rearing his own pigs for four years and had previously worked for four years on a farm just outside of Kampala. He claimed that when he started rearing pigs himself he had no slab, just timbers. However, with heavy rains the timbers had rotted away meaning that a concrete slab, while expensive, became necessary. Amos spent a substantial amount of time caring for his pigs. In addition to the piglet, Amos owned ten pigs, five Large White and five local mixed breeds. As Amos asserted, 'Pigs are the best for business; they bring money quickly…You can't lose money even with few pigs you can't'. He continued as he pointed to specific pigs, 'These white ones are the best they grow very fat very quickly…In terms of sickness they are all the same. Once one has *omusujja* they will still all die'. As Amos finished cleaning, his brother who lived close by returned from feeding his own pigs. He wringed out the bottom of his sodden T-shirt while complaining of how since the flooding the swamplands had overflown into his pigsty making it nearly impossible to wade over. That morning he had been able to insert new timbers into the frame so that the pigs were now perched in a corner, huddled together to escape the rising water.

The next day torrential storms submerged the valleys of Kampala. Amos's house was flooded and the water ran in torrents so high it reached the upper ledge of his elevated pigsty. In the storm, three of his ducklings were washed away. The following evening Amos's piglet was unable to walk. He decided to call his brother to help administer an 'Ivermectin' deworming tablet. Holding the piglet in his arms, he prized its mouth open, tossing the tablet in. To enable the piglet to swallow the pill, he poured in water and vigorously poked at its oesophagus. The action forced the pill down the piglet's throat. After deworming the piglet, Amos and his brother dewormed all of the pigs in the same manner (Figure 7).

Figure 7. Amos and his brother deworming pigs. Photo by author.

After deworming the piglet started to forcefully cough, the entirety of its body gruffly puffing in and out. Amos pointed enthusiastically, 'That means the medicine is working, see the pig is coughing'. As Amos attempted to sweep the muddy water out of his house, he stressed, 'I don't know what it is but I think it's the water, there something in the water and it is making him sick'. The piglet's stomach gruffly puffed in and out and by the evening its ribs had started to visibly shake under its skin. A day later its carcass lay lifeless on the floor of Amos's house, its ears were dappled in light red spots and the outlines of deep purple blotches were developing on its stomach.

That evening, Amos decided that the dead piglet was small enough to throw into the gushing stream that ran behind his house and into the open swamplands below. Over the following days, Amos voiced confusion over why exactly his piglet had died. As he concluded:

> Last year all of my fifteen pigs died from *omusujja.* Once the first two died, I took the rest for slaughtering. There are two ways to know that problem, the skin becomes very red and the hairs stand on ends. It is seasonal the fever, it is only in the hot season. Now in the rains it is not there because the rain washes the fever away. When there is no rain, the fever comes through the air so that means there is no way to prevent it. I know if the pig starts to get red ears and red stomach that is very, very dangerous (*kyabulabe nnyo, nnyo*).

In Amos's opinion, the piglet had become sick because of something in the rainwater. Amos believed that *omusujja* only occurred during the dry season and this meant that sickness outside of this period must have another cause. Moreover, unlike the year before, none of Amos's other pigs had developed any symptoms of infection. Accordingly, he decided it must have been excess rainwater that caused the piglet's stomach to become too bloated. Despite not being certain about what killed his piglet, over the following days Amos paid close attention to the bodies of his ten remaining pigs. He was worried that they too would develop similar symptoms and he would lose them all.

Symptoms and the time of year were all that Amos relied upon to decide what had killed his piglet. As none of his other pigs became visibly sick in the following days, he became more convinced that the piglet had not died from *omusujja.* This suggests that it was only when multiple pigs started to die that *omusujja* was considered to be the cause. As one farmer similarly recalled, he first knew his pigs had *omusujja* because it all happened 'very fast'. He asserted, 'First all your pigs become slow. When they lie down, they do not stand back up. Then they stop eating. Then that afternoon they will turn very red and then the next day they will die'.

Farmers claimed that if only one pig died or it was not the dry season then witchcraft and poisoning were most likely the cause behind the rapid death of pigs. As Mama Ajiyo told me one afternoon, 'There is a slaughter man in the village and if that man comes and visits your pigs and you don't sell them to him he will make all your pigs die within a month. Everyone is talking about him now. If he comes then you better sell and at his price'. She also spoke of a fellow farmer who built a large sty and became 'too good' at rearing pigs. Subsequently, she claimed that when the farmer had invited neighbours to see his farming success, 'A few people came in the night to kill the pigs. They came and poisoned them all, it burnt them from the inside to the outside'. Despite all the pigs dying in a short space of time and appearing visibly red, Mama Ajiyo did not associate these pig deaths with *omusujja.*

This difference in interpretation could be due to seasonal expectations, with *omusujja* strongly associated with the dry season. As Richards observed during the West African Ebola epidemic, identifying certain pathways of disease transmission led to narratives in which people believed themselves to be safe from Ebola infection (2016: 31). Thus, people did not perceive themselves at risk of Ebola because they did not live in close proximity to a forest or eat bushmeat. Richards illustrates how an early driver of the epidemic was not, however, forest subsistence but instead trade across borders (ibid). In Uganda, farmers similarly considered pigs to only be at risk of *omusujja* during the dry season. As George summarised, 'There is a season of sickness when it is hot between January and February. At that time when *omusujja* starts attacking every pig will fall sick'. Veterinary researchers similarly noted that ASF outbreaks disproportionally occurred during the dry period in Uganda (Atuhaire et al. 2013; Dione et al. 2014). However, this connection led farmers to only associate *omusujja* outbreaks with the dry season.

Aside from *omusujja*, farmers did not mention any other sickness in pigs that could cause reddening skin followed by rapid death. As Hinchliffe noted on pig farms in the UK, veterinarians rank pathogens in order of their importance. This means that some pathogens are '*big*, and, by extension, there are smaller pathogens that can circulate more freely' (2016: 125). As Hinchliffe continues, the word big 'is a matter of emphasis, suggesting a microorganism that may be notable in terms of its effects and/or a life form that is difficult to manage or eradicate' (ibid). Transferring this idea to Ugandan farms, farmers believed that *omusujja* was the most visible and challenging sickness in pigs. There are, nevertheless, other diseases such as *Erysipelothrix rhusiopathiae* (diamond skin disease) which cause bodily signs such as fever, depression, and skin discolouration in pigs (Dione et al. 2014). Diamond skin disease is a bacterial zoonotic infection. The disease is endemic in Uganda and in pigs can cause widespread erythema (redness) to purplish discoloration of the ears, snout, and abdomen (Duran & Render 1997). Unlike ASF, diamond skin disease can be treated with antibiotics. Ugandan farmers did not, however, mention any other fatal sickness other than *omusujja*. This illustrates the way in which networks make certain sicknesses more visible than others and how this in turn means that symptoms are more frequently enacted as signs of one sickness rather than another. Thus, from the point of view of Ugandan farmers, the symptom of redness in the dry season could only ever be one sickness – *omusujja.* This association between red skin, dry seasons, and *omusujja* may, nevertheless, be obscuring other, potentially treatable diseases that occur on the Ugandan pig farms.

Biosecure Farms

ASF has no known treatment or cure (Muhangi et al. 2015). As a result, all of the veterinarians I worked with claimed that ASF could only be prevented through the proper implementation of biosecurity measures. Within publications on ASF in veterinary journals, authors have identified Uganda as a low biosecurity setting (ibid) in which the adoption of preventative biosecurity measures by farmers is 'very low' (Dione et al. 2014: 574). As a veterinary epidemiologist working at ILRI clarified, 'ASF is a major problem here and what

Uganda really needs is a better strategy for improved pig health. This can only be achieved through more vigorous training on biosecurity protocols'.

Although I never observed veterinarians diagnosing ASF on the farms, it was a frequently discussed disease amongst the veterinarians who worked in Mukono. This became clear throughout my first two months researching on the Mukono farms, during which I accompanied a para-veterinarian named Joseph (discussed at length in chapter two). Joseph held a national diploma in animal production and management and had recently completed a bachelor's degree in biomedical and laboratory technology from Makerere University. His qualifications categorised him as a government animal husbandry officer, yet he always proudly referred to himself as a veterinarian. While not contractually working for the government, Joseph had been loaned a government motorbike. On the journeys riding between farms, Joseph would pass the time by making comments on the previous farmer's pig rearing practices. When describing 'good' farming practices, Joseph would always stress how farms in which pigs were reared in concrete sties were 'model farms' – farms that all Ugandan pig farmers should aim to replicate. Many of the 'model farms' that I visited with Joseph were, however, large and run by employed staff rather than the owner of the pigs themselves.

In his attempts to prevent ASF outbreaks, Joseph constantly told farmers that the ASF virus was present in all body parts of infected pigs – in the meat, bones, blood, and skin. He explained to farmers that pork brought from outside of the farm and eaten in the home could potentially transmit the disease and strongly encouraged farmers to eat their own pigs. On every farm, Joseph also told farmers to build sties for rearing their pigs, to regularly disinfect their boots, clothes, and equipment and to restrict visitors from places in which pigs were being reared. Joseph would also frequently express frustration over farmers panic selling their sick pigs as opposed to culling them or putting them into quarantine. On several occasions, Joseph mentioned that farmers were incapable of effectively implementing biosecurity measures despite being told that the practices would prevent their pigs from suddenly dying. As Joseph expressed, 'There are so many pigs here and they are all just walking around. Most farmers are illiterate; they don't understand the importance of building sties so all their pigs are roaming free'.

Across the Ugandan farms, Joseph had to translate biosecurity into a Luganda equivalent. As he clarified, 'Yes, I say biosecurity but then I have to explain what it means. I tell them in Luganda, *okutangira endwadde ng'o 'kozesa embera ya 'obutoonde'* (the natural way to prevent diseases). In discussions with Joseph, he made it clear that outbreaks of ASF were a direct result of poor pig husbandry practices. In his opinion, only farmers educated on biosecurity measures would be able to follow the correct farming practices and prevent the spread of the disease. Joseph conceptualised pigs' bodies as disease threats and a risk to healthy pigs' lives and his advice therefore advocated the separation of species in order to prevent diseases (cf. Hinchcliffe et al. 2016). The ensuing biosecurity measures followed the 'conventional efforts to survey and secure "infectious" species' (Lezaun & Porter 2015: 99) thereby overlooking the earlier evidence on pig-farmer relationships and the fact that pigs were interwoven within farmers' everyday lives and futures.

Anthropologists researching biosecurity measures have illustrated how they aim to reconfigure relationships between species in order to prevent diseases. For instance, in the United States, Blanchette (2015) describes how human labourers working in an industrial pig farm were perceived by managers as a risky threat to pigs' bodies. As a result, workers were subsumed into 'porcine worlds' (ibid: 641) with biosecurity protocols dictating how they lived both their home lives and their work lives. The extreme measures that govern the lives of labourers on industrial farms in the United States are, nevertheless, incompatible with the practices of smallholder farmers who manage their livestock in and around their homes (Lowe 2010; Porter 2013). As Lowe writes, during outbreaks of avian influenza in Indonesia, backyard poultry production was perceived by avian flu experts from the US to be inherently dangerous, as, unlike commercial farms, the backyard could not be made biosecure (2010: 638). These accounts call into question what we define as 'the farm', particularly as biosecurity measures appear to have been formulated to fit a singular definition. Blanchette's (2015) account of the industrial pig farm in the United States indicates that the successful integration of biosecurity measures depends upon farms being bounded spaces. Yet, elsewhere, such as the poultry farms of Indonesia or the pig farms of Uganda, the boundaries of the farm are often not clear-cut. This difference in understanding over what constitutes 'the farm' has significant implications for the implementation of biosecurity measures.

In their efforts to make the Ugandan backyard biosecure, veterinarians attempted to adhere to the same practices as those of the American industrial pig farm. They introduced pre-emptive measures (Anderson 2010: 790; Braun 2013), transforming pig rearing practices by separating lives and thereby altering the pathways of ASF outbreaks. Veterinarians conceptualised pigs' bodies as disease threats and a potential risk to healthy pigs' lives. As a result, veterinary advice overlooked the importance of pig-farmer relationships and instead promoted the complete separation of pigs from farmers and their homes.

Feeds, Dry Seasons, and Free-Roaming Pigs

On the farms, feeding pigs was a constant source of worry for farmers. Farmers would often comment on what they had fed their pigs that day, with all farmers encouraging their pigs to eat as much as possible. As Mama Ajiyo once claimed, 'When it eats it becomes fat, so you have to see it eating. Eating is most important'. When tethered or in sties, farmers would try to feed their pigs at least twice a day. In this regard, pigs were not perceived by farmers to be a time intensive livestock. This meant that pig farmers could spend the majority of their time farming crops or working in jobs outside of the farm, for example as, drivers, teachers, pharmacists, and shopkeepers.

Despite pigs being able to eat and digest a vast array of food, farmers often expressed difficulties in accessing enough feeds for their pigs. While farmers praised pigs for being 'the simplest' animal to raise on a diet of household leftovers, many also noted that in order to really fatten a pig they required a vast quantity of food. While every farmer cited feeds such as maize bran, *mukene* (Lake Victoria sardine) and potato vines, others included; jackfruits, cassava, rice, potatoes, banana, pineapples, watermelon, and buckets of hotel waste food. Collected in buckets, hotel waste food included; rice, meat, vegetable peels, beans, and maize meal often mixed with soapy water, bottle caps and plastic bags. While farmers claimed not to feed pigs meat, as George, a pig farmer and teacher once elaborated, 'We don't often feed the pigs meat but if we eat a chicken or even a goat then we might give some of it to them…My friend at the school has told me that I should also give them anthill soil every week for iron and salt to make them thirsty, is it true?' Like George, many farmers would comment on feeding pigs salt as it was believed that salt would cause pigs to drink excess water and that this would make them grow faster. Additionally and as evidenced by Amos, some farmers would also add marijuana to their feeds. As Amos who jokily ordered me to smell the dried green leaves in his bound fist explained:

> This is *enjagga* (marijuana); my grandfather told me that if we dry it first and then we feed it to the pigs along with the small silver fish it cures everything from fever to worms. I have found it also makes the pigs sleepy so they make less noise and I get fewer complaints from the neighbours. A bag of this costs UGX 70,000 (£15) and I just give a small handful a day so it last for months.

For Amos, the drowsy effect of marijuana was particularly beneficial in order to reduce the noise associated with urban farming and living in intimately close proximity with animals.

All the farmers I interviewed claimed that it was too expensive to only feed pigs food bought from a shop (maize bran and *Mukene*). In accordance, farmers fed their pigs household and hotel waste on a daily basis. That all farmers claimed to feed pigs their leftover food illustrates the ability of pigs to transform waste food into fat. It was not, however, just a fat body that pigs could convert from waste. As one farmer articulated during a pig farming training session, 'I pity those farmers who think pig dung is dirty. I don't call it dung, I call it "green gold"'. Similarly, the majority of farmers claimed that pig manure was superior to that of other livestock, particularly when used directly onto their crops. Through rearing pigs, farmers transformed waste both into fat pig bodies and into an effective manure. This was the case with Deborah who was growing other crops and in particular plantain. Deborah explained how the manure of the pig could be used as a fertiliser almost instantly on her farm. As she clarified, 'We use the pig dung to make manure and within three days the manure is ready. I know with cattle the manure can take up to six months. See every part of the pig can be used to make money'. While Joseph the veterinarian condemned this practice due to the potential spread of diseases, many farmers across Mukono considered pig manure to be an extremely valuable and effective fertilizer.

Aside from feeding pigs waste, the most important practice in order to ensure that pigs grew fat was letting them free-roam in order to scavenge for food. Almost all farmers claimed that pigs should be left to walk around the farm in order to access fresh foliage, such as sweet potato vines or cassava leaves. As Amos explained, 'If your pig is not getting fat in the sty then you have to let them go free'. Or as Mama Mukiza similarly asserted, 'When you can't afford feeds or there are no feeds, then certainly you have to let all the pigs free to eat'.

The act of free-roaming was particularly used to fatten piglets. Farmers believed that when fed in sties smaller piglets could be denied access to feeds by larger pigs and when starved they would remain small throughout their lives. As Mama Ajiyo argued, 'If you put all the pigs together, the big ones will eat everything leaving the small pigs without food. No one in the village puts the small ones in the cage because if you put them all in the cage together the young ones will starve'. With piglets reared in anticipation for the future, ensuring that they were well fed was a priority for all farmers. As Benson stated:

> Most days I let the small pigs walk around because they don't destroy the farm so you can leave them to eat. If you leave them roaming they will grow very fast because they have a lot of freedom. Everyone here is leaving their piglets like that. When they become too big the neighbours will start complaining and then it is time to sell them anyway.

While piglets often free-roamed throughout villages, larger pigs were more likely to be tethered or sty reared and only let out during the dry season when crops, such as maize, sweet potato, and cassava had been harvested. The dry season was also perceived to be a difficult time for pigs of all sizes to access feeds. As Rose claimed, ‘I am still trying to keep the pigs on ropes so they can’t escape and eat what they want but you know we are in drought at the moment. What can they eat? During the rainy period I can have up to ten pigs but now I am struggling to feed even two’. In the following days, Rose let her two pigs free so that they could scavenge for food. She justified, ‘In the dry season people don’t plant a lot so you don’t get so many complaints about your pigs from your neighbours!’

Without access to abundant food supplies pigs were not believed to grow and become healthy for the future. Moreover, the fact that farmers allowed their pigs to free roam in the dry season despite the perceived threat of *omusujja* highlights how preventing diseases is not always a priority for livestock farmers’ (cf. MacGregor & Waldman 2017). Implementing biosecurity measures to prevent diseases was seen by Ugandan farmers to impede pigs’ access to food. Keeping pigs in sties was therefore risky for farmers as it could produce stunted pigs while also having minimal impact over outbreaks of what they considered to be a highly contagious and unpredictable sickness.

Figure 8. A sow in a sty with a hole made at the bottom of the gate so piglets could free-roam. Piglets were encouraged by farmers not to suckle too much as this could also result in the sow rapidly losing weight. Photo by author.

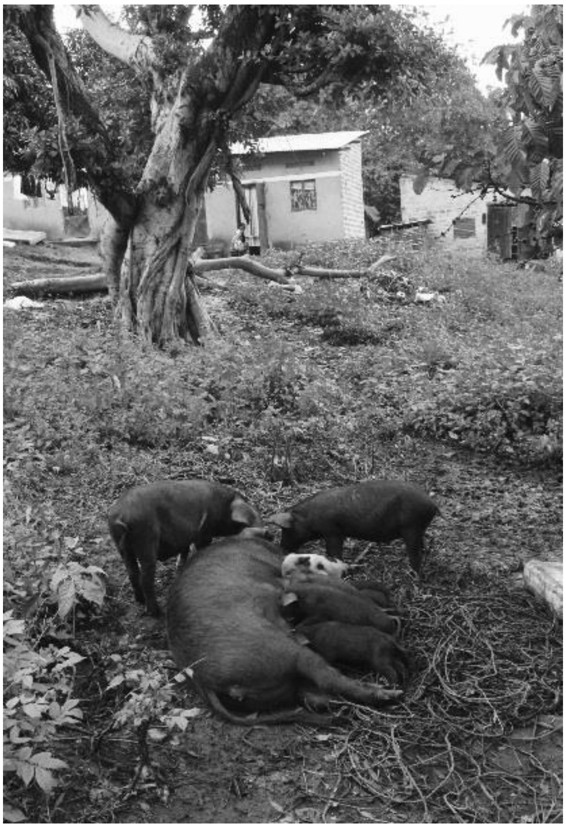

Figure 9. A tethered sow surrounded by potato vines. The smaller pigs and piglets have been left to roam-free. Photo by author.

Panic Selling

With no cure for ASF and no financial compensation for farmers if their animals suddenly died, all farmers claimed that they had to try and sell their pigs if they believed they were infected with *omusujja.* In response, farmers did not observe biosecurity measures and pigs were sold immediately to traders. From a veterinary perspective, pigs infected with ASF are no longer marketable as this would spread the infection. This means that from a veterinarian's point of view a pig infected with ASF has no economic value. This is why quarantine and culling is advocated. However, based on the findings above, the implementation of a quarantine or cull would result in the death and complete loss of *obulamu* in relation to the farmer's future. Through selling pigs to traders, pigs were still able to provide for and fulfil their responsibilities in relation to the family. Thus, in order to secure the health and wellbeing of the family, pigs, even when sick, still had to be sold.

With a general knowledge of the signs and symptoms of *omusujja*, farmers believed that quickly selling infected pigs was a better option than waiting and paying for the services of a veterinarian. In her research on bird flu in Vietnam, Porter similarly observed that the financial loss of poultry illness was considered to be 'generally lower than the cost of professional diagnosis and treatment' (2013: 141). In Uganda, not only were veterinary services expensive, a sick pig could still be sold and this meant that culling infected pigs was inconceivable for the majority of farmers. This, however, meant that farmers who did not participate in quarantining or culling sick animals were blamed for the spread of diseases or devalued as being 'backwards' (cf. Porter 2013: 143). Nevertheless, this blame overlooks the reason why farmers decided not to quarantine or cull their sick pigs. As Porter highlights in Vietnam, farmers were not opposed to culling because it caused death but instead that culling negated the 'moral, economic, and alimentary value of their animals' (ibid: 144). Similarly, in Uganda, pigs were part of the family and had responsibilities to provide for the family. Accordingly, farmers claimed that they would rather call traders to come and buy their sick pigs, as this was preferable to their death and a complete lack of familial health and wellbeing into the future. In this context, veterinary advice had very little value. Not only would a veterinarian charge money for their services, they could also potentially cull infected pigs. This meant that the presence of a veterinarian generated uncertainty around a farmer's future. On the occasions when veterinary advice was sought, farmers would often rely upon community animal health workers (CAHW), known in English as 'Local Vets'.

It was in the village of Nama where I first met a Local Vet named Issa. Throughout Nama almost every household kept pigs. These pigs were kept in small wooden sties, tethered behind houses, or left to free roam around the streets. In order to visit farmers, Issa rode around the village on an old red scooter. On the back of his scooter, he had strapped a white bucket down with an assortment of bungee cords. Issa had recently received a diploma in animal husbandry from a college in Kamuli district and after working for just six months, he had already been able to buy his scooter. As Issa and I spoke, a nearby farmer summoned Issa to vaccinate his cow for East Coast Fever. Issa collected his bucket and walked over to the farmer's house. On the way he asserted, 'There are so few vets in this area so mostly they call me if something is seriously wrong with their animals. I buy the drugs for my bucket in Mukono town. I have some regular treatments and vaccines but mostly that is for cows'.

Ezekiel, the farmer who had called Issa to vaccinate his cow also kept three tethered pigs. After Issa had finished injecting the young Friesian cow, I asked Ezekiel if he had ever called Issa to treat the pigs. Ezekiel began to describe a time in 2012 when his pigs suddenly stopped eating. In response, he called Issa who swiftly confirmed that the pigs were all suffering from *omusujja*[6]. Ezekiel explained, 'He told me to kill them all. We slaughtered all the pigs and then I sold the meat in town'. He continued:

> Farmers have to sell sick pigs quickly. We do not know where the fever is in the environment. People do not know how it starts or how to avoid it. Yes, pigs could make you very rich but they can also make you poorer than when you started. So you have to sell them if you see the first sign of something serious like *omusujja*.

[6] Unlike Joseph who used the term African swine fever, Issa, like the farmers, described the sickness as *omusujja.*

Listening in to the conversation, Ezekiel's neighbour remarked on how during the same period he had lost fifteen pigs. He claimed, 'I went early one morning and all my pigs had died. In one day a pig with *omusujja* will die. It will stop eating and you know it will not recover. There is no treatment so you just have to wait and see. If it does not die quickly then you are lucky and you can sell it'. Unlike Joseph, Issa understood pigs' bodies in the same way as farmers. He identified *omusujja* based on the presence of general symptoms and aided farmers in slaughtering and selling infected meat. This allowed farmers to secure as much money as possible before the pigs died. If their pigs did die prior to being sold, then most farmers claimed that they would bury the pigs immediately on the farm.

Traders were also aware that farmers needed to sell pigs as quickly as possible once the symptoms of *omusujja* appeared. As a trader from Kampala stated, 'This *omusujja* is common in pigs now. It's all over Mukono and it spreads in the air so all the pigs are dying and the farmers are selling the pigs to me very cheap'. He continued, 'I would still buy a pig that was sick though because you earn so much from a sick pig. You can eat the sick pig and you'll never get sick yourself…That means I can buy the pigs cheaply and still sell the meat at a normal price'. As will be discussed in chapter three, traders perceived sick pigs as a fast way to make money. As there was no cure for ASF and farmers knew they would not receive government compensation if their animal was to suddenly die, they were desperate to sell their infected animals as quickly as possible. As Mama Mukiza voiced, she had once sold three growing pigs at UGX 100,000 (£21) each even though she knew they could sell for more than UGX 200,000 (£42). She justified that *omusujja* was attacking other farms in the village. As a consequence, when traders came, she decided that she could not risk her future and that it was better to sell her pigs.

During outbreaks, traders explained how they were able to buy and transport sick pigs as they had found ways in which to move live animals without being caught or fined by the police. As Joseph the para-veterinarian described:

> It is our duty to issue movement permits for live pigs but it is not the practice. Most traders and butchers we work with are illiterate. The normal practice would be that if a pig were found to have ASF then with a permit you could follow it back to the district it came from. I think police need to be stricter on the road. As in, if you do not have a permit they will arrest you.

The movement permit Joseph described was an official document issued by the government agreeing that livestock were healthy to travel. The movement permit also specified the origin and destination of the animals. As Joseph explained, ‘The permit costs around UGX 20,000 (£4) per trip but if you travel without the permit the police will order you to pay around UGX 100,000 (£21)’. Accordingly, none of the traders I accompanied had a movement permit and instead bribed police along the road. Samuel, a trader who I discuss in length in chapter three, even described bribe money as ‘special money’. This type of money he kept in his top pocket separate from the money for pigs in his trouser pocket. Every time I travelled with Samuel he paid around UGX 5,000 (£1) to each police officer, many of whom he knew. By the end of the day, he had paid UGX 20,000 (£4), the same price as a permit. Moreover, Samuel claimed that as the police were so used to his money, even with a permit he would still have to bribe them.

The inevitability of bribing the police on the roadside meant it was easier to do so than to go through the bureaucracy of gaining a movement permit. This was particularly the case when moving pigs a short distance between Mukono and Kampala. If a trader did not want to pay a bribe then they would slaughter pigs prior to bringing them to Kampala. As a trader at an informal slaughterhouse in Kampala commented, ‘If the pig is really sick on the farms, I will have to slaughter it in Mukono and take to Kampala – kill and take. It is easier to bring the meat than transporting the live pigs. You don’t need a permit from the government to transport meat’. The way in which traders operated gave farmers a route in which to sell their sick pigs. This meant that farmers could retain a portion of the wealth invested into the pigs' bodies and reinvest the money into sustaining their families' future.

Conclusion

This chapter has asked why pig farmers in Uganda were not consistently adopting and integrating biosecurity measures despite the potential threat of ASF. My findings suggest that this question can only be answered by first asking why pigs are important to farmers and their families. In Uganda, pigs were given specific responsibilities for the future and their bodies acted as an external sign of the *obulamu* of farmers and their families. Pigs were in turn perceived to be part of the family, they were physically part of farmers' homes and farmers chose not to eat their own pigs because of the relationships that they developed. The ethnographic details provided, illustrate the importance of recognising the way in which humans and animals share their lives together (cf. Haraway 2008) as well as the centrality of livestock animals to the health and wellbeing of humans.

Understanding how the health of pigs converged with the wellbeing of farmers and their families suggests why biosecurity measures were not consistently adopted. While veterinarians advocated biosecurity measures in an attempt to stop the spread of ASF, for farmers preventing diseases in their pigs was not their sole concern. In accordance, many farmers eschewed biosecurity measures in favour of allowing pigs to free roam or by selling sick pigs in order to retain some security over their future. This suggests why, as evidenced in the final section, a number of farmers built pigsties to contain their pigs and yet they still allowed then to free-roam during times of feed scarcity. This was because the direct risk of stunted pig bodies had more immediate consequences than the potential risk of pathogens. Thus, veterinarians who argue that pig farmers are simply incapable of implementing biosecurity measures overlook that for farmers, health in pigs is not just about the absence of pathogens.

Due to a lack of diagnosis, it is unknown whether all the pigs that rapidly died with red skin were in fact infected with ASF. However, through tracing farmers' understanding of *omusujja*, it becomes clear that the sicknesses with the most visible symptoms were enacted by farmers as the most dangerous. This understanding of sickness on the farms has implications for other diseases that may be contained or left untreated within pigs' bodies.

Chapter Two

Ascaris or *Njoka*: Diagnosing and Treating Parasites in Pigs

Driving out of Kampala the roofs of houses slowly started to give way to hills blanketed in growing plantain, sugar cane, and tea. The public bus ride to Mukono town should have only been thirty minutes but because of the constant flow of passengers, it often stopped and started for over an hour. The Mukono District Local Government headquarters and the Mukono veterinary office were located on the outskirts of Mukono town centre.

As I waited inside the district veterinary office I was distracted by the inspirational quotes that lined the tops of the walls; 'Worrying is arrogant because God knows what He's doing'. Plastered underneath posters on coffee wilt disease, trypanosomiasis identification, and rabies prevention had started to brown and curl at the edges. It was in this office where I initially met the government contracted para-veterinarian, Joseph (chapter one). Joseph was returning from his first morning of administering vaccinations to cattle after a positive anthrax sample had been confirmed the previous day. In line with anthrax protocols, Joseph was wearing white overalls. On the back of his motorbike, he had strapped a bucket full of disinfectants, aprons, gloves, and shoe covers. During our meeting, Joseph stated that he would be unavailable for the coming weeks as he was busy splitting his time at the Ministry of Agriculture, implementing quarantines, and administering vaccinations so as to ensure that there was no further movement of anthrax infected cattle. Despite being based at the government veterinary offices, I later discovered that the government did not permanently contract Joseph. Instead, the District Veterinary Officer (DVO) routinely called him out to help with certain livestock related tasks. This clarified why I first met Joseph during the anthrax outbreak, when the government had mobilised animal health extension workers in order to contain the outbreak as quickly as possible.

Two weeks after the anthrax outbreak, Joseph was back on the pig farms in three sub-counties of Mukono (Goma, Kyampisi, and Mukono Central). On these farms, his main job was to advise local farmers on animal and disease management. In line with this, he focused upon teaching farmers pig husbandry practices, implementing biosecurity measures, and administering deworming medication. When discussing deworming medication, Joseph believed that the most common gastrointestinal parasite to be treated on pig farms was *Ascaris*, more commonly known as roundworm. Joseph advocated that farmers should deworm their pigs every three months in order to control *Ascaris.* As he clarified, 'It is because of the longevity of the *Ascaris* eggs in the soil that we can assume that all the pigs we will see are infected. Because all the pigs we see are being constantly re-infected, they are nearly always underweight and when the burden becomes really severe they start to die'.

Joseph's comment touches on the lifecycle of the parasite *Ascaris suum*[7], a lifecycle that is direct and therefore not requiring an intermediate host (Straw et al. 2013). Once the pig swallows the eggs of the worm, they hatch and penetrate the wall of the intestine. These larvae then migrate around the body of the pig, first to the liver and then to the lungs. During this process, the worm is constantly maturing. The larvae are then coughed up and re-swallowed into the gut where they mature into an adult worm. This lifecycle takes up to eight weeks. The adult worm then produces eggs that pass out through the pig's faeces. The eggs of the adult worm have a sticky protective top layer that means they can survive for years outside of a host (ibid: 904).

As Joseph and I discussed the parasite, I noticed how with me he only referred to the parasite by its scientific name *Ascaris.* Conversely, with farmers he would switch to the Lugandan term *njoka.* This translates as worms of all kinds including common earthworms. The way in which the same parasite could be conceptualised both as a specific worm and as a generic worm, marks the starting point of this chapter's argument. Drawing on work from STS on the enactments of disease (Mol 1994; Mol 2002; Law & Lien 2012), I illustrate how during interviews, veterinarians would speak about signs on pigs' bodies as

[7] *Ascaris suum,* is almost identical to the human roundworm, *Ascaris lumbricoides*. Recent studies have established that both *Ascaris* genotypes have been found in pig and human bodies and therefore the pathogen is zoonotic (Alves et al. 2016).

indicative of specific pathogens. The specific pathogens discussed were those that had been reported by ILRI during previous studies conducted across the Mukono farms (Roesel et al. 2017). After enacting specific pathogens, veterinarians would then discuss the appropriate treatment regimes. Through following the practices of Joseph, it became apparent, however, that in discussions with farmers he predominantly used the generic term for worms, *njoka*. This had implications for the way in which farmers came to understand signs and symptoms of sickness as well as affecting their treatment choices.

In anthropological accounts, John Law has described the way in which veterinarians come to know and diagnose sickness in animals as the ‘trained eye’ (2010: 61). In Law’s account, UK based veterinarians use their ‘trained eye’ in order to identify the signs of pathogens contained within animals’ bodies. This ‘trained eye’ follows the same logic as Foucault’s ‘way of seeing’ or the ‘medical gaze’ described in *The Birth of the Clinic* (1973). Unlike veterinarians who use their ‘trained eye’ to enact specific pathogens, for farmers symptoms were often a sign of a generic sickness. This was evident in chapter one, in which the rapid onset of reddening skin was the main symptom of *omusujja* (fever) not a specific virus or the disease ASF. In terms of *njoka*, the main symptoms that farmers noted in their pigs was a cough, inability to eat, and stunting. These symptoms pointed to a generic sickness rather than a specific pathogen that required specific treatment.

Throughout Mukono district, veterinary advice was not readily available. This was particularly the case when farmers lived far from Mukono town centre. This meant that often farmers used previous advice given by veterinarians in order to treat sickness in their pigs. However, without the ‘trained eye’ of a veterinarian, farmers could bypass veterinary advice and instead go directly to a veterinary drug shop. Anthropologists have long noted that antimicrobials have social lives and carry meaning that extend beyond their curative ability (Whyte, Van der Geest, & Hardon 2002; Van der Geest & Whyte 1989). As discussed in the previous chapter, farmers claimed that a stunted pig was a sign of neglect, disease, and a lack of *obulamu* for the family into the future. With stunting in pigs a clear sign of sickness, farmers used antimicrobials to ensure their pigs' bodies remained healthy and more importantly growing into the future. Thus, in drug shops, farmers would describe generic symptoms in pigs without definitively identifying the cause of the symptoms. Drug shop workers were only ever treating symptoms and consequently farmers regularly administered various dosages of multivitamins, broad-spectrum antiparasitic agents, different brands of antibiotics, and various types of herbal medicines into their pigs. Most farmers did not administer biomedical drugs to target specific pathogens but instead to target symptoms of a generic sickness.

Veterinary Knowledge

On our first morning together, Joseph, the DVO and I walked over to a small cabin located at the top of the local government's plot of land. Outside the door, goats and a young heifer casually grazed. The block, painted white, had 'veterinary diagnostic and lab centre' printed on the locked doors in large black letters. Inside, boxes, books, and files lay scattered in piles. The DVO moved around the laboratory quickly sorting all the equipment Joseph and I might need while working on the farms; latex gloves, a white apron, shoe covers, and disinfectant swabs. As the DVO plied Joseph with all of the different items he commented, 'As you can see we are prepared in Uganda, we even have PPE (personal protective equipment) ready in case of Ebola. We are very prepared, just like the rest of the world'.

The DVO's comments were made as the West African Ebola outbreak, which had started almost a year earlier in March 2014, was still threatening to spill out of Western Africa causing a global pandemic. Passengers landing at Entebbe were still being screened for fever by nurses clad in PPE, who then required them to fill in forms tracing them to their aeroplane seats and place of departure. The DVO's focus on seeing that Uganda was prepared for an Ebola outbreak highlighted the way in which preparedness and biosecurity measures were interpreted as appropriate for large-scale infectious disease outbreaks and pandemics. Yet, as the diseases I was studying did not have obvious pandemic potential, Joseph rarely used the equipment that the DVO provided.

Over lunch around a month into working together, Joseph spoke of how he had previously been contracted as a government extension worker. However, he continued, his job was terminated in 2013 after the government decided to restructure the whole of the Ugandan veterinary services. As he asserted:

> They wanted to change the system; they said they wanted us to join the government permanently. But in reality there was no money. Extension services were using too much money and we were very many workers. This termination was countrywide and we are all still waiting for the government to absorb us again. Now the government pays for the time you spend working so it depends on what you are going to help the government with and how long that takes. Technically, I don't have a contract and I don't have a salary.

The decentralisation and privatization of clinical veterinary services has been occurring in Uganda since the structural adjustment programmes of the late 1980s (Ilukor et al. 2015). As a result of this privatisation, many actors involved in providing veterinary services do so without adequate regulation or supervision (Mbowa et al. 2012). While a core government public veterinary service does still operate in Uganda, these changes have led the Ugandan government to adopt a reactive as opposed to proactive service delivery. For example, vaccinations are only administered during outbreaks of diseases rather than as part of routine practice. This was why Joseph was recruited during the anthrax outbreak, in which all cows within a certain radius were vaccinated against the bacteria. However, once the outbreak was contained he went back to predominately providing private veterinary services.

Joseph operated within a system in which private sector businesses, cooperatives, and non-government organisations provided the majority of veterinary extension services and essential veterinary medicines. This mix of public and private services had generated issues for Joseph, as farmers had certain expectations of him when they knew he also periodically worked for the government. As he stressed:

> I sometimes work for the government and then the farmers think I am a public servant. They do not want to give me money. When the

> government pays you, you are paid by scale so I worked on "science u4 public service"…per month that is a salary of between UGX 600,000-1,000,000 (£128-£214). The money they give you is not enough when you have a family. How should I feed my children on UGX 600,000 (£128) a month? The government does not provide drugs. I am using my own drugs and so I have a problem when farmers do not pay me. That means when I am working for the government, I am going to farms for teaching, training and farm management only – not treating.

In accordance, when Joseph was employed by the government he spent the majority of his time training farmers on animal husbandry methods and collecting data on livestock numbers. In rare instances, he would also vaccinate livestock and enforce quarantines, although I never observed this in practice. As I accompanied Joseph around the farms, it quickly became apparent that he believed I should focus on ASF and on gastrointestinal parasites. He justified that these diseases were the biggest challenge for Ugandan pig farmers[8]. Yet, he continued, 'Without sampling specific pigs you will not get good results, you know some diseases cannot be easily identified clinically. Anyway taking samples along the way is what a good researcher should do'. Joseph's suggestion that my research should include taking samples indicates his knowledge about pathogens in pigs. As many pathogens have limited clinical signs, they can often only be enacted as a specific pathogen under a microscope. As Joseph exclaimed two months into my research, 'Are you sure you are getting the right answers, maybe you should start taking faecal swabs?' Joseph's question echoes Enticott who noted in his article on testing protocols for bovine tuberculosis (bTB), that when researchers were not acting scientifically, 'scientists involved with the project were worried: they suggested a need for 'standardizing the application of the test', to 'improve its efficiency' and so that its results were 'consistent' (2012: 78).

Joseph's focus on sampling and producing scientific knowledge had been formed through working alongside veterinarians from ILRI. In particular,

[8] This is corroborated by veterinary studies conducted in eastern and central Uganda in which ASF and worms were considered by farmers to be the most challenging disease constraints (Dione et al. 2014; Muhanguzi et al. 2012).

Joseph had worked with a German veterinarian, Gloria. In the previous year, Joseph had collected samples of pigs' faeces throughout Mukono which were then examined by Gloria in a laboratory in Kampala. The practice of collecting samples and analysing them under the microscope had illuminated the pathogens that were contained within pigs' bodies in central Uganda. Joseph knew that the pigs on the farms may have pathogens contained within their bodies and these pathogens could only be enacted and made visible when reduced to a microscopic level. On the farm, he had to take this scientific knowledge and attempt to enact the pathogens, making signs and symptoms on pigs' bodies visible to farmers.

Diagnosing Ascaris

As Joseph had no fixed salary from the government, he supplemented his income through farmers who paid him privately for his services. Throughout our first week together, we started visiting these farms, four of which were situated in a cluster at the centre of Mukono district. As we walked from one farm to the next, Joseph would discuss the problems he had observed from working with pig farmers in Uganda. On one occasion Joseph claimed, 'These farmers all know me, most of them only do the right things on their farms because of me'.

The first farmer Joseph and I visited was Irene. Arriving in a small valley, the lush green gardens of Irene's farm stretched out as far as the surrounding hills. Irene was a tall, broad woman who always farmed barefoot. The first time we spoke, she leaned back on a bench and picked off the dried, dark mud that caked her feet. Irene's pigsty was large and located at the centre of her plot of land. Irene had started rearing pigs during the previous year and explained how her husband had only just finished building the wooden sty. Inside the middle of the structure, Irene walked us down a muddy path and pointed into the five individual pens that ran either side. Separated through the pens, Irene kept fifteen piglets and seven pigs (two boars and five sows). These pigs were a mixture of the popular yet slightly more expensive breeds, Landrace and Large White. In addition to rearing pigs, Irene grew maize and sweet potato.

After meeting Irene, Joseph took me inside the sty to observe the pigs. He quickly started to comment on how the management of the pigs within the sty was, in his opinion, not in any way satisfactory. As he brashly commented, 'You can smell the ammonia from where we parked the bike. This is poor sty management'. He subsequently pointed to the pens where a cracked concrete floor had allowed pigs' urine and faeces to gather in pools. Joseph explained how farmers often left faeces to gather for subsequent use as manure on the farm. He asserted, 'Most farmers are not composting. This just spreads the *Ascaris* across the farmland'. As we walked down the sty, two pigs were dragging their bodies along the wooden fencing. Joseph told me to note the pigs' ears and how they were inflamed, red, and patchy. 'See this, this is sarcoptic mange'[9], he remarked.

One of the pigs in the adjoining pen was thin and occasionally coughing. Joseph climbed into the pen and showed me how the pig's stomach was enlarged in relation to its back legs. While it continued to cough, Joseph ran his hand down towards the pig's tail pushing down its standing fair, white hairs. While doing so, he talked me through the clinical signs of *Ascaris* – standing hairs, bloated stomach, and coughing. He specified, 'Listen to that cough. That is the larvae of the *Ascaris* migrating through the lungs'. On Irene's farm, Joseph could only rely upon clinical signs to isolate the *Ascaris* infection. Joseph enacted the pathogen as a specific entity that was contained within the body of the pig. Each sign Joseph identified as a pathological sign of *Ascaris,* strengthened his diagnosis and his decisions over subsequent treatment interventions.

Over lunch that afternoon, Joseph concluded that if I was to also study diseases in pigs it was important that I could easily identify the 'classic' signs of an *Ascaris* infection. On subsequent trips to the farms, Joseph would

[9] Sarcoptic mange is an external parasitic infestation caused by *Sarcoptes scabiei* var. *suis.* (Laha 2015). It is the most common mange infestation in pigs and clinical signs include itching, often against the wall of the sty, and loss of body weight (Loewenstein et al. 2006). Sarcoptic mange is zoonotic (Bandi & Saikumar 2013).

repeatedly ask me whether I could recognise the correct signs of *Ascaris*. He would tell me to 'look carefully' at the pig's hair, its stomach, and for a cough. The visibility of these signs, which Joseph claimed were both universal and replicable across all the farms, subsequently confirmed the presence of *Ascaris.* Despite Joseph claiming to know the clinical signs of *Ascaris,* the Encyclopaedia of Parasitology notes that while *Ascaris* larvae can cause damage to the liver and lungs during migration, these lesions are not always associated with signs and symptoms (Mehlhorn 2008: 65). Accordingly, the only way to definitely diagnose *Ascaris* would be through samples or during inspections of the liver and lungs post slaughter. While not all *Ascaris* infections are symptomatic, Joseph knew that the pathogen was common due to previous samples taken by ILRI across the farms (Roesel et al. 2017). Joseph therefore believed *Ascaris* was simply invisible to farmers and made every attempt to enact the internal parasite through the external signs that were present on pigs' bodies.

After Irene had finished collecting sweet potato vines to feed her pigs, she returned to the sty where Joseph and I were still discussing the signs of *Ascaris* in her pigs. Irene interrupted, explaining how she had called Joseph to her farm because her pigs had been suffering from diarrhoea. She explained, 'I have been trying to manage the pigs' diarrhoea. This week I bought these new drugs from the vet shop; I was going to call you but my neighbour helped instead. I wanted to treat the pigs quickly because I was afraid that if I waited for you then they would die'. Joseph asked if she had seen any *njoka* (generic term for worms) in the diarrhoea. She replied, 'Many months ago I saw the *njoka*; they were white, long, and thin (she illustrated drawing a line across her hand), but I have not seen them since this diarrhoea has come and it is bad'. She pointed at her pen of piglets, 'I am afraid my pigs are not growing properly and I need to make money'.

Joseph asked Irene to show him the medication she had been using to treat the pigs' diarrhoea. She brought out a used bottle of multivitamins and a brown bottle labelled 'Sdime'. She described how she had been drenching the pigs' mouth once a day. Irene believed that this method would work because her neighbour had told her that Sdime had treated his chickens when they had similarly suffered from diarrhoea. Joseph briefly looked at the bottle and stated sharply, ‘Sdime is a sulphonamide – only used for bacterial infections’. He looked at Irene and said, ‘Your pigs have *njoka*, this medicine is going to do nothing’. Instead, Joseph told Irene he would deworm her pigs properly using the product Ivermectin (a broad spectrum antiparasitic agent). As he finished, Joseph looked down to where a pig peered out of a wooden slat. He turned and told Irene, ‘See this one has *njoka*, so clearly you can see’. On the farms, Joseph suggested that it was only through seeing signs of a pathogen that farmers could know what treatment was necessary. However, in the example above, Joseph had not previously associated *njoka* with diarrhoea. This meant that Irene also did not think that diarrhoea was a symptom of *njoka*. Thus, instead of treating *njoka*, she instead used an antibiotic, sulfonamide, as it had worked for the same symptom (diarrhoea) in her neighbour’s chickens.

Joseph used his ‘trained eye’ (Law 2010) to enact signs on pigs’ bodies as signs of internal pathogens. This meant that for Joseph a pig that had a pitted stomach, standing hairs, and a cough was infected with *Ascaris* (see Figures 10 & 11). Although I observed Joseph mentioning all these signs to farmers*,* in practice he was not consistently enacting *Ascaris*. This was because when speaking to farmers he always used the generic term for worms, *njoka*. When I asked Joseph why he switched from describing the signs of *Ascaris* to signs of *njoka,* he explained that regardless of terminology, both *Ascaris* and *njoka* could be treated with a broad-spectrum antiparasitic such as Albendazole or Ivermectin. However, I suggest that by switching between terms, *Ascaris,* as a specific pathogen, never came into existence on the farms. Thus, farmers continued to describe symptoms of a generic sickness – *njoka.*

The way in which Joseph spoke about *njoka,* rather than the specific pathogen, *Ascaris,* had further implications for the control of other specific pathogens such as TSTC. In Luganda, tapeworms are a specific worm (*enfaana*) and their eggs (*amagi g’enfaana*) cause porcine cysticercosis in pigs. TSTC infections start on the farm when pigs consume faecal matter containing *T. solium* tapeworm eggs. These eggs can live in the environment and have been found in contaminated water, feeds, and soil (Gweba et al. 2010). Live pigs do not often present clinical signs of TSTC infection and the only method for detection on farms is through inspecting the pig's tongue. This method has, nevertheless, been shown to have low sensitivity[10] particularly if the pig is not heavily infected (Guyatt & Fèvre 2016). In discussions with me about TSTC, Joseph explained how farmers and traders should be inspecting pigs' tongues prior to sale. If signs of a TSTC infection were found, then farmers should use a specific type of dewormer, Oxfendazole, and wait three weeks before reselling. Despite there being a specific sign of TSTC, on the farms Joseph never enacted cysts in the tongue as a sign of a pathogen or sickness contained within pigs' bodies. As TSTC caused no other observable symptoms of sickness in pigs, for farmers, pigs with TSTC were not sick. This meant that TSTC as a specific pathogen was never enacted or treated on the farms.

Figure 10. Irene's pigs displaying what Joseph considered classic signs of *Ascaris/njoka*. Photo by author.

[10] In clinical terms, sensitivity is the ability of a test to correctly identify bodies infected with a disease.

Figure 11. Joseph highlighting a tethered pig's pitted stomach and raised hairs. These were, in his opinion, the most common signs of *Ascaris/njoka.* Photo by author.

Veterinary Drug Shops

Driving out from Mukono town with Joseph, he noted how if farmers had only two or three pigs it was too expensive for them to call him out to treat them. As he concluded, 'The farmer has to pay for my time, fuel and for the treatment so it is pointless if they are far away'. When working as a private veterinarian, Joseph charged for his services. In an attempt to avoid this cost, many of the farmers I visited did not call out veterinarians when their pigs were sick and instead attempted to treat the symptoms themselves. This observation corresponds with studies from agricultural economics (Ilukor et al. 2015), which found that the majority of Ugandan farmers treated their own animals through drugs bought from veterinary drug shops. The same authors noted that farmers only sought the services of veterinarians or CAHWs when a case failed to respond to treatment (ibid: 6).

A proliferation of veterinary drug shops has been noted in studies conducted throughout Uganda (Byarugaba 2004; Mbowa et al. 2012). These same studies suggest that it is businessmen, without any veterinary or animal health qualifications, that are opening many of these shops. This has arguably led to the Ugandan veterinary market being flooded with antimicrobials. This has implications for the rise of antimicrobial resistance (AMR), with resistant genes in Ugandan livestock also being found in humans (Afema et al. 2016; Byarugaba et al. 2011). The potential threat of AMR when farmers administer biomedical drugs haphazardly into their livestock has been noted in other contexts (Beinart & Brown 2013: 158; Chang et al. 2015). While there is a clear link between antimicrobial use in livestock and the development of antimicrobial resistance (Van Boeckel et al. 2015; Holmes et al. 2016; McEwen & Cray 2002), there is little data on how and why livestock farmers choose to use certain medicines in their animals and the role of veterinary drug shop workers in these transactions.

The rise of drug shops across Uganda has allowed farmers to find cheap and accessible solutions for their pigs' sickness (cf. Van der Geest, Whyte & Hardon 2002; Van der Geest & Whyte 1989). In drug shops, farmers would describe symptoms to workers without first consulting a veterinarian. This is clear in the section above, in which the symptoms of Irene's pig (diarrhoea) were enough for her to buy the necessary treatment. Nevertheless, issues arise when farmers' descriptions of symptoms result in different treatment choices than those suggested by veterinarians. In the example above, Irene understood symptoms as a sign of sickness, while Joseph interpreted symptoms as a sign of a specific pathogen. One interpretation led to the use of antibiotics, while the other an antiparasitic.

Many of the veterinary drug shop owners I worked with were not trained veterinarians. Despite this, all the drug shop workers that I interviewed had developed an extensive knowledge around which veterinary drugs treated which symptoms. Unlike veterinarians, veterinary drug shop workers were not concerned with enacting specific pathogens. Instead, the efficacy of their drugs and the success of their businesses were based on whether farmers observed a visible improvement in their pigs' symptoms. This meant that veterinary shop owners' ideas around what constituted sickness were directly aligned to farmers – not to veterinarians.

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Brightly painted on the outside with pictures of cows, chickens and farm equipment, the Mukono veterinary drug shops were permanently filled with farmers and animal health workers. Each shop supplied a selection of animal feeds, supplements, and veterinary drugs. Upon entering a particularly large drug shop in the centre of Mukono town, the owner Daudi, stood casually behind a counter. The counter was covered in pieces of paper and a light white powder. Behind him, the walls were lined with different products including pesticides, feed enhancers, cartons of multivitamin tonics, floor hygiene powder for poultry, and brown boxes marked in green with Ivermectin. A small refrigerator was sitting at the back of the shop to store vaccines but without a generator and unreliable electricity supply a red light kept blinking on and off. Throughout the morning, farmers continually came to the counter to order one or two syringes of Ivermectin or to ask Daudi for general farming advice.

Daudi had graduated in 2009 with a bachelor's degree in business computing and information management. He had no veterinary training but he had learnt the names and dosages of drugs on the job and through growing up on his parent's farm in Kamuli (eastern Uganda). Daudi also had a business partner, a trained veterinarian who had set up a number of different veterinary drug shops across Mukono town. On the one occasion that Daudi's business partner was present at the shop, I asked him why he decided to start selling drugs as opposed to treating animals on the farm. He replied:

> If you move around the farms randomly then the farmers can call you to come and treat. They treat you like a hawker. They can pay you anything. They think that is your routine to go around and they will pay you next time. You can treat their animals and they will say I don't have money. In the shop I have the products here. The farmer can say I only have UGX 2,000 (43p) and I can advise them which product to buy. In the shop you can sit here and the farmers come and buy. Then you always get your money.

Legally under the Uganda National Drug Authority (NDA), Daudi should have been supervised by either an animal husbandry officer or a veterinarian. His business partner was, nevertheless, almost always absent. Moreover, Daudi never mentioned the NDA aside from how the authorities tested drugs before they went on the market to check their efficacy. As he recalled, ‘You hear of fake drugs often. There was a vet shop near here that was selling a fake vaccine for African swine fever to farmers. It was so popular. That shopkeeper became very rich very fast. Then the NDA came and shut his shop down’. For Daudi, the NDA was therefore only explicitly mentioned in relation to the sale of fake drugs.

Although neither qualified as, nor supervised by a veterinarian, Daudi had still been able to establish himself as a well-known and respected veterinary drug supplier throughout Mukono town. As he himself claimed, ‘I want my shop to provide the very best veterinary solutions. That is why every day people come from all over Mukono to buy from me’. I asked Daudi whether he believed farmers were coming to his shop as opposed to calling out veterinarians. In response, he asserted:

> It is very common for farmers to treat their pigs themselves. Often it is just too expensive to call a vet. The government has given the farmers authority to use the drugs however they want. There is no regulation. Farmers use us as knowledge. They come for drugs, they ask me for advice and then they apply the drugs themselves. You understand? The government does not care about farmers or drug shops or veterinarians. It is a problem. The government only want what the animals produce but they do not care about the farmers. I help farmers more than the government.

As a main source of information for farmers on drug choice and use, Daudi had extensive knowledge of deworming drugs and knew, without consulting his records, all of the separate manufacturers of Ivermectin and their selling potential. As he listed:

> We supply Norbrook Ivermectin that one sells the best, UGX 15,000 (£3.20) for 50 milligrams. Interchemie also sells well at UGX 13,000 (£2.70) for 50 milligrams. Hebei Yuanzheng from China is UGX 20,000 (£4.20) for 100 milligrams but most farmers do not want a Chinese product. I have seen that the more expensive drugs sell better because

> people trust a country's reputation. If the main production plant is in the UK or Holland people will buy. People just have more trust in Western things.

He continued on the topic of selling drugs, 'Some farmers want a specific drug but they do not actually know the cause of the disease, others come in just for Ivermectin but they do not know they can also use Levamisole Hydrochloride [another type of anthelmintic agent used in large livestock]. You know, even when farmers are deworming they do not know about the types of drugs for deworming…even they do not know how much they should use. It should be one milligram per 33kg – but look one milligram is very little'. He held up the dose that he had drawn into a syringe.

Daudi, unlike Joseph, relied on farmers' accounts of their pigs' bodies in order to sell his drugs. Another owner of a drug shop, Alesi, echoed this reliance upon farmers' accounts in order to sell medications. As Alesi expressed, 'Mostly farmers use the drugs themselves. They tell me, "my pig is sick" and I will pull out the best drug for them'. She continued, 'Farmers know when their pig is sick. They can look at it and see. It is especially obvious with the pig. When it has something like African swine fever, it will turn red. When it has worms it will cough, cough, and cough'. Despite describing ASF and worms, Alesi claimed that the most common drug she sold was an antibiotic. As she recalled, 'Oxytetracycline 10% is the most common antibiotic I will sell. Farmers buy this one so much for the treatment of simple sickness, vomiting, and diarrhoea'. Alesi's comment indicates how veterinary drug shop workers treated symptoms of sickness as described by farmers. This in turn led to an increase in broad-spectrum antibiotic sales. As Alesi remarked, 'The problem is every drug goes with body weight. The farmers just don't know the weights. They will tell me the wrong weight. They misguide me. Most people are then giving the wrong dosage'. When I asked why, she continued:

> Ugandan farmers are poor. Everyone wants to save a penny for tomorrow. That means farmers buy just enough of the drug and then misuse it. They administer it wrong. Farmers will buy something like Ivermectin and administer it but see no improvement. I know that is an

> under dose. Or others will come and say all my pig's hair fell out. That is over dosing.

The way in which Alesi described drug dosages was similar to Daudi. Late one afternoon, as I was chatting with Daudi, a farmer came hurriedly into the shop. He explained that his pig had been coughing and that he needed one syringe containing one milligram of Ivermectin. Daudi instantly asked the farmer how much his pig weighed. The farmer guessed aloud, finally deciding around 60kgs. Daudi then explained how the pig would need two milligrams, as at that weight, one milligram would be insufficient. The farmer immediately accepted Daudi's advice and took two milligrams in his used syringe. I asked Daudi why farmers did not calculate the weights of their pigs before administering drugs. He pulled out a red weighing band and after showing me the price stressed, 'This band costs UGX 60,000 (£12.80) few farmers can manage to buy it. That is expensive'. He stated:

> See farmers may deworm every month but they are always underdosing. They just believe as long as a dewormer is given they do not care if it is the correct dosage. The problem is, I have started to hear about resistance especially to the sprays used for sarcoptic mange. But because the demand for pigs is so high and the life span of the pig is short, it is very hard to measure resistance. I know if resistance to Ivermectin happens, it will be a big problem for my business.

Both Alesi and Daudi expressed concern over farmers administering the wrong dosage of drugs and the potential that this may have for resistance to the drugs to develop. As Daudi further articulated, he did not believe that farmers were observing the recommended period between administering a drug and slaughtering an animal. As he asserted, 'For an antibiotic they should wait forty-three days and for an antiparasitic they should wait twenty-one days. People do not observe that. They want money. They don't want to waste money waiting'.

Unlike Joseph, Daudi and Alesi were not concerned with accurately diagnosing specific pathogens such as *Ascaris*. They were, however, reliant upon treating symptoms of sickness in pigs in order to sustain their veterinary drug businesses. If veterinary drugs lost their efficacy or failed to treat the pigs' symptoms, then the drug shop could potentially lose business. This suggests why Daudi framed the threat of resistance to veterinary drugs in a way that was detrimental to his business and not to human and animal health.

From the accounts above, it is clear that farmers bought veterinary drugs to treat symptoms of sickness. As discussed in chapter one, one of the main symptoms of sickness in pigs was stunting. This symptom meant that farmers also chose veterinary drugs based on their ability to promote growth. The importance of rearing fat pigs had led to a new market of pig feed supplements sold from veterinary drug shops. Alesi sold large amounts of these products and as she asserted, 'Nowadays many people are buying Big Pig and Wonder Pig' (Figure 12). Big pig, in particular, was a new supplement that was being marketed as improving feed conversion. As Daudi stated, 'Farmers want fatter pigs in a quicker time and for that Big Pig is the best'.

Supplements were not the only way in which pigs' bodies were transformed into fat bodies. It was in the veterinary drug shops that I first heard accounts of farmers feeding their pigs antiretrovirals (ARVs) in order to keep them fat. As Alesi asserted, 'Have you heard farmers are using ARVS to fatten their pigs...they say that in pigs and poultry it fattens the animals very fast'. She started to laugh as I asked her why farmers believed that ARVs would fatten their pigs. Eventually she replied, 'Here, farmers will complain their pig has a cough and they will treat them using Ivermectin and it will work and then the farmer thinks that Ivermectin works for every cough', she continued, 'people know ARVs work and that they make people fat. So farmers think that drug makes every animal fat'. Alesi's comment was echoed by Daudi who on the same topic of ARVs claimed:

> I have heard people talking about it. They say that ARVs boost pigs' immunity and they make pigs fat. They think it works in humans and I think farmers want to do research. They ask, "Can that drug work on an animal?" When it works, they will continue to use it. Farmers want to get the best result so they also do research.

Whether ARVs made pigs fat or not, farmers believed in their efficacy based on the fact that humans were perceived to become fat while taking them. This suggests that the way in which people perceive a drug's efficacy, even drugs that may be pharmaceutically inert, impacts on whether the drug is deemed to be efficacious (cf. Sanabria 2016: 176). The use of ARVs also demonstrates how certain drugs become associated with the treatment of symptoms – not specific pathogens. With farmers desiring fat pigs, drugs that had a visibly direct impact on the overall health and growth of pigs, were the most dispensed within Ugandan veterinary drug shops.

Figure 12. Alesi and pig supplements designed to produce fat pigs. Photo by author.

Njoka on the Farm

It was behind the local village market in Nama that I initially met Kato. Kato, who was busy playing cards and eating sugar cane, had been identified by other pig farmers in the area as the most experienced farmer within the village. Kato had been farming for five years and was currently rearing eleven local pigs. He was in the process of fattening these pigs for selling later in the year. The importance of Kato's pigs for the future of his family was clear, as he asserted, 'These pigs are part of the family. It is their job to make money. I have seven children going to school; the pigs pay for them all. I would not allow the pigs not to be there, I cannot be without my pigs'.

Kato, like other farmers, had occasionally seen what he described as *njoka* in his pigs' faeces. *Njoka* were described by farmers in a multitude of ways. This in turn highlights how they were perceived as a generic sickness rather than a specific parasite. The corresponding descriptions of *njoka* included long (*empamvu*), small (*ekitono*), big/fat (*ekinene*), white (*enjeru),* and like maggots (*emvunyu*). This range of descriptions was also similar to the way in which *njoka* were described in humans (chapter six). In pigs, all farmers were adamant that *njoka* should not be allowed to develop to a point in which they could be seen in faeces as this would mean that the pig was at danger of becoming seriously stunted and sick. In an attempt to avoid his pigs becoming stunted, Kato preventatively dewormed his pigs every month. If the pigs displayed symptoms of *njoka*, for instance coughing or not eating, then Kato believed they were already affecting the size of the pigs' bodies. As Kato claimed, '*Njoka* make the pigs look sick. They will not look happy. They will not eat well. When there are *njoka*, the food doesn't work and the pig becomes stunted'. Regular deworming was therefore vital for ensuring that pigs would not suffer symptoms of sickness, most specifically stunting, into the future.

When I worked with Joseph, he had suggested that farmers' desire to produce fat pig bodies had led farmers to deworm their pigs more than their children. As Joseph asserted:

> I think farmers deworm their animals much more than their children. It is not common for farmers to wake up and deworm their family but if farmers are fattening a pig, they know that if they regularly deworm and rear a fat pig then they can sell the pig for more money. The problem is most farmers do not know how pigs get these parasites but they do know how to treat their pigs if they think they have them.

Kato invited me to observe him as he dewormed his pigs later that week. When I arrived, he told me he had just returned from Mukono town where he had bought a bottle of Norbrook branded Ivermectin and a bottle of injectable multivitamins. Kato claimed that most of his knowledge of deworming had come from a drug shop owner in Mukono and from an agricultural fair held in

Kayunga town. Kato had developed a relationship with one specific shop owner who he now trusted to give him farming advice and effective drugs. As Kingsley (2015) observed in his study of substandard veterinary drugs in Nigeria, a common strategy of drug vendors was to build trust with particular customers. In Uganda and as evidenced above, drug shop workers achieved this trust if they were able to identify which drug would effectively treat the symptoms farmers had observed.

I asked Kato if the drug shop owner he had visited had offered him Big Pig or any of the new supplements for his pig feeds. He exclaimed, ‘He told me that Big Pig is a lie. They are after money only. My neighbours have bought that from a different shop and I have not seen any change in their pigs. That drug shop owner is an expert in everything to do with pigs. He told me the only way to make a fat pig is to be a good farmer; use multivitamins, deworm regularly and feed well’. Kato’s opinion of the supplements was based upon his observations of his neighbour’s pigs. Kato was adamant that the supplement had not enabled his neighbours to visibly transform their pigs’ bodies. The fact that the drug shop owner had also alerted Kato that the supplements might not have any observable benefit reinforced that he was a trusted and expert veterinary drug vendor.

The majority of Kato’s pigs were free roaming in the acres of land around his house. While some of the pigs had been tethered, they regularly escaped to eat the corn that was being dried in his yard. As we walked through the village towards his house, Kato explained that he always followed the same practice of deworming his pigs every month. This was because he was keen to avoid his pigs from becoming stunted and because the drug shop owner had informed him that this would allow his pigs to grow properly and sell for more money at the point of sale. According to official guidelines, Kato was deworming his pigs too frequently, as pigs only require preventative deworming every three months post weaning (Tatwangire 2014). Kato’s concern that his pigs could become stunted had led him to over medicate them. This was in an attempt to ensure they would never show any symptoms of *njoka.*

Kato, who always wore flip-flops, walked us over to a wooden pen behind a row of trees that separated his house from his farm. None of the pigs were inside the pen but instead tethered to the trees around it. Kato snapped a large splinter off the top of the pen to demonstrate how the rains had spoiled the wood and how this had allowed his pigs to escape through the lower broken slats. Kato identified the pig he wanted to deworm first. He did not know the exact weight of the pigs but decided that one milligram of Ivermectin would be enough. He did not want to give too much as he had many pigs to treat over the coming months and only enough money to buy one bottle of Ivermectin.

Kato pointed to a collection of pigs and said, 'This one is about 20kg…this one is about 40kg', he continued, 'I don't really know how else I can tell the weight of the pigs aside from guessing'. Kato grabbed the first pig by its ears, pulling it onto its hind legs. The small pig started to forcefully squeal. Kato injected the Ivermectin into the side of its neck, quickly releasing it. He immediately reinserted the needle into the bottle roughly drawing another one milligram and inserting the needle into the next pig until all of the pigs had been treated (Figure 13).

Figure 13. Kato deworming a pig with Ivermectin. Photo by author.

Two weeks later, I returned to Kato's farm. He claimed that the only way he could be sure that the deworming had worked properly was if his pigs ate well and appeared to be growing. He asserted that sometimes, despite using Ivermectin, his pigs would continue to display symptoms of *njoka*. This, he argued, was a result of fake drugs. As he claimed:

> Sometimes for the pigs you get fake drugs. They just do not work. Maybe you will inject Ivermectin and after treatment the *njoka* stay trapped inside and the pigs still will not grow. The fake drugs are sold in the normal shops at a normal price so it is only once you have bought the drug and start to use it that you know if it works or not.

Various farmers throughout Mukono echoed Kato's fear of fake veterinary drugs. As one of Kato's female neighbours interjected:

> There are so many fake drugs and it is only by chance that you get it right. I buy drugs from the veterinary shop in Mukono and there is no one to tell you if the drug is right or not, not even the vet. With animals you are just looking for a cheap option but you can buy it and then it doesn't work and that's even worse. The ones from India are always fake, even those from China, those brands are just not trustworthy. They just dump all those fake things in Africa.

Farmers' concern over the sale of fake drugs has been noted in other contexts (Kingsley 2015; Newton et al. 2006; Shakoor et al. 1997). As Kingsley noted in his study of veterinary drugs in Nigeria, 'Over the last ten years, but especially over the last five, poor-quality products have become increasingly commonplace and…identifying efficacious drugs has become a lottery' (2015: 2). Like Kato's neighbour, Kingsley's informants similarly linked substandard drugs to generics produced in India and China (ibid: 6). Despite this observation, studies suggest that generic products are not substandard to branded pharmaceutical products (Newton et al. 2011). Both Kato and his neighbour assumed that if symptoms did not improve or if expected outcomes of drugs did not occur then the treatment was potentially fake. As the efficacy of veterinary drugs was based on the improvement of symptoms, this meant that farmers overlooked whether the drugs they used targeted a specific pathogen or whether they had administered the correct dosage.

On the Ugandan farms, if symptoms of sickness persisted rather than directly seeking a veterinary diagnosis, farmers often used different drugs in order to assess their efficacy. This use of medicine was not limited to biomedical drugs and often incorporated herbal medicines. To illustrate, in order to make sure that his deworming practices were completely effective, Kato had been adding crushed papaya seeds to boiled water to supplement his pigs' daily feeds. This was to ensure that all the *njoka* were treated. The bitterness of the papaya seeds was attributed to its ability to wash the pigs' stomachs free of worms. The same was also said of *Aloe vera* and plants such as *Senna occidentalis* (in Luganda this plant is known as *Muttanjoka* which literally translates as 'to kill worms'). These plants, when boiled, were said to produce a bitter tea. Kato remained sure that using papaya seeds in conjunction with Ivemectin was the best for ensuring that he cultivated fat, symptom free, pig bodies. As he stated, 'Ivermectin alone might not treat all of the *njoka*, but Ivermectin and papaya seeds together definitely works'. Thus, as Kato was unsure about the efficacy of biomedicine, he decided to use papaya seeds due to their overall curative ability to flush *njoka* outside of his pigs' bodies thereby preventing any chance of stunting.

Kato's practices highlight the different temporalities and rhythms of veterinary drug use. For deworming, Kato used Ivermectin on a monthly basis and herbal medicines almost every day. In conjunction, these practices would avoid pigs from ever developing symptoms of *njoka*, the most concerning of which was stunting. This relates directly to the previous chapter. With pigs' health a sign of the health and wellbeing of the family, a stunted pig came to represent a lack of *obulamu* into the future. Deworming practices and veterinary drug use more generally, therefore became part of farmers' ability to transform their pigs' bodies and their families' lives into the future.

Conclusion

In this chapter, I have documented the different ways in which a para-veterinarian, veterinary drug shop workers, and farmers enacted worm infections in pigs. I have illustrated how the way in which worm infections were enacted affected the types of treatment that was given. Veterinarians from ILRI had collected samples which indicated a high prevalence of the gastrointestinal parasite *Ascaris* in pigs. Through working with ILRI, Joseph knew that *Ascaris* as a specific pathogen was contained within pigs' bodies. Joseph had a particular 'way of seeing' (Foucault 1973) in which bodily signs became signs of specific pathogens contained within pigs' bodies. In accordance, he attempted to link external signs on pigs' bodies to internal pathogens. Through these practices, Joseph believed that farmers would align to his veterinary understandings of specific pathogens and use a treatment that would target the pathogen. This was not, however, the way in which farmers understood sickness in their pigs. Joseph's advice was further complicated as in practice he generated knowledge around symptoms and not around specific pathogens. This was particularly evident in Joseph's use of the term *njoka* when talking to farmers. As Joseph used the generic term *njoka* in order to relate to farmers, he never actually enacted or brought into existence any specific pathogens. This has further implications for the control of specific worms such as TSTC, as symptoms of TSTC were not considered by farmers to be signs of sickness at all.

Furthermore, in an attempt to save costs, farmers drew on previous veterinary advice in order to buy drugs at veterinary drug shops. This meant that they could treat pigs without first consulting a veterinarian. In veterinary drug shops, farmers would explain the symptoms of their pigs to workers and drugs were dispensed accordingly. As drug choice was based on symptoms, veterinary drug shop workers often sold broad-spectrum antiparasitics and antibiotics. This was in the hope that a broad-spectrum drug would have some efficacy in treating the symptoms and this would mean that farmers would keep frequenting their shops. This suggests that veterinary drug shop workers' and farmers' ideas about health and sickness were both based on the presence and treatment of symptoms as opposed to specific pathogens. Through tracing why and how farmers bought and used drugs, it becomes apparent that many farmers were less concerned with targeting pathogens and more concerned with ensuring that pigs remained fat and symptom free.

Chapter Three

Traders and Slaughterhouse Workers: The Transformation of Sick Pigs into Marketable Meat

I had arrived at one of Uganda's largest markets, Kalerwe, just before 6am on a Friday morning. As I waited for Samuel, a pig trader, I ordered breakfast and watched as the vendor in front of me cracked two eggs onto a frying chapatti[11]. Around me, vegetable sellers started to arrange their pumpkins, tomatoes, and onions into intricate pyramids. At the same time hawkers circulated, spooning charred yellow grasshoppers (*nsenene*) out of plastic bags and into the cupped hands of passersby.

Samuel arrived half an hour later apologising that he had been caught in the early morning traffic. In the back of Samuel's pickup truck there were two workers, both of whom I had met previously at Kasozi's slaughterhouse (described later in the chapter). After I pulled myself up into the cab of the truck, Samuel started to explain how they had all already been awake since 3:30am. He detailed how they had spent the early hours of the morning slaughtering pigs and arranging the weekend delivery of meat to pork joints across northern Kampala. As we drove out of Kampala, along Gayaza Road and towards the top of Mukono district, the two workers slept in the back of the open-air truck.

Just after 10am, we arrived at the banks of the River Nile and embarked on a short boat journey. The river marked the boundary between Mukono and the eastern, Kamuli district. As we approached the other side of the Nile, a woman selling mangoes ran over and shouted eagerly at Samuel. As we disembarked, Samuel leaned out of the truck window and told the woman to follow us by motorbike[12]. As the woman clambered onto the back of the bike, Samuel turned to me smiling and explained how she had been waiting for almost two weeks for him to return to this part of the district. He then said that

[11] A popular street food known as a 'Rolex'.
[12] Samuel paid for the motorbike once we arrived at the woman's farm.

we would make a short detour to buy one of her pigs. Twenty minutes later, we arrived at the woman's house.

The woman had tethered her pig to the back of her vegetable stall and as we approached, Samuel audibly commented on how he was disappointed by its size. The woman loosened the rope around the pig and immediately asked Samuel for UGX 200,000 (£42). Samuel scoffed at her, asserting that the pig was worth no more than UGX 100,000 (£21). In an attempt to negotiate, the woman started to indicate the ways in which she believed the pig was a 'good pig' (*embizzi ennungi*). She pointed out its size, we watched it eat, and she walked it to the road where the truck was waiting. Samuel concurred that the pig looked good but remained adamant that it weighed less than the woman believed it did. With Samuel threatening to leave the pig altogether, the woman conceded and agreed to sell the pig at the lower price of UGX 150,000 (£32). The pig was immediately loaded onto the back of the truck and we drove away.

In central Uganda, people working along the supply chain often judged the health of a body on its appearance. In accordance, a body that was healthy was characterised by an absence of any symptoms or signs of sickness. Along the supply chain, actors claimed that bodies that were healthy were good looking (*kulabika bulungi*). This was why the farmer marketed her pig to Samuel based on its visual appearance, as it was this that indicated that it was healthy and should sell for a high price. If a pig was sick then the sickness could be confirmed through the presence of symptoms. This would in turn cause the pig to look bad (*kulabika bubi*). Traders described symptoms of sickness as, but not limited to, stunting, inability to walk, clear lesions on the skin, and discolouring of the skin. Ideas around what constituted a sick body were the same amongst farmers and traders, with sickness confirmed through the presence of symptoms rather than a specific pathogen. Nevertheless, the qualities that traders and farmers desired were fundamentally opposed. While farmers desired a fat, healthy body, traders desired a fat, sick body. This was because sick pigs in slaughterhouses could always be transformed into meat that was marketable to butchers. Subsequently, the job of traders and slaughterhouse workers was to transform live pigs into marketable meat – meat pink in colour and without obvious abnormalities such as lumps or excess amounts of fat. As Robert Foster describes, actors embedded within Coca Cola commodity chains are situated within a 'network of perspectives' (2008: 26). He illustrates how perspectives from one location have an impact on another due to being aware of each other's inclusion in the same translocal commodity network. Brad Weiss builds on this notion through his study of pig farmers in America and illustrates how farmers select pigs' bodies based on what they think chefs will desire and therefore purchase (2016: 8). While the accounts above focus on the networks of perspectives that inform the trade of global commodities (Foster 2008), and local foods (Weiss 2016), I ask how in Uganda, networks of perspectives informed the way in which signs and symptoms of sickness were enacted in pigs and in pork meat. In this chapter, I show how carcasses were only marketable when slaughterhouse workers conformed to standards set by butchers and pork consumers further along the pig supply chain.

While farmers lost money from sick pigs, traders could always make a profit from the same pigs. This was because if a pig appeared seriously sick, traders could always deliver the pigs to informal slaughterhouses, removing the potential condemning practices of the *Wambizzi* meat inspectors (chapter four). In an effort to produce marketable meat, informal slaughterhouse workers mimicked meat produced by *Wambizzi*. This was achieved through the application of a duplicate meat inspector's stamp as well as through disguising or cutting out visible irregularities in meat. Informal slaughterhouses therefore transformed meat in an attempt to align with both consumers' demands and meat produced by *Wambizzi*.

In accordance, this chapter illustrates the network of perspectives that informed how pigs and pork were perceived to be healthy, comestible, and therefore marketable. Through comparing the infrastructure of pork slaughterhouses (*lufula y'embizzi)*, both informal and formal, I highlight how the only major difference between the two was the presence of the meat inspectors in the formal slaughterhouse – *Wambizzi*. Despite the presence of the meat inspectors, formal slaughterhouse workers held the same ideas around sickness in pigs as workers in informal slaughterhouses. Across all of the slaughterhouses, including *Wambizzi*, workers believed that sickness in pigs could not infect humans. In accordance, I show how despite veterinarians and meat inspectors enacting signs in pork as signs of pathogens that could infect humans (chapter four), traders and slaughterhouse workers were not enacting the same signs, as signs of sickness at all.

Trading and Sickness in Pigs

Samuel had established a network of brokers across the districts of Mukono and Kamuli. As we drove away from collecting the first pig, he explained how in this area he worked with two specific brokers. After a short drive, we arrived at a junction where one broker waited on the side of the road. The broker shouted his greetings to Samuel and jumped onto the back of the truck with the two other workers. As we traversed the lanes leading from farm to farm and village to village, the men hung onto the back of the truck intermittently shouting, '*Wano, wano, wano'* (here, here, here). If the truck did not immediately stop, they would bang on the sides of its metal body. Throughout the afternoon, we drove up tiny lanes to load single pigs, reversing back again and continuing to the next farm. As the pigs were loaded, farmers stood and watched as larger pigs were lifted under the truck's bar and smaller pigs were thrown over the top (see Figures 14, 15 & 16).

Samuel's brokers had already bought the majority of the pigs through mobile money transfer. This technology allowed Samuel to send money from Kampala through his mobile phone account, meaning that brokers could immediately pay farmers for their pigs. In the previous week, the broker had called Samuel to say he had identified thirty-two pigs across the farms. He had calculated all their weights with the biggest pig estimated at 52kg and the smallest at 13kg. He asked Samuel to send him UGX 4.5million (£964) in order to pay the farmers up front. Samuel, like many traders based in Kampala, would only go to the villages when his brokers assured him that there were enough pigs to fill one truck. However, Samuel asserted that his brokers, who spanned across the central and eastern districts, were consistently sourcing at least thirty pigs a week throughout the year (for a chart of how pigs and money from pigs' moved see Figures 22 & 23).

As Samuel's brokers had already bought the pigs, after each pig was loaded a worker pinned them down and marked them with a razor. This was in order to inscribe the symbol of the broker. The symbol of the first broker was 11. The symbol of the second was 1. This marking of the pig's body was in order for Samuel to trace the pigs back to specific brokers when they were weighed post slaughter. These numbers meant that Samuel knew which broker consistently made the most money. The best brokers, Samuel remarked, were the ones who were able to 'See a pig that is worth UGX 300,000 (£64), tell the farmer UGX 200,000 (£42) and get it at that price'. As Samuel continued, 'My brokers are experienced they can't pay for a 50kg pig when it is only 40kg. It is very rare that my brokers get it wrong'.

Such claims were similarly articulated by one of Samuel's brokers who stated, 'I always just guess [the weight of the pig] but I know more than the farmer. I am a good businessman, I can say its 20kgs but the pig might be 50kg'. When I asked how he could calculate the weight based on visual estimates, he replied, 'I look and see. It is just common sense I always get more from the pig than I paid. Maybe I just know more than the farmers. Only once in my life have I made a loss. It was a very huge pig and I paid UGX 400,000 (£85) but the pig was pregnant and even the owner did not know. I think I lost UGX 90,000 (£19)'.

Not one trader or farmer ever claimed that they tried to record the actual weight of a pig. This meant that traders were never calculating a 'true' market price. While brokers and traders argued that they aimed to buy live pigs at UGX 5,000-7,000 (£1-£1.50) per 1kg, in practice and as illustrated in the introduction, all prices were based on the appearance of a pig's body. This corroborates Caliskan's argument, which considers how prices were set in a cotton market of Turkey. Caliskan claims, 'Prices are never set by a mere coming together of supply and demand. They are made, produced, and challenged by a multiplicity of actors in a market process' (2007: 242). In Uganda, traders asserted authority over the market and the price of pigs. They knew that farmers were often desperate to sell their pigs, particularly if the pigs were displaying any signs or symptoms of serious sickness. The more urgent farmers were to sell their pigs, the more traders could determine the actual transaction price. Farmers therefore had little negotiating space, apart from attempting to demonstrate what they considered to be the markers of good health in their pigs.

As was discussed at the end of the first chapter, farmers would often panic sell their pigs to traders when they spotted symptoms of serious sickness such as the reddening of the pig's body. Traders actively sought sick pigs – pigs that had visible symptoms – as sick pigs made the most profit. The fact that traders could determine prices based on the appearance of the pig meant that farmers lost significant money when selling sick pigs. This was despite traders knowing that they would still be able to transform and therefore sell the subsequent pork to butchers in Kampala, often at the standard market price (1kg for UGX 9,000; £1.90). As Samuel explained during the evening drive back to Kampala, 'When you reach the village you can buy sick pigs very cheap. The most money is in sick pigs. If they have stopped eating then it is a risk because it could die on the way back to Kampala. I know from experience if a pig might die and if I am really worried I will slaughter it on the way'. None of the pigs we had collected that day were in Samuel's opinion 'sick'. When we reached Kampala at midnight, under the light of two mobile phones, Samuel observed the pigs being offloaded at Kasozi's slaughterhouse. He noted that the pigs had travelled well and that he would be back at the slaughterhouse by 5:30am to weigh them post slaughter.

Figure 14. Collecting pigs on the farm. Photo by author.

Figure 15. Loading pigs into the truck. Photo by author.

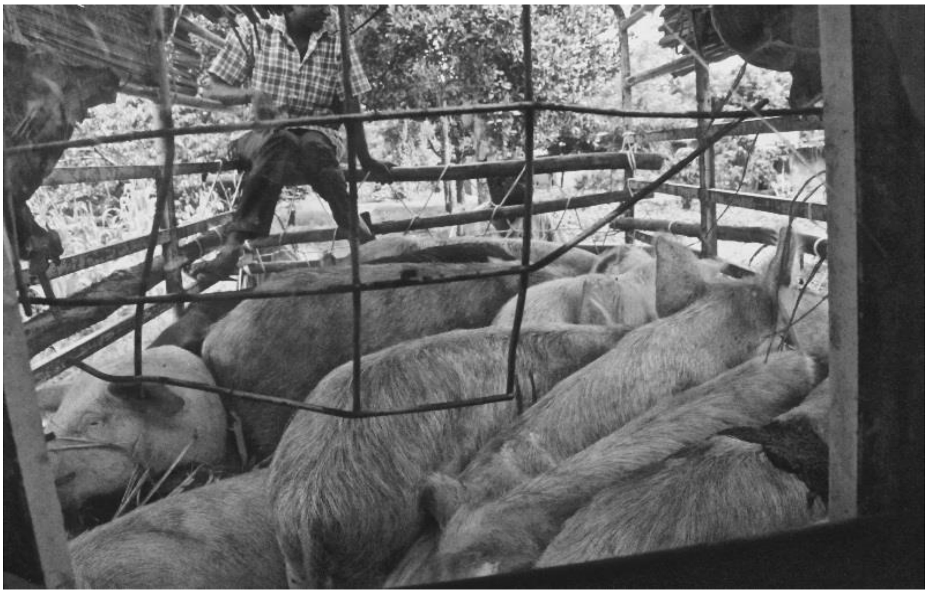

Figure 16. Pigs being transported back to Kampala. Photo by author.

Traders, such as Samuel, supplied pigs to specific slaughterhouses in Kampala. The traders would then supply meat to pork joints across the capital. Nevertheless, travelling to and from Kampala in order to buy meat was financially unviable for many butchers in Mukono. Without any large scale slaughtering facilities in Mukono, slaughtering pigs behind butchers premises or on farms was the only method available to butchers. This meant that every Mukono butcher I visited either slaughtered their own pigs, bought pigs from the surrounding farms, or bought meat from neighbouring butchers. As I worked with and watched backyard slaughters carried out in Mukono, I observed that butchers' understanding of sickness in pigs correlated with that of traders and slaughterhouse workers in Kampala. This becomes clear through an account of a butcher named Francis. Francis, who had just turned seventy-seven, had been a pork butcher for exactly sixty years.

On the edge of a pine forest situated to the southwest of Mukono town, Francis had constructed an open wooden stand where he stood all day selling pork. He had arranged the meat in order to attract customers; larger pieces hung from a hook at the front of the stand and smaller parts had been laid out on a table covered by banana leaves. Behind the counter, he had constructed an eating area. Like many of the butchers across rural Mukono, Francis slaughtered the pigs that he sold. Every week he would go with his son and buy pigs from the surrounding farms. The two men would then bring the pigs back to their own house a short walk away from their butcher stall. One Wednesday morning, Francis invited me to collect two pigs for slaughter from a friend who was keen to quickly sell her pigs to pay for her daughter to go back to school (Figure 17). When we arrived, the pigs, crossbreeds with black and white patches of hair, were tethered around the back of the family home. As we walked towards the pigs, I asked Francis how he knew they were healthy. He replied by commenting that a sick pig would show some kind of symptoms of sickness before slaughtering. As he expressed, ‘A sick pig always looks sick: vomiting, head down, walking slowly, not eating. You can tell just by the way it looks. When a pig is sick, especially in the white breeds the eyes become red inside even the skin becomes much more red. Sometimes saliva comes out of the mouth’. In response, I asked whether he would ever buy a sick pig. He continued, ‘When it looks like that only people in the village will sell that meat. I cannot bring a pig like that here because the customers do not like it. I can’t sell it here but I could deep in the village’.

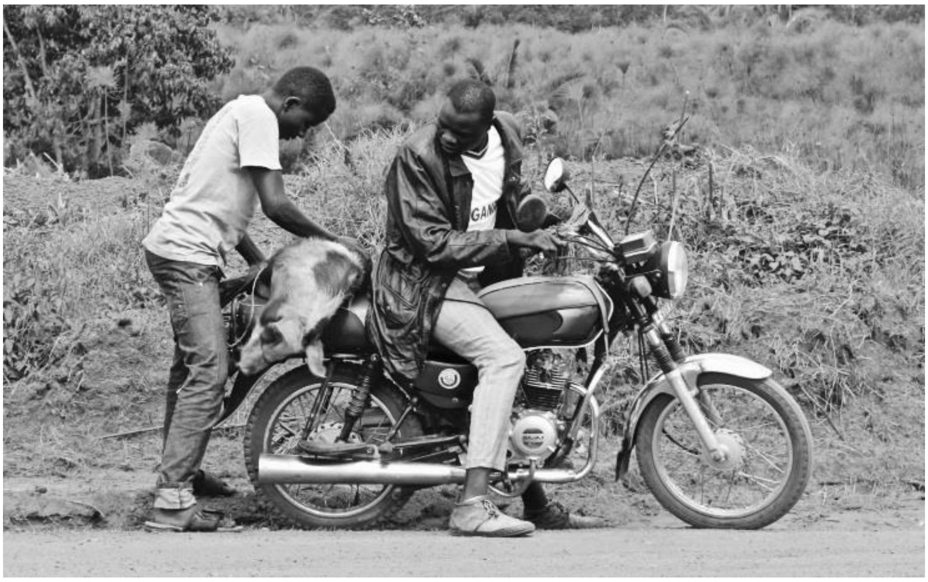

Figure 17. Francis’s son attaching a live pig to the back of a motorbike. Photo by author.

Francis’s comment highlights how ‘sick’ pigs, which produced meat of a lower quality could always be sold. Francis, like the traders and brokers above, did not believe that the sickness of pigs could infect humans. Instead, pigs that appeared sick instead produced lower quality and therefore potentially less marketable meat. As another butcher who had just bought a slaughtered pig in a wooden box from his farm to his pork joint in Mukono central stated, 'I know the fever, the meat becomes red. Someone will always eat that red meat but the customers in town do not like to see it. My fear when I buy that meat is it will go bad very quickly and the customers will complain that it has a different smell. That smell which really attacks the nose'. Butchers, traders, and slaughterhouse workers consistently remarked that sick pigs produced less marketable meat. As a consequence, many butchers and slaughterhouse workers also attempted to disguise any signs of sickness in order to sell the meat to customers and at a standard price (discussed at length at the end of the chapter).

Along the supply chain, people did not believe that sickness in pigs caused sickness in humans and this meant that meat from sick pigs could be sold and eaten. This was reiterated to me repeatedly and became evident in the formal slaughterhouse, *Wambizzi.* In *Wambizzi*, workers were under the watch of a meat inspector and yet they were adamant that they could not fall sick from working with pigs or from eating pork. As a slaughterhouse worker pithily asserted, 'There is no sickness in pigs unless you overeat pork and become too fat'. This assertion was echoed by another worker from *Wambizzi* who commented, 'It's very normal to work here. There are no diseases that pass during slaughtering. No one who has worked here has ever been that sick'.

When people did describe falling sick in the slaughterhouse they described the sickness as coming from the environment as opposed to being infected by the pigs themselves. As a young worker from an informal slaughterhouse clarified:

> I was so sick but only once. I was cleaning and there was blood everywhere. The flies were so many and all those flies produce maggots and the whole place was stinking. I got a bad fever, pains all over my body and headache. I tested for malaria and it was not that. It's not a problem to have the blood on you because you can just wash it

> off. It is bad when the blood lies for a long time because that is when the flies will come.

These accounts indicate the ways in which ideas about sickness in pigs travelled. Traders, butchers, and slaughterhouse workers interpreted sickness through visible symptoms on pigs' bodies. As will be discussed in chapter five, customers demanded a particular quality of meat. This was because aesthetically pleasing pork (pink in colour and without visible abnormalities), correlated with healthy meat and a better taste. Thus, traders made the most money if they could buy sick pigs and then transform the meat into something that butchers could hang in their windows. This reasoning informed slaughterhouse practices within Kampala.

Slaughterhouses

Slaughterhouses have been depicted in anthropological literature as ambiguous places. Slaughterhouses and slaughtering places have been largely exiled from urban centres, with the death of animals concealed and hidden from society (Fitzgerald 2010). As a result of their invisibility, scholars have described slaughterhouses as places that are 'no place' (Pachirat 2011), or as spaces that 'float between two worlds' (Vialles 1994). As Fitzgerald (2010) traced in her paper on the social history of the slaughterhouse, animal slaughtering in the UK historically shifted from private into public facilities. This transition removed the sight of animal slaughter from public places and allowed slaughterhouses to be regulated by the state. Consequently, public slaughterhouses were believed to be more hygienic with diseases easily monitored.

In line with this shift from private into public slaughterhouses, Uganda's first formal pork slaughterhouse, *Wambizzi* Cooperative Society Ltd. was established in an industrial zone of Kampala in 1971. During this period, the cooperative was supported by government funds and the demand for pork in Uganda was low – at an estimate of 0.5 kg per capita per year (Roesel et al. 2016). As a manager at *Wambizzi* explained, with political unrest within

Uganda, after 1978 the infrastructure of *Wambizzi* deteriorated. During the subsequent civil war, vehicles and equipment within *Wambizzi* were destroyed or stolen and the earlier financial support from the government was blocked. The equipment and infrastructure of *Wambizzi* destroyed during this period was never replaced or developed yet the demand for pork has been steadily rising in Kampala (Tatwangire 2014). *Wambizzi* now has the capacity to slaughter up to 150 pigs per day, with the processing fee for each pig costing UGX 3,000 (64p). As the manager articulated, 'We don't have basic equipment like stunners, there used to be stunners here but they were looted during the war and then they were never replaced. Now the workers have got so used to just cutting the pigs with a knife'. The manager was, nevertheless, adamant that *Wambizzi* still produced the best quality pork in Uganda.

Wambizzi did not have the infrastructure or capacity to meet the growing demand for pork in Kampala. As one of the managers at *Wambizzi* proclaimed during an early morning meeting, 'There are thousands of carcasses processed in Kampala every day. Only around eighty of them are processed in *Wambizzi.* All the rest come in from outside and that means that most meat is just not inspected'. Despite the manager's claim, when speaking of informal slaughtering with a veterinary epidemiologist at ILRI, he was quick to inform me I was erroneously labelling one off, backyard slaughters as slaughterhouses. Yet, as I traced meat back from butchers, it became increasingly apparent that informal slaughterhouses were prevalent across Kampala and collectively produced thousands of kilos of pork per day.

Acknowledging the presence of informal slaughterhouses, a public health officer from the KCCA articulated:

> We want legal, registered premises which we can monitor and regulate through the presence of meat inspectors. Informal slaughterhouses are mushrooming and they are unhygienic and illegal. They operate without authority…the problem is so much pork comes from places other than *Wambizzi.* That means that butchers in Kampala are full of uninspected meat. You know, *Wambizzi* has problems but at least there are meat inspectors there.

The officer continued, showing me his phone and telling me to read ‘Ordinance 9 (meat)’, a law enacted in 2006. In the Ordinance it was stated that, ‘4. (1) A person shall not slaughter any animal or bird intended for sale to the public or intended for public consumption, except in a licenced slaughterhouse’. Ordinance 9 also stipulated that meat in pork joints must be marked with a blue stamp issued by the Ministry of Health. In response, the public health officer asserted, ‘Meat must be inspected, the Ministry of Health has a stamp, a blue stamp and the ink must be full grade ink. The blue stamp is very hard to forge and *Wambizzi* has a number so I know if I reach a butcher whether a stamp is ours or not’. The presence and actions of meat inspectors confirmed to KCCA officers that pork in Kampala had been transformed into something that was ‘fit for human consumption’. I, however, suggest that whether pork was deemed to be ‘fit for human consumption’ shifted depending on which person was involved in processing the meat.

In informal slaughterhouses, workers ensured that meat was ‘fit for consumption’ based on its appearance. They did not speak about pathogens within the meat but instead focused on transforming the meat into something that could be marketed. This meant that traders had more control over the supply and transformation of sick pigs in the informal slaughterhouses than at *Wambizzi.* In accordance, sick pigs were more often bought by traders who supplied informal slaughterhouses than those who supplied *Wambizzi*. This was because if traders took sick pigs to *Wambizzi* the meat could be condemned, thereby losing traders money. This implies that the presence of the *Wambizzi* meat inspectors potentially pushed sick pigs into informal spaces.

In order to understand how pigs and pork moved between traders and slaughterhouse workers in Uganda, in the next section I present field note excerpts from three pork slaughterhouses in Kampala. The first is from slaughtering at *Wambizzi,* while the subsequent two are from informal slaughterhouses. The excerpts are followed by two Figures that chart the way in which a single pig and the money generated from a single pig moves along the supply chain (Figure 23 & 24).

Wambizzi

In the early hours of the morning our journey down Kampala's usually crammed Northern bypass felt eerily quiet. The dark fencing that flanked the bumpy road leading to *Wambizzi* felt oppressively high and inside Marabou storks and egrets squawked, the flocks of birds in numbers much greater than the workers present.

Within the main courtyard, bright lights highlighted the working spaces. The last we reached was the slaughter room. This dark room contained two long stone slabs that ran parallel to the walls. It was filled with workers all wearing gumboots and blue overalls. While workers took it in turns to slaughter the pigs one by one, a few slept on the slabs, blood gushing in the galleys between them. The meat inspector who accompanied me shook one, '*Sebo* (mister), wake up, stop drinking *waragi* (gin) here!'

The pigs were repeatedly tossed onto the ground and slaughtered with a knife. Before each slaughter, the worker sharpened his knife against a machete, the sharp rasping of the metal reverberated around the hall. At the end of the room, slaughtered pigs lay heaped on the ground. Their bodies slumped in pools of fresh blood. Around the edges of the room, the once frothy, bright red blood had become dark, thick, and clumpy. A pig frantically squealed as it walked up the ramp into the slaughtering room, the worker kicked it from behind, propelling it forward. Once it reached the slaughtering space, it began smelling the floor and licking the carcasses scattered across the ground. One of the workers started playing the songs of Jason Derulo from his phone; the music instantly lifted the mood, completely changing the atmosphere of the subsequent slaughters.

After the slaughter, the pigs were left for some time until they stopped violently thrashing; once still, the pigs were dragged by their legs or tails and placed into a large vat of boiling water. Multiple pigs were hauled in to boil at the same time. The water was boiled by wood and the resulting steam made the room feel clammy and smell musty. A Large White boar was waiting to be stewed, ‘This is huge, like a cow’, a worker exclaimed. The pig had bucked teeth and the same worker contorted its lips, pretending it was speaking.

Hoisting the carcass into the water, one worker twisted its tail around his hand while another used a metal hook to catch the top of its mouth. The boiled water splashed everywhere as the workers heaved the pig up and into the vat. The worker who controlled the movement of pigs in and out of the vat inhaled the fumes as he swilled and turned the carcasses. During the morning, he ate three chapattis while continuing to check that the pigs were submerged in the water. With his other hand, he removed tufts of the pigs’ hair to see how easily it peeled away. This process took up to fifteen minutes. When boiled, the pigs were dragged out of the vat and heaved back down the ramp, leaving a seeping trail of watery blood. Following freshly slaughtered pigs, Marabou storks gazed from the edge of the surrounding unfinished barns and egrets perched on slats in the open roof. By 6:00am the majority of the slaughtered pigs were being cleaned in the evisceration room.

The evisceration room had one bright light. A wire mesh and a corrugated iron roof protected the otherwise open structure. Inside, the hair of pigs was rapidly scraped off using a metal cup. The crunching sound of the metal hitting the flesh sounded around the room and even from outside you could hear the men at work. After the first layer of hair had been removed, a single razor blade shaved the final, finer hair. At some points, thirty pigs lay on the floor waiting to be cleaned.

On every pig, an insertion was made into the left leg and a metal hook forced through. The pigs, bare and white, were hauled up onto a metal bar where they hung in two long lines. Each carcass was then opened and the organs removed and placed either in a plastic barrel or at the edge of the room. One sow was pregnant and the undeveloped foetuses were pulled out in clusters of amniotic sacs. Women stood around the outside edges and the pigs’ livers were passed to them through gaps in the mesh.

The floor was quickly saturated with hair, blood, water, and countless green gallbladders. When the meat was hacked, water and fats soared in every direction. On one occasion, the fat hit my face. A worker laughed, exclaiming, ‘Quick rub it in, it will keep you soft!’ The overflowing waste was flushed out of a small opening in the cleaning room, flowing into an open stream where Marabou storks stood, waiting. By the end of the morning, sixty pigs had been slaughtered and cleaned.

When the buckets at the side of the evisceration room were full, the intestines and stomachs were carried by hand back round to an annex behind the slaughterhouse. Outside the annex the stomachs were taken and cut open so the faeces could be squeezed out by hand onto a mound of compost. Birds flew overhead swooping down to peck the final pieces of meat mixed into the manure. The stomach lining was then taken back to where the intestines were being squeezed into a large open pit. The casings of the intestines were cut off for sausages and the rest of the stomach and large intestines washed in the pit to be prepared as dog food. Inside the pit, *njoka*, or as the meat inspectors distinguished, *Ascaris,* were mixed into the faecal matter. A worker, Timothy, pulled one out for me to have a look, ‘These *njoka* are very common’ he asserted (see Figure 19).

Back in the evisceration room, the meat inspector checked the meat. If they deemed the meat to be ‘fit for human consumption’ then a blue stamp was applied across the carcass (this process is discussed at length in chapter four). After inspection, the left leg was the last to be hacked off the carcass. Using the metal hook the worker hit the leg hard and twisted until the bone cracked. A knife was then used to cut the last hanging tendons. The meat was then placed over the shoulders of a worker and taken to a final room where the carcasses were piled on top of one another to be weighed. Some carcasses had the fat, bones, and skin removed. This type of meat was called ‘special’ pork and sold for a slightly higher price than meat mixed with bone and fat. Once weighed, traders took the pork to butchers throughout Kampala on the back of pick-up trucks and tied to motorbikes.

Figure 18. Cleaning carcasses in the evisceration room. Photo by author.

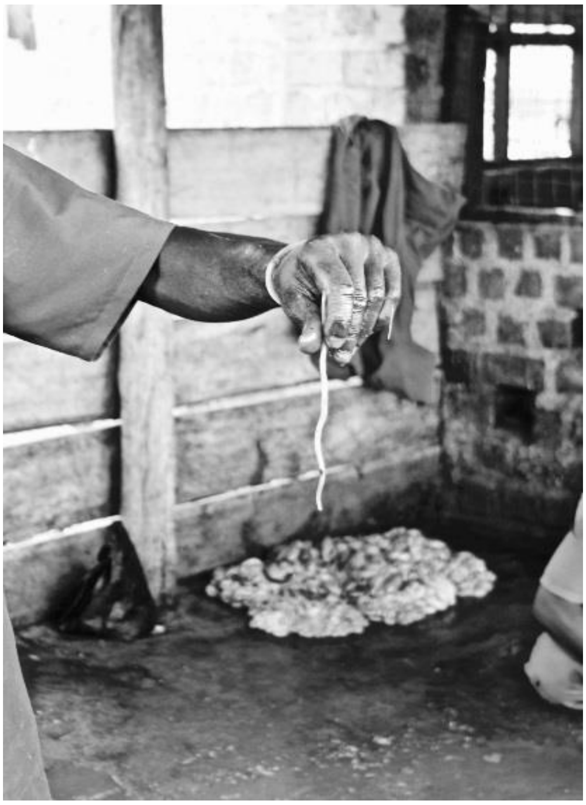

Figure 19. Timothy holding an *Njoka* [identified by the meat inspector as *Ascaris*]. Photo by author.

Kasozi's slaughterhouse

I was told by Kasozi to arrive at his butcher shop by 6:00am; as I arrived, I was greeted with seven pigs packed into the back of his pick-up truck. Kasozi was already waiting in the driving seat. I climbed into the front cab and we immediately drove down into a valley of densely packed houses. Reversing down a back lane, we arrived at a metal gate. Directly behind the gate, a small wooden structure had been erected. In the surrounding courtyard four cows, six dogs, and ten pigs were roaming freely. Another ten pigs were contained inside the structure alongside five freshly slaughtered carcasses.

Slaughtering had begun at 5:30am and five of the workers were packed into the small structure. The dead and live pigs clogged the floor and hung from wooden slats. The remaining live pigs had started to sniff the dead carcasses on the floor. A worker grabbed the next pig, quickly hitting it hard on the head with an axe. Its squeals immediately stopped. Kasozi clarified, 'It is because the neighbours don't like to hear the pigs crying'. The jugular was severed and the pig was left bleeding out on the ground. The carcass was then passed through a hole in the wooden fence to a large metal bath filled with boiling water. It was occasionally turned and then passed back through the fence where it was shaved with a metal cup and then a razor.

Under the watch of Samuel (the trader from the beginning of the chapter), a worker heaved the carcass onto a weighing scale in the centre of the structure. With each pig, the worker called out its weight, '64kg', '58kg', the pin twirled round and was recorded in a book by Samuel. After weighing, a young man stamped the carcasses in a blue stamp. The stamp was the same as the one used by the meat inspector at *Wambizzi*. Kasozi specified, 'If we don't stamp it then the butcher will be questioned by KCCA, anyone can stamp here though'.

At around 8am women arrived with beans, rice, pumpkin, and chapatti. The men cut pieces of meat off the stomachs of the newly slaughtered pigs and roasted them with liver under the bath of boiling water. Most of the men ate in the slaughtering pen. Several men drunk sachets of *waragi,* they offered some to Kasozi who declined but added, ‘I am going to make money today so I can drink later’.

The slaughterhouse had been built next to a small stream and the workers continuously brushed the blood, hair, and bodily fluids of the pigs into the running water. This stream was also where the pigs’ innards were washed and collected and where further downstream children from a local school were playing. Once washed, intestines were piled into plastic bags. Four women lined the end of the pen and collected the legs, heart, lungs, and liver for resale. One woman was in charge with a record book recording the pieces to be sold and their prices. By 9am all the offcuts had been sold, with the women taking the pieces to be cooked as street food.

As the women left, multiple men on *boda bodas* arrived and started binding the large plastic sacks filled with pork to the back of their bikes. Two of the larger dogs eagerly watched and sneaked forward to steal chunks of pork. At 10:30am another truck full of pigs arrived. Six of them were offloaded and marked with a large ‘K’ to represent the broker that bought them. The pigs ran into the courtyard to wait until the next morning’s slaughter.

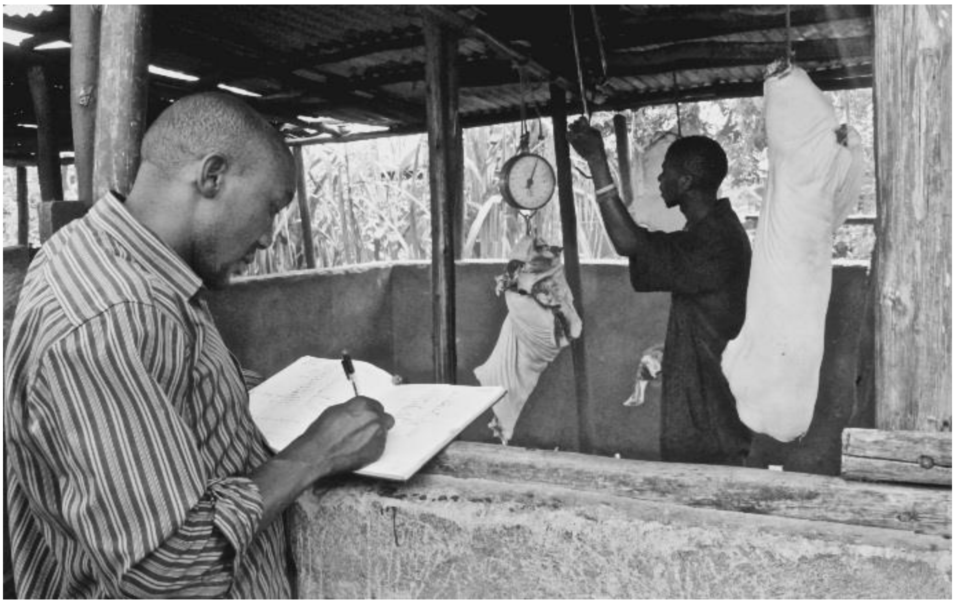

Figure 20. Samuel recording the weight of the carcass. That day the slaughterhouse produced 585kg of pork. Photo by author.

Musaazi's slaughterhouse

After a week, I arrived back at the slaughtering site. The previous six mornings had been filled with rain and the roads leading between the swamplands were drenched. There was no roof at Musaazi's slaughterhouse and the pigsties to the back of the site were overflowing. This meant that the pigs waiting to be slaughtered were submerged in ankle deep, muddy water.

Musaazi, who was also a pig trader, was sitting by an old bath fuelling the boiling water. He explained, 'When it rains we burn rubber tyres first to get the heat going, it smells bad and the fumes make you cough but the rain does not put that fire out'. By 6:30am the sun had started to rise and seven carcasses were hanging on a wooden structure in the middle of the compound. Two freshly slaughtered pigs were lying on the ground. Alongside the sun, flies also emerged. Every surface started buzzing and covered the hanging meat. The flies constantly excreted brown drops. 'It feels like it has started raining but it is actually the flies', Musaazi playfully remarked.

One by one, the pigs were dragged out of the pens and led onto a small-concrete square. The fresh blood from the previous slaughter was funnelled through a hole in the concrete into a jerry can. One worker held the pig by its ear and the other by its hind leg. They threw the pig on its back and the worker at the front had to pin it down with all the weight of his body. The pig screamed incessantly and the worker on top dragged the knife multiple times before any blood started to spill. The pig kicked its own blood back into the worker's face. He shouted, 'I am unable to cut, it's not sharp enough'. The pig was left thrashing on the ground as the workers clumsily sharpened the knife against a machete. By the time the knife was ready only the pig's legs were twitching. Musaazi watched on. Later he told me, 'Pigs are powerful you have to know what you are doing, anyone can slaughter but only a few know the perfect way to do it'.

Many of the pigs slaughtered that morning were between 50-100kg and needed up to five men to hoist them up onto the wooden slats. The pigs were washed and shaved. One worker cleaned the pig using a metal cup while keeping the razor in its anus. He pulled the razor out occasionally to remove the finer hairs.

Around the edges of the slaughtering site, women were standing collecting organs and shaving the tops of pigs' severed heads. Musaazi explained how the same women came every day. He continued, 'That is how the slaughter boys make more money. The money of the head and the liver and legs is for the owner. The boys take the money from the stomach, lungs, and heart'. After cleaning, the pigs were hacked into two and weighed from a scale perched on a tree branch. The meat was stamped in blue ink and it was expected that the slaughterer of the pig would ensure that the meat had been marked.

By 9:30am twenty pigs had been slaughtered. *Boda Boda* men had started arriving from 8am and helped bag the carcasses into plastic sacks. Meat was being transported all over the north of Kampala from Naguru, Ntinda and Kalerwe over to Bukoto and Kisassi. Blood leaked out of the plastic sacks as two men hoisted the meat into bags and strapped it down to the backs of motorbikes with rubber bands.

Once all the work was over and the carcasses had been transported, a large metal bowl was filled with water and frothed with a bar of soap. All the workers washed their hands and faces together, throwing the remaining dregs of water over their boots.

Figure 21. Slaughtering at Musaazi's slaughterhouse. Photo by author.

The way in which pigs, carcasses and money moved along the supply chain as described in the descriptions above is detailed through the following charts. In Figure 22, I follow the process whereby live pigs are transformed into pork. The boxes in yellow highlight points at which pork is consumed. While prices continuously fluctuate, in Figure 23, I describe the approximate amount of money each actor would receive based on the sale of a 50kg pig in the year 2015.

Figure 22.

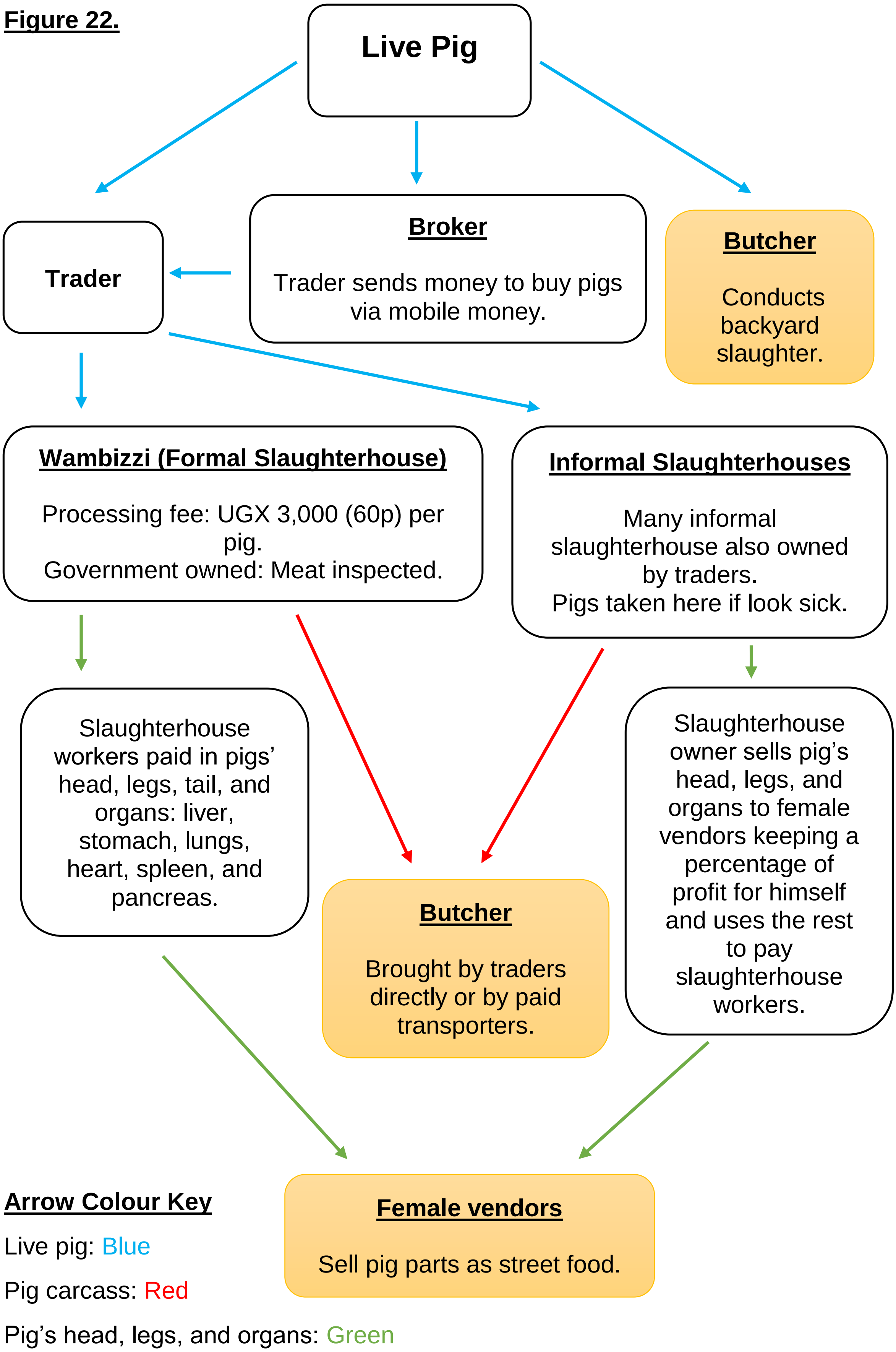
Live Pig
Trader
Broker
Trader sends money to buy pigs via mobile money.
Butcher
Conducts backyard slaughter.
Wambizzi (Formal Slaughterhouse)
Processing fee: UGX 3,000 (60p) per pig.
Government owned: Meat inspected.
Informal Slaughterhouses
Many informal slaughterhouse also owned by traders.
Pigs taken here if look sick.
Slaughterhouse workers paid in pigs' head, legs, tail, and organs: liver, stomach, lungs, heart, spleen, and pancreas.
Butcher
Brought by traders directly or by paid transporters.
Slaughterhouse owner sells pig's head, legs, and organs to female vendors keeping a percentage of profit for himself and uses the rest to pay slaughterhouse workers.
Female vendors
Sell pig parts as street food.
Arrow Colour Key
Live pig: Blue
Pig carcass: Red
Pig's head, legs, and organs: Green

Figure 23.

Actor	Flow of Money
Pig farmer	A 50kg pig bought at UGX 6,500 (£1.40) per 1kg. Final pig price: UGX 325,000 (£69). (Sick pigs could be bought as cheaply as UGX 1,500 (30p) per kg).
Broker	Paid by trader UGX 10,000 (£2) per pig.
Formal slaughterhouse (*Wambizzi)*	UGX 3,000 (60p) processing fee per pig. (No processing fee at informal slaughterhouse).
Formal slaughterhouse worker	Slaughterhouse workers paid in pigs' head, legs, and organs: Head: UGX 15,000-20,000 (£3.20-£4.30) Legs (4): UGX 8,000-20,000 (£1.70-£4.20) Liver: UGX 2,000-3,000 (40p-60p) Other organs negotiable but prices range from: UGX 1,500-4,000 (30p-70p).
Informal slaughterhouse owner	Sells pigs' head, liver, legs to female meat vendors (see prices above).

Informal slaughterhouse worker	Workers paid by owner, UGX 20,000 (£4.30) per day, plus sale of other organs to female meat vendors.
Trader	Final carcass weight: 50kg. Carcass sold to Kampala butchers at wholesale price of approx. UGX 9,000 (£1.90) per kg. Final price: UGX 450,000 (£96) per pig. Profit per pig UGX 125,000 (£26.80) minus fuel for collection, broker fee, and processing fee if slaughtered at *Wambizzi*.
Meat transporters	Pay dependent upon distance of the delivery from the slaughterhouse.
Female meat vendors	Sell heads, legs, and organs as street food. Prices per serving range from UGX 500-1,000 (11-21p).
Butcher	Pork sold at between UGX 2,500 (54p) for a skewer to UGX 13,000 (£2.80) for a kilo of fried pork with added vegetables.

Slaughtering as a Job

Slaughtering has been described by scholars as ‘dirty work’ (Ashforth & Kreiner 1999). This is because it involves the dismembering of bodies and coming into contact with pollutants such as ‘blood’ (ibid). Aside from being associated with ‘dirt’, alongside the rise and accessibility of cheap meat, research conducted in slaughterhouses in Britain and America has highlighted the high rates of injury and mortality (Schlosser 2002), and psychological trauma (Dillard 2008) associated with slaughtering animals. Despite this literature, in Uganda, slaughtering pigs was never described as a dirty job and workers did not comment on suffering from injuries or sickness. Instead, workers described slaughtering pigs as a way in which to make ‘quick money’ (*sente mangu mangu or sente za mangu*) and to provide a better future for their families. As a worker at *Wambizzi* stated, ‘This job brings us happiness. Can you fear your job? You have to be proud of your job. People out on the streets know we are earning and we are giving them something delicious. Giving people pork will never be seen as a bad job’.

After finishing work at *Wambizzi*, a group of workers went back into the slaughter room to relax, drink alcohol, and sleep. Many of the labourers had been working in the slaughterhouse for over a year and some for up to ten years. The men were all between the ages of nineteen and twenty-nine. In a discussion on training, Timothy, one of the eldest of the group explained, ‘I’ve had no education. I finished school at primary seven. I have never had any training for this job. We train ourselves. When a new worker comes, he watches his friend and then he copies. So we all follow the oldest workers. They show us the right way’. Across all of the slaughterhouses, workers appeared as a unified group and expressed how older and more experienced workers had passed down their knowledge of slaughtering practices.

Across all of the slaughtering sites, workers framed employment within the slaughterhouse as positive. This was particularly the case as slaughtering was deemed to provide ‘quick money’ in comparison to other informal jobs, which were described as general market work, building, waste picking, and chapatti making. As Paulo, a worker from Musaazi’s slaughterhouse claimed, ‘This work is not tiresome on the body; by midday I am free to go. If I was a builder I could work hard labour the whole day and get paid UGX 5,000 (£1). Here you work less for more money and you can eat the meat for free’.

The way in which slaughtering correlated to making money was also evident in discussions with the owners of both the informal slaughterhouses. As one owner, Kasozi, stated:

> It was five years ago I started my first pig business. I wanted to make money. I first started a pig farm but the pigs all got sick and they all died. Then a friend told me you are wasting your time being a farmer. He told me if I started slaughtering, I would make quick money. I started that business with UGX 2 million (£428). Now I have a butcher and the slaughterhouse and with the two businesses together, I can make UGX 2 million a week.

Musaazi, who was a pig trader and an informal slaughterhouse owner, also iterated how much money could be made from owning a slaughterhouse. Musaazi had previously been a local councillor and during work one morning, a campaign rally for the upcoming election passed the entrance to the slaughterhouse. Motorbikes whizzed past and the drivers shouted and whistled. As the campaigners progressed, Musaazi boldly announced:

> There is more of a future in pigs than politics. Unless you are really corrupt, you can't make money in politics like you will make from pigs. Politics in Africa is not the future, pigs are. Here I can sell up to 500kg per day and that money is mine, I can spend it how I want to and no one can ask me why.

Transforming pigs into pork was unanimously described as a lucrative venture both by the informal slaughterhouse owners and by all slaughterhouse workers. This ability to make money was often explicitly discussed in relation to drinking alcohol, which was widely consumed in all of the slaughterhouses. Most workers chose to drink sachets of *waragi* (gin) that cost between UGX 500-1,000 (11p-21p). As two workers at Kasozi's slaughterhouse explained, 'We are making money, everyday I make money, every time I cut a pig I make money. This morning I made money. People are so excited by that, they just start drinking straight away'. His co-worker elaborated, 'It is only UGX 500 (11p) for a sachet of alcohol. You come at 5am and at 10am you get your money. People will not know what you do and where you get your money from, but everyday you have clear money. This is why I can buy alcohol as I like'.

Many workers attributed their need to drink on 'the nature of the work', 'the cold' and 'to forget what we are seeing'. This desire to drink in order to forget was also recorded in an American pig slaughterhouse in which an employee stated, '[a] lot of [the slaughterhouse hog killers] have problems with alcohol. They have to drink, they have no other way of dealing with killing live, kicking animals all day long' (Eisnitz 1997 cited in Dillard 2008). This assertion coupled with those of Ugandan slaughterhouse workers, suggests that drinking alcohol is a coping mechanism that masks the reality of slaughtering animals for a living.

Aside from being used as a coping strategy, slaughterhouse workers also described alcohol as a way in which to gain concentration, power, and mental strength. In his book on fast food, the journalist Eric Schlosser describes the widespread use of methamphetamine by meatpackers in order to keep up with the unrelenting demands of the production line (2002: 174). Schlosser's informants described taking the drug in order to feel 'charged and self-confident, ready for anything' (ibid). Amongst my informants, alcohol consumption was similarly attributed to gaining power and aggression, both of which were thought to improve a slaughterer's technique. As a worker at Musaazi's slaughterhouse claimed, 'I drink *waragi* every day. The pigs are aggressive so you have to be aggressive. The pigs always bite, see look at my finger (he held up a tender and swollen middle finger from a pig bite earlier in the week). If you drink you go numb to it all, it gives you some power and if the pig is acting up you can just grab it without fear'.

It was noted by several different workers, that whether a worker drank large amounts of alcohol suggested the type of future he was expecting from slaughtering pigs. As Jude a worker at Musaazi's slaughterhouse explained, 'Some of the men here see this work as permanent. This is it for life. Those people also drink daily. We call people like that "DDO – daily drinking officer". That man who is cutting in his 50s, he has no wife, no children, no responsibilities, he can drink everyday'. As Vincent a worker from *Wambizzi* similarly asserted, ‘It depends on the individual. Some will drink all their money, others will plan ahead’. Jude and Vincent’s claims suggest that futures could be made in slaughterhouses. However, alcohol negatively affected the potential value of slaughtering for making future plans. As Vincent remarked, ‘Having a plan is very important. People who do not plan are *tategera* (crazily stupid). I want to work to make money to build a house and make a shop; then I know that when I become old I will be able to sleep’.

It was not just men who worked in slaughterhouses. Women were also constantly present and yet I never observed a woman slaughtering a pig. Unlike smaller animals such as rabbits and chickens, pigs often struggled before being slaughtered. Pigs were often over 50kg and on occasion could weigh up to 100kg. Pigs would often thrash about, bite, and kick workers prior to slaughter. Thus, across all the sites, women were considered to be inept at dealing with the overall power of a pig’s body. As Musaazi claimed, ‘Women can’t slaughter, they don’t have the power. Their bodies are too soft so they can’t kill’. As Musaazi’s co-worker exclaimed in response, ‘A woman would have to be very courageous to cut the pig. She can’t just be physically fit, she would need to have a strong heart and a straight mind.’

Throughout all of the slaughterhouses, there was a gendering of pollutants with blood (*musaayi*) perceived to be dirty for women – not men. Anthropologists have drawn attention to the associations made between women and blood, with menstrual blood in particular often cited by men as both polluting and dangerous (Douglas 1966; Good 1980). Whereas menstrual taboos suggest that women’s own blood could pollute men and the family (ibid), in the slaughterhouse it was the blood of the pig that could pollute women’s bodies. As one of the managers at *Wambizzi* claimed, ‘We don’t employ any women here, this work is for men. The cleaning job involves scrubbing blood and fat, collecting hairs. There is blood everywhere and keeping women in blood is terrible. Women need simple work that doesn’t involve blood’. Slaughtering pigs was therefore perceived to be an inherently masculine role, with pollutants, such as pigs’ blood, more likely to affect women. Women could, however, handle meat directly after slaughtering and were constantly present on the periphery of the slaughterhouses as meat vendors coming to buy organs and off-cuts for selling on as street food. It was therefore the act of slaughtering and the draining of pigs' blood that was perceived by men to be problematic and dangerous for women's bodies.

While separated spatially, through comparing the excerpts of slaughtering in *Wambizzi* and that of the two informal slaughterhouses, I have highlighted how the themes of money, gender, and alcohol were discussed throughout all of the slaughtering spaces. Slaughtering was consistently described as a job that made 'quick money' and could support workers into the future. The significant difference between the spaces was the presence of the meat inspector at *Wambizzi.* Yet, in the next section, I argue that whether in the presence of a meat inspector or not, all slaughterhouse workers had similar ideas about the sickness of pigs. The establishment of informal slaughterhouses meant that all meat could be sold. If a pig were deemed too sick for *Wambizzi,* then traders still had the option to take it to one of the informal slaughterhouses. This meant that the transformation of sick pigs into marketable meat was particularly evident in the informal slaughterhouses.

Marketable Meat

In Ugandan slaughterhouses, the presence of a meat inspector was legally required and enforced through the KCCA. However, except *Wambizzi*, all of the pork slaughterhouses I visited operated without one. In Musaazi's slaughterhouse, the absence of a meat inspector was explained to me soon after I arrived. As Musaazi asserted:

> The KCCA came and closed my last slaughterhouse. I know what I am doing is illegal. But we have to survive. Now when KCCA comes we give them some money and they will leave. KCCA say that *Wambizzi* is for the government and that the government only wants one slaughterhouse. Even if we created the most perfect slaughterhouse it would still be illegal in the eyes of KCCA.

In order to make their meat marketable and in order to avoid butchers from being penalised when buying their meat, Musaazi used a duplicate blue stamp.

This stamp was in adherence with Ordinance 9 that stated that all meat must be embossed with evidence that it had been inspected and was therefore 'fit for human consumption'. In all the informal slaughterhouses, I observed workers stamping meat. As Musaazi continued, 'You can buy the blue stamp in town, they make it there at Nasser road [the main printing street in Kampala]. Anyone can stamp as long as they know the places they should be stamping. We have no meat inspectors, the KCCA are constantly trying to shut us down. It's not a fancy slaughterhouse but it makes us money'. He continued, 'But really what do those inspectors see that we can't, do they have magic eyes?'

Musaazi's comment highlights how in his opinion knowing whether a carcass was 'fit for human consumption' was based upon the appearance of the meat and what could be seen. This meant that meat that was 'fit for human consumption' was meat without visible signs of sickness, not meat that was necessarily pathogen free. As Rheinlander et al. (2008) established amongst informal food vendors in urban Ghana, food selection by customers was based predominantly upon the visual appearance of food. Similarly, in Kampala, consumers demanded their pork to have a certain appearance (discussed in chapter 5), which was pink in colour, without abnormalities such as lumps, and free from flies. If meat did not conform to this aesthetic then it would not easily sell in butchers.

In order to produce pork suitable to hang in a butcher's pork joint, slaughterhouse workers would cut any abnormalities from the meat. Across all the informal slaughterhouses, workers had observed white clumps in pork. They described these lumps as *mchele* (rice). In Swahili, *mchele* denotes uncooked grains of rice, while in Luganda *mchele* refers to both cooked and uncooked rice. The term *mchele* was used, as the white lumps were said to resemble rice particles. The term *mchele* also implies that the lumps were essentially edible, with rice an important staple in the Ugandan diet, particularly in urban areas. As a worker from Kasozi's slaughterhouse explained:

> Sometimes we see spots…Small, white dots between the pig's skin and fat, like small particles. We call it *mchele*. It is found in the skin after slaughter. With *mchele* the pig looks totally normal, it's not sick. My

> brother [who worked at the slaughterhouse and as a butcher] cuts out the meat around the *mchele* before selling it at his butcher.

Mchele was often considered to come from the North and East of Uganda with Lira, Soroti, and Arua regularly mentioned. Workers explained that it was always found in the body (*mu mubiri*) of pigs with no external signs present on the body prior to slaughtering. Meat with *mchele* was considered as difficult to sell to butchers, as butchers subsequently displayed the meat in their shop windows. Following up these claims, one butcher supplied by an informal slaughterhouse stated, 'I have seen these fatty lumps in the meat. I would never hang it in my window because I don't think people would choose to buy or eat it'.

Workers did not perceive *mchele* to be a sign of sickness. This became evident when a slaughterhouse worker ate what he considered to be *mchele* in a piece of discarded meat. After all the pigs had been slaughtered, one of the workers walked over carrying a large piece of a pig's thigh. The first inch was dappled with several white, transparent lumps. I asked what he thought it could be. He studied the meat and answered, 'This part of the pig had some *mchele* so we cut it off'. When I asked if he was going to eat the piece of meat, he replied, 'This is fine, this pig has no sickness (*obulwadde*). I am not going to become sick (*sigenda kulwaala*). My body is so used to this pork, I could eat this raw and still be fine. I will never get sick from pork'. The worker then proceeded to roast the chunks of meat along with the pig's windpipe, heart, pancreas, and testicles over the open fire. To prove that the meat was completely fine to eat and to also ensure that it remained 'soft' (*egonda*), he took it off the fire before it was completely cooked. For the worker, there was no sickness in the piece of pork. The *mchele* was not a sign of sickness. Instead, it was simply an abnormality and therefore not marketable in pork joints.

The idea that pigs and pork did not cause sickness in humans was complicated by the fact that the most visible sickness in the slaughterhouse was *omusujja*, which workers knew was not zoonotic. As a worker at Musaazi's slaughterhouse stated, 'I have never been sick because of this job; there is no sickness in pigs, not at all. The serious sickness in pigs is *omusujja* and only that. Nobody has been sick from *omusujja* even though there are outbreaks all the time'. As farmers sold pigs with *omusujja* to traders at a cheaper price, pigs scorched red in colour were extremely common in informal slaughterhouses (Figure 24). As the owner of Kasozi's slaughterhouse claimed:

> That *omusujja* is all over Mukono. I bought twenty-four pigs yesterday and I have slaughtered the sick ones first. This meat is not a problem for humans. It is just that the butchers do not like to see red, red skin. So we have two options either we sell the meat to the women at UGX 5,000 (£1) per kilo or we mix it in with the white meat. Either way I am making money.

As with the *mchele* example, slaughterhouse workers had to either remove or disguise parts of the meat that they believed butchers would be unable to sell at full price. As a worker at Musazzi's slaughterhouse detailed:

> When a pig has *omusujja* you just remove the top layer of skin. The largest percentage of the fever stays in the skin. Then you cut a lemon and put that together with the pork in a bucket. When it comes to roasting or frying the customers will say, "What a flavour". They cannot eat that pork and say this one had a fever. They cannot taste the fever. When something tastes good, it cannot affect your stomach. It is when something tastes bad it damages your stomach.

Over the course of the morning, a worker slowly removed the scorched red skin off four carcasses. The meat was chopped into smaller chunks and combined with the white meat to be sold to butchers. The way in which the workers disguised the meat also applied to *mchele*. This suggests why one butcher, Mama Zawadi, had once found what she described as *mchele*, in her meat. As she recalled, 'Two times last year I found the *mchele* in the meat. It looked like fat (*amasavu*) but it was hard. They had chopped that part into small portions and mixed it with the other meat'.

Mama Zawadi's observation highlights the way in which workers attempted to transform meat into something that was marketable. Sickness in pigs was not perceived to be infectious for humans. The skill of the trader and slaughterhouse workers was therefore to buy cheap pigs and transform carcasses into meat that would qualify as marketable meat in butchers. As evidenced above, this involved the mimicry of the *Wambizzi* meat inspectors stamp, as well as the removal or disguise of any abnormalities in the meat.

Figure 24. Scorched red carcass [right] in comparison to white carcass [left]. Photo by author.

Conclusion

This chapter has shown the ways in which ideas about pigs, pork, and sickness travel along the pig supply chain in central Uganda. I have demonstrated how sickness in pigs was not considered to cause sickness in humans and how this allowed traders to actively seek sick pigs. This was because for traders, sick pigs made the most profit. Once traders and brokers bought sick pigs, informal slaughterhouse workers would then transform the pig into meat that was marketable in butchers' pork joints.

Building on work that considers networks of perspectives (Foster 2008; Weiss 2016); I have shown how this notion extends to ideas about health and sickness. For the slaughterhouse workers and traders all meat could be eaten but the meat that most people wanted to consume conformed to a certain aesthetic. This was because meat that was a pink colour with no abnormalities was deemed by butchers and pork consumers to have the best taste. Slaughterhouse workers therefore transformed meat through disguising sickness such as *omusujja* or through chopping *mchele* into smaller pieces. This was in an attempt to avoid the butcher from complaining or switching to suppliers from another slaughterhouse. Recognising how sick pigs made money and how human sickness was not believed to come from pork is vital to understanding the next chapter. This is because, as I discuss next, ILRI veterinarians attempted to make specific (often zoonotic) pathogens in pork visible to butchers and slaughterhouse workers through training interventions.

Chapter Four

Constructing Zoonoses: Taking Samples, Butcher Trainings, and Meat Inspections

Dr. Lutalo, a Ugandan lecturer of veterinary medicine, requested to meet me at Makerere University. I arrived in the morning and a day after students had been protesting a hike in university fees. In response, police had surrounded the campus and dispensed tear gas to disperse the crowds. On the lawns of Makerere's main campus, large groups of students were still gathered holding banners and chanting. As we walked to a nearby cafeteria, Dr. Lutalo waved at one group of students who shouted playfully back.

Dr. Lutalo, who had worked extensively with staff at ILRI, had completed a PhD on *T. solium* infections in pigs earlier in the year. When I met him, he was in the process of writing up his findings for publication. Dr. Lutalo indicated how his recent epidemiological studies had presented significant preliminary findings. He claimed that within Uganda his studies suggested that the prevalence of porcine cysticercosis was at 17.4% in urban areas compared to a rural result of 10.1%. He asserted, 'My informants don't know the *T. solium* lifecycle. From my observations, 60% know of the tapeworm but they can't link the tapeworm to the cyst. They only think of the worm as an adult tapeworm. They don't know *T. solium* infection in humans is linked to the ingestion of eggs and therefore is a product of poor hygiene'.

Later that week, I discussed Dr. Lutalo's results with Gloria, a veterinary epidemiologist at ILRI. Gloria nodded intently as I recalled the figures but in response began to explain how since 2013 her study had focused on the nematode *trichinella*[13]. She described how ILRI had sampled blood from over 1,400 pigs at a household level, 100 pork samples from butchers, and 200

[13] Trichinosis is caused by the larvae of, 'trichinae', a small nematode worm. Human consumption of undercooked pork potentially causes infection. It commonly causes diarrhoea and abdominal cramps. It can, however, progress, causing fever, muscle pain, and headaches and in severe cases meningitis, pneumonia, and death (Pozio et al. 2013).

samples from carcasses at *Wambizzi* slaughterhouse. From these samples, she had found a significantly high prevalence of the *trichinella* parasite. Yet, she emphasised, 'You can't see that parasite with your eyes, it can only be seen through a microscope'. For Gloria, the data produced on *trichinella* during her study was more of a concern than that from Dr. Lutalo's study. As she concluded, 'His study is claiming that in Uganda up to 40% of pigs in Uganda have antibodies to *T. solium.* But I think this figure is just overreacting'.

Both of the veterinary scientists made it very clear that the fact that I could not see the pathogens they studied did not mean that they were not present in Ugandan pig bodies or pork meat. While Dr. Lutalo's evidence suggested that *T. solium* was the most significant zoonotic disease spread between pigs and humans, Gloria was adamant that *trichinella* was more prevalent and of more pressing concern to human health. In Annemarie Mol's (2002) account of atherosclerosis in a Dutch hospital, she argues that diseases are *being done* and are therefore dependent upon the practices of others in order to be enacted. In this vein, Mol places emphasis on the 'techniques that make things visible, audible, tangible, knowable' (ibid: 33). In order to be made visible to scientists, however, microbes and diseases have to be isolated and stabilised by our technologies and practices (Kirksey 2015; Latour 2000; 1999). As Latour argues, microbes can only exist when a multiplicity of agents gather together into a stable and coherent whole. As Latour articulates, 'A substance is more like the thread that holds the pearls of a necklace together than the rock bed that remains the same no matter what is built on it (1999: 151). In line with this reasoning, this chapter considers what happens when networks fail or are simply not in place to allow actors to enact and make specific diseases visible.

The first half of this chapter demonstrates how data from veterinarians' studies were used in an attempt to establish networks which would allow certain diseases to become visible to people along the pig supply chain. Outside of the laboratory, the technologies and practices that allow diseases to be enacted were, however, not in place. In the second half of this chapter, I show how this meant that the practices of meat inspectors were not coordinated (Mol 2002) with the practices of the veterinarians.

Sampling in the Slaughterhouse

In their discussion on how facts travel, Baillie & Dunn claim that how 'ideas or facts come into the world will greatly affect how they are understood. Scientific data is interpreted on every level, and yet many assume it to be the "truth"' (2004: 14). This suggests why despite their different findings, Gloria and Dr. Lutalo presented their data as universal and objectively valid. *Trichinella* and *T. solium* were not the only diseases discussed by veterinary scientists studying pigs in Uganda. The diseases that each scientist considered to be of most concern to Ugandans' health were the diseases that they had been sampling pigs for in their studies. This became evident during my first week visiting *Wambizzi.* During the same period, Erica an international veterinary scientist contracted by ILRI, was also conducting research on infectious diseases in pigs. Her research intended to establish the presence of different viruses contained within pigs' bodies in Kampala and in a western district of Uganda. The viruses she was attempting to isolate included but were not limited to, viral hemorrhagic fevers, Hepatitis E virus, and Henipaviruses.

Standing outside the evisceration room, I accompanied Erica as she watched live pigs being thrust into the slaughtering hall and dragged back out as carcasses. Erica calmly explained how she was particularly keen to determine whether pigs in Uganda could harbour the haemorrhagic diseases of Marburg and Ebola. Erica was preparing to take samples from pigs' blood and liver, as well as from nasal and faecal swabs. That morning she was trying to establish the best methods for collecting her different samples in order to create a system for students from Makerere's veterinary school. These students would later come to assist her in the final sample collection.

Erica put on a white apron, gumboots, and latex gloves and waited for a worker to bring the next pig into the slaughtering hall. The pig trotted up the alley that separated the live from the dead pigs. As soon as it reached the top, the closest worker severed its throat and pushed his finger into its jugular. He then tried to direct the gushing blood towards the small opening of the vial held in Erica's hand. A dribble of blood collected at the bottom of the vial while the rest sprayed over Erica drenching her apron and splattering up her arms and face. After several unsuccessful attempts, Erica decided that collecting vials of blood straight from the pig would be difficult especially considering the number of samples she expected to eventually collect. She bought over a small bucket in which she would drain the blood during the next slaughter. Although more time consuming, Erica decided this would be the most efficient method to incorporate into her final study.

Erica's study highlights the 'places' in which scientific knowledge is constructed (Henke 2000). Erika was attempting to collect samples about diseases with pandemic potential such as Ebola, in a local, Ugandan slaughterhouse. In doing so, Erica illustrates the complexities and experimentation involved in 'making a place for science' (ibid). As Livingstone postulates, 'The image of science as a placeless activity has bitten deep in our culture' (2003: 184). Yet, in practice, Erica could not transform the slaughterhouse into a laboratory; instead, she had to tinker with her methods swapping vials to buckets and asking workers in the evisceration room to take swabs from deep inside pigs' noses and high into their intestinal tracts. Through the process of collecting samples, Erica would generate evidence in order to make a set of viruses visible within a laboratory in Kampala. She would then publish her results in a scientific journal. In order to enact and make visible viruses such as Marburg and Ebola in Ugandan pigs, Erica was dependent upon among many other things, buckets, slaughterhouse workers, laboratory equipment, and journals. However, as Erica trialled different data collection techniques, tensions emerged with the workers for whom the slaughterhouse was their place of work, not a place of science. While Erica perfected the process of collecting samples, she left her bucket containing a mixture of syringes and pipettes at the side of the hall. One of the meat inspectors bought them over and handed them to me. The inspector stated, 'You know the people who work here are not scientists, they could just pick these things and take them without knowing what they are'.

Despite Erica's sampling at *Wambizzi*, slaughterhouse workers remained resolute that there was no sickness in pigs. Amongst the workers, the idea that viruses, such as Ebola, were lurking in pigs' blood was quite literally laughable. As one worker asserted after Erica had left, 'I don't know why they are always checking pigs, for what? I have never been sick from working here'. As the previous chapter (chapter three) illustrated, slaughterhouse workers did not believe that diseases in pigs and pork could infect humans. Thus, slaughterhouse workers perceived the evidence produced by scientists such as Erica to only have a negative impact upon the Ugandan pork industry. After Erica's study had concluded, workers within *Wambizzi* claimed that, much to their frustration, White researchers regularly arrived to test and sample pigs. For these workers, scientific trials had come to present a threat to their business. A week after Erica had collected her samples, a trader explained:

> White people (*Bazungu)* came before from Makerere. They came for research and they wanted to know where these pigs were coming from. We told them Lira and within a few days they had blocked pigs coming from Lira. We were told people should not go and buy in that area. I do not know why they stopped us buying those pigs but that made my business stop.

During the conversation a woman who was busy buying and selling pigs heads interjected, 'Why do *Bazungu* come here? What do they want? They are not helping to improve. They are always coming and once they leave we get problems here, like stopping business. We do not know why they are always here taking the blood away'.

The woman's assertion calls into question the way in which blood, in particular, is used to produce scientific knowledge. Historical accounts of blood in East Africa, document the kinds of rumours that circulated alongside the colonial extraction of African's blood (White 2000). In these accounts, Luise White argues that while no one knew exactly what Europeans did with African blood, they did know that 'white people [were] taking precious fluids from the people they colonized' (ibid: 17). Geissler highlights similar concerns in his paper on venous blood taking and medical research in Kenya (2005: 174). In his account, Geissler documents how people became concerned about blood stealing practices, particularly as medical research was associated with the distant, ambiguous location of the 'laboratory', 'white people', and 'outsiders' (ibid: 178). Despite initial suspicion, Geissler also notes that later in the medical research project, many mothers took a pragmatic stance once they discovered that blood collecting was advantageous for their children's health (ibid: 181). Women's suspicion surrounding blood taking was therefore mitigated when positive outcomes were observed in the bodies of their children. Unlike in Kenya, the workers in Kampala did not witness any positive outcomes of the blood taking practices in the slaughterhouse. Furthermore, like studies concerning human blood taking (ibid; White 2000), slaughterhouse workers were suspicious of researchers who came to sample pigs' blood. This was because slaughterhouse workers perceived the practice of blood sampling to negatively impact their job, livelihoods, and in turn their *obulamu* (health/wellbeing/life).

Beyond being just suspicious of blood sampling, the workers further believed that the results of the research conducted within *Wambizzi* were simply incorrect. This was because workers observed that despite working in the slaughterhouse every day, they were not falling sick. If sickness was in pigs, then the workers asserted that they would have developed signs and symptoms of sickness. Despite Erica articulating to workers why she was sampling the pigs, the workers dismissed her study. Or as Timothy, a slaughterhouse worker stated succinctly, 'The sickness in the pigs just doesn't attack human beings'.

Erica's study brings to light the tension over what scientific research and sampling makes visible and to whom it is intended to benefit. In an attempt to make the samples taken from pigs and pork relevant to actors along the pig supply chain, ILRI veterinary scientists attempted to make diseases visible through training programmes. In accordance, veterinarians attempted to enact signs and symptoms of internal pathogens in pig carcasses and on pork meat.

Enacting Diseases

In the last week of February, Gloria decided to hold a butcher training in a sub-county of Mukono district. Early on a Friday morning, Gloria and I weaved through the typical traffic jam that clogged Kampala's northern bypass. Pulling off the main road and lurching over each pothole, the jerry cans packed into Gloria's backseat shifted noisily backwards and forwards. It was more than an hour after leaving Kampala that we pulled into the grounds of a large, secluded church. The orange dust from the road rimmed the church's blue and green stained glass windows. While we unloaded the car, Joseph (chapter one & two) appeared on his motorbike. He took out a handkerchief to wipe his face clean and then started to help carry the extra bars of soap, pieces of rope and laminated card into the church hall.

For the past three years and in line with ILRI's larger research project, Gloria had collected samples in the Ugandan districts of Masaka, Mukono, and Kamuli. In her study, she had focused predominately on what she described to me as, 'The two major pork borne zoonotic parasites'; *Trichinella* and *Toxoplasma gondii*[14]. Using the same samples, a different scientist at ILRI had researched *T. solium* prevalence rates. As a result of this study, Gloria wanted to train butchers on the invisible pathogens potentially contained within their pork meat.

Gloria's butcher training was due to start at 9am but by 10am we were still waiting for the five invited butchers to arrive. As we waited in the empty church hall Gloria stressed to me, 'This training is so important…you should know that Uganda is now leading East Africa in pork consumption with 3.4kg of pork being consumed per person per year'. Just before 11am, the final

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[14] Toxoplasmosis is caused by a protozoan which can be transmitted between multiple different host species (Tenter et al. 2000). In healthy adults, infection with *T. gondii* rarely results in symptoms. In pregnant women, children, and immunocompromised people it can, however, result in serious complications and fatalities (ibid).

butcher arrived and the session started. After brief introductions and the singing of the national anthem, Gloria began to present in English as Joseph simultaneously translated into Luganda.

Gloria began, ‘Our studies have shown that after backyard slaughtering, pork carcasses are being contaminated with bacteria. So this is our opportunity to give practical tips on hygiene, which you can take back to your butchery’. Continuing, she explained:

> On your hands you have multiple bacteria. These are so small that you can’t see them. You cannot imagine that your hands are dirty when they look clean but those bacteria make meat spoil faster. The meat starts not tasting so good and then it can cause diarrhoea. Customers can also come and touch the meat and what if they did not wash their hands after the toilet? Or what if the butcher wipes his knife on his apron?

To explain Gloria took a large piece of white paper and laid it on the ground. She took six kidney beans and placed them across the paper. As she placed the kidney beans she described how from the samples the team had taken, one of the most common bacteria was *E. coli*. Using the kidney beans to represent the multiplication of *E. coli* on hands and meat, she explained how every twenty minutes Joseph would double the beans on the paper. Then, at the end of the training, everyone could see how the bacteria, *E. coli,* contaminate meat. At the end of the training, Gloria turned to the beans on the floor. She noted how when the session had started there had been six beans and how after just over one and a half hours there were now ninety-six beans. She finished, ‘If this meat had been contaminated in the morning it would be spoiled by lunchtime. See how hygienic practices are needed to stop these bacteria from spreading’.

Gloria subsequently asked what the participants were currently doing to keep their pork joints ‘hygienic spaces’. One replied that he swept daily and provided water for customers to clean their hands. Another answered that he ensured that his pork joint was tightly closed at night so that stray dogs could not enter the premises. The butchers agreed that they were all conducting similar practices. Gloria articulated how this was not enough and she distributed a free bottle of bleach, *Jic,* to each of the butchers. She told the butchers to soak their utensils and towels for at least one hour after work. The small bottle of bleach, which Gloria explained could last for a month, cost UGX 2,500 (54p). However, the butchers could also choose to purchase five litres for UGX 20,000 (£4.30). Gloria clarified, ‘Chlorine kills germs in your butcher so if you use *Jic* your meat will remain fresher and cleaner. You know you will add value to your butchers if you keep it clean. Keeping meat fresh for longer and making sure that the meat doesn’t make you or your customers sick’.

At the end of the training, Gloria briefly distributed a poster developed by ILRI and the Medical Research Council on the TSTC lifecycle (see Figure 2 in introduction). As she spoke, Joseph translated *T. solium* into Luganda as *enfaana* (tapeworm). Gloria asked the butchers to study the poster and to ensure that it was displayed in their pork joints. As with Dr. Lutalo at the beginning of the chapter, in the butcher training Gloria also attributed the spread of TSTC to ‘poor hygiene practices’. She continued to emphasise the importance of hand washing and suggested that all butchers install a tippy tap (a jerry can operated by a foot lever), as a ‘cleaner’ way to wash their hands. Through following Gloria’s training, it becomes clear how veterinarians in Uganda attempted to enact pathogens in meat. In particular, Gloria focused on *E. coli*, making the bacteria visible to butchers through the use of kidney beans. Through adopting this approach, Gloria assumed that butchers would begin to implement her advisory hygiene practices. The butchers, she expected, would do so in an attempt to eliminate what she had illustrated were invisible pathogens that had the potential to spoil their meat and make their customers sick.

In Uganda, issues around zoonotic diseases and food borne diseases were framed as the responsibility of veterinarians with little to no observable collaboration with physicians. This observation builds on Frederic Keck’s argument, in which he claims that zoonotic diseases can be addressed by veterinarians or physicians depending on whether the pathogen is ‘considered from the perspective of its consequence for animals or its impact on humans’ (2008: 198). Keck (ibid) describes how in France, veterinarians were given authority over the realm of food safety; this was until the onset of the bovine spongiform encephalopathy (BSE) crisis, in which food safety was shifted from a veterinary issue to a human health issue. This meant that food safety was organised in a way that protected human health. While in France, control over zoonotic disease shifted between doctors and veterinarians, in Uganda, Gloria as a veterinarian and ILRI as a livestock institution, were held responsible for the surveillance and control of food borne and zoonotic diseases including *E. coli*, *Trichinella*, *Toxoplasma gondii* and TSTC. As a result, Gloria had been advised by staff at ILRI to teach butchers on the TSTC lifecycle and to distribute a poster designed to protect human health. Subsequent to Gloria's training, the only place that I ever observed the same poster was in butchers premises. The fact that Gloria was distributing the TSTC poster indicates how in Uganda, it was veterinarians who were taking responsibility for food borne and zoonotic diseases. This meant that it was veterinarians and not doctors who were enacting and creating networks around diseases that could infect both pig and human bodies.

A month after Gloria's training, I visited a butcher who had been present. The butcher, Luka, had established his business in Kyampisi on the edge of the main road that led into the north of Kampala. Luka had owned his pork joint for thirteen years, the exterior of which comprised of a hut with a mixture of corrugated iron and thatch roofing. Inside, six customers were gathered around a pot of Marua, an alcohol made from millet. As we spoke, the customers drank the mixture through long straws made from bamboo.

Luka, who wore an open shirt, shorts, and white wellington boots, was always keen to relay the information that he had learnt from the ILRI training sessions. As suggested by Gloria, Luka had hung the poster displaying the lifecycle of TSTC next to a WHO poster on the five stages of food safety. Above he had pinned a local advert for vodka (Figure 25). Luka explained, 'We use bar soap and sweep around with a broom. The place needs to be clean. You have to make sure your customers don't get sick and if everything is clean more people will come'. Luka continued, 'You can see now I am doing what

Gloria taught me. Do you remember, she gave me some *Jic* to kill the cockroaches but that *Jic* has run out. Can you buy me some more?'

In her training, Gloria focused on contamination and human behaviours such as the importance of hand washing and not wiping knives on pieces of clothing. She continually repeated that diseases were spread through 'poor hygiene practices'. As a consequence, Luka's reference to cleanliness was a result of Gloria's focus on hygiene practices. Gloria's focus on hygiene and cleanliness, indicated to butchers, such as Luka, that the threat of diseases was not inherent in the pork itself but that invisible pathogens in meat were a consequence of a dirty environment. Luka therefore perceived *Jic* as a product to clean his butcher and control pests such as cockroaches. He believed that a clean pork joint would ensure that his meat was safe. This in turn would not make customers sick.

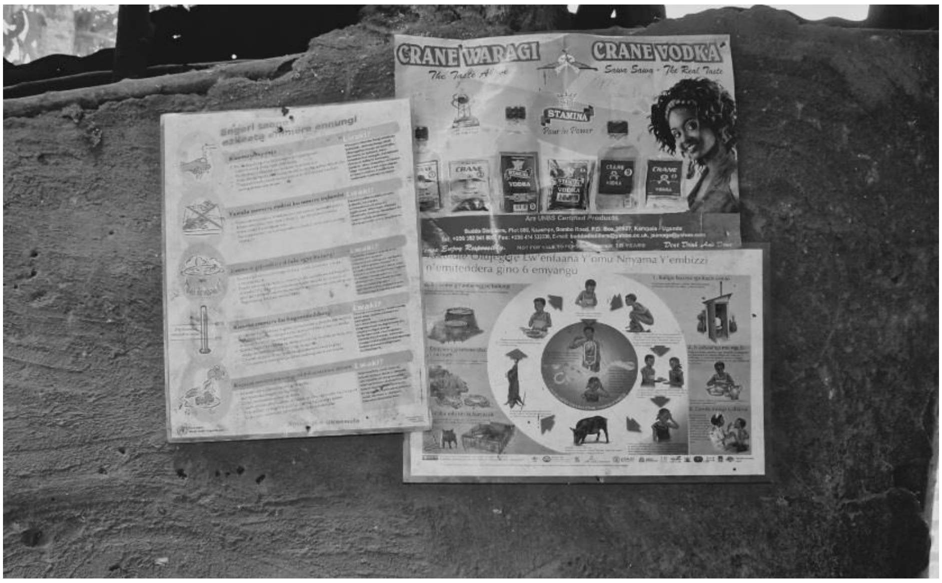

Figure 25. Posters displayed inside Luka's pork joint. Photo by author.

Luka started to discuss the poster depicting the lifecycle of TSTC. He unpinned the poster and traced the illustration with his finger. He commented, 'We learnt that pigs have *njoka*, it's long and white like this one. You get it when you do not wash your hands or if you keep your meat in dirty places'*.* The poster written in Luganda used the local word for a tapeworm, '*enfaana'.* I asked Luka whether the worm on the poster was *njoka* or an *enfaana.* He firmly asserted, 'It's not an *enfanna*. *Enfanna* is a type of worm that lives in your stomach. You can only get it if you eat raw potato or cassava'. As an illustrated picture, Luka who was unable to read the text identified the worm generically as *njoka*. Despite the training, in which the term *enfaana* was used, Luka did not perceive the poster to show the specific tapeworm. Instead, he believed that the poster represented *njoka*, which like on the farms (chapter two), were commonly associated with pigs. Similarly, when I asked about worms in other pork joints, butchers often spoke of *njoka.* This was separate from *enfaan*a a specific type of worm. As another butcher in Kyampisi explained, '*Enfaana* is a super worm which destroys the liver. They live in the vessels, they are the really long ones.' Equally, a butcher in Goma claimed, '*Enfaana* I know. It is different. It is like a snake but it is white. It stays in the stomach. It's not from the pig – it lives in the dirt'.

Enfaana was known by many butchers, yet it was not thought to be zoonotic. In accordance, not one butcher expressed that cysts in pork were a sign of a pathogen that could cause a tapeworm in humans. As a butcher in Mukono Central once told me, 'Pork can't give you *enfaana*. *Enfaana* has a small tail and a big head and it is yellow in colour'. As a butcher in Mbuya, Kampala similarly stated, 'There are *enfaana* but that is not from pork. In Uganda, *enfaana* are in raw potatoes. Only when they are not cooked is when you'll get *enfaana'*. The belief that *enfaana* was spread through the consumption of raw vegetables was widespread. Throughout all the pork joints *enfaana* was described as a specific worm, which was considered to be longer and more powerful than a generic worm infection. Most importantly, *enfaana* was not considered by butchers to come from pork but instead the environment and raw vegetables.

Not one butcher interviewed linked *enfaana* to pigs' bodies. This was despite the fact that some of the butchers I spent time with had also attended the training led by ILRI veterinarians on the lifecycle of TSTC. During the training and on the poster, real pictures of cysterici had not been used. Instead, illustrations of worms and abstract descriptions were used to enact TSTC. As discussed in chapter two, the association between pigs and *njoka* was entrenched on the farm. This knowledge extended to butchers, who also associated the picture of the worm on the poster with *njoka* and not *enfaana*. Furthermore, as was clear through the example of Luka, Gloria's emphasis on hygiene practices meant that she was unsuccessful in enacting the signs of TSTC as a pathogen that was contained within and passed through both pig and human bodies.

Wambizzi Meat Inspections

At ILRI, multiple staff had conducted research at the formal slaughterhouse, *Wambizzi.* The samples taken during these studies had come to inform training sessions, such as Gloria's described above, as well as the practices of the Ugandan meat inspectors. Nevertheless, I suggest that without adequate infrastructure, the meat inspectors were unable to enact diseases within pigs' bodies in the same way as ILRI veterinarians and animal scientists. Without diagnostic facilities or microscopes, meat inspectors had to rely upon visible signs of diseases. However, this in turn reinforced to slaughterhouse workers that sickness could always be determined based on the presence of clearly visible signs.

In an ILRI study conducted by Gloria, her results reported limited meat inspection in *Wambizzi*. She observed inconsistencies and limited official standards used in the post mortem inspection of pigs, while also highlighting that the meat inspectors often missed significant macroscopic clinical signs, such as enlarged lymph nodes. Gloria noted that even if macroscopic lesions (cysts) in the muscle were detected there was no possibility to submit specimens for microbiological or parasitological laboratory analysis. What Gloria's report illuminated was the difficulty for meat inspectors to carry out their jobs in a context in which, rulebooks were 'rarely matched with precise measuring tools' (Nading 2017: 479). Despite Gloria's concerns, the meat inspectors at *Wambizzi* were still passing meat every day as 'fit for human consumption'.

The concept of food safety was fundamental to the interventions led by international organizations such as ILRI, the government led Ministry of Agriculture Animal Industry and Fisheries (MAAIF) and the public health division of the KCCA. In an economic study of fish value chains in Uganda, Ponte (2007) argues that food safety standards were based upon EU designed 'scientific principles' and risk assessments. Ponte illustrates how in the 1990s the EU imposed a ban on fish imported from Uganda, yet the EU did not have evidence that the fish was 'unsafe' for consumption (ibid: 180). Instead, the EU banned the fish on the basis that Uganda did not have an effective food safety system that was being regulated and monitored. The Ugandan fish industry fixed 'the system' by implementing inspections of the fish, thereby restoring its status as 'safe'. Ponte, however, draws attention to the gaps and inconsistences of the Uganda food safety system. Without appropriate infrastructure such as microbiological tests and laboratories, many operations were carried out through 'rituals of verification' (ibid). This meant that many features of the Uganda fish safety management system were visible on paper and not in practice. As Ponte argues, rituals 'conform to a pre-determined outcome resulting from a specific set of procedures, no matter what the actual practices are' (ibid: 188).

Ponte's study sheds light on the ways in which 'rituals' and practices of certain actors come to define what is 'good' and 'safe' in food systems, regardless of the actual quality of the food. In terms of pork, *Wambizzi* was the only pork slaughterhouse considered by the MAAIF and KCCA to be able to meet Ugandan food safety standards. The meat inspectors of *Wambizzi* followed regulations set out in the Animal Diseases Act (2000) and the guidelines of the Draft Uganda Standard (DUS 734), as well as separate meat laws created by KCCA (see chapter three). Within *Wambizzi*, it was the presence of the meat inspector and their ability to stamp pork, which in turn confirmed to KCCA that the pork was 'fit for human consumption'. In pork joints, pork that was not stamped was condemned by KCCA and the butcher given a warning or a fine.

As discussed in the last chapter (chapter three), the practice of stamping meat was duplicated in informal slaughterhouses. This illustrates how it was the ritual of stamping the meat that confirmed that it was 'safe' in the eyes of KCCA. Although meat inspectors and informal slaughterhouse workers produced pork that in the eyes of the KCCA was visibly similar, the practices of the meat inspectors were based upon a radically different idea about what was healthy for human bodies. This was because meat inspectors knew that pathogens were potentially contained within the meat.

It was in the evisceration room that both the meat inspectors of *Wambizzi* spent the majority of their time. Dressed completely in white, the meat inspectors actively separated their role from that of the slaughterer. As the male meat inspector, Bahati remarked sharply one morning, 'I inspect pigs, I don't kill them'. Bahati worked with a female inspector Sanyu, both of whom worked at the slaughterhouse seven days a week except for two Sundays of the month. The inspectors started work every day at 6am and finished at 11am. The start of their shift was an hour after the first slaughters had begun.

The female meat inspector, Sanyu had received a diploma in animal husbandry in which she claimed she was, 'Trained in everything to do with looking after and treating animals'. After starting a smallholding of her own, she decided to pursue meat inspection in order to make more regular money. She subsequently trained for a two-year certificate to become a veterinary assistant and then a final year in training for a specialized inspection diploma. Without a veterinarian on site, the meat inspectors were the only individuals in *Wambizzi* who had received any scientific or specific food safety training.

Accompanying Sanyu in the evisceration room, she began to inspect carcasses after they had been cleaned. Over the course of the morning, Bahati and Sanyu would inspect every carcass, which that day came to a total of eighty-two. After observing the slaughtering practices, Sanyu led me over to one carcass that was covered in light red spots. She described that it looked like ASF but she could not be 'one hundred per cent sure' as the skin had not completely haemorrhaged. She told me to smell inside the carcass and then she questioned, 'It is a little bit musky, no?' Sanyu explained that if she were to condemn the carcass the trader would lose his money. Therefore, as the carcass was not displaying all of the clinical signs of infection she decided to mark it as ‘low grade meat’, which could be sold on at a reduced price. Sanyu commented, ‘ASF is the most common disease to be seen in the slaughterhouse. There are multiple cases every month’. Still, she continued, ‘It can only really be diagnosed in its advanced stages when the carcasses are really red, the lungs congested and the liver and spleen much darker in colour’.

Sanyu asked a worker to pull out another pig’s lungs. He reached inside the carcass and tugged at the innards ripping them cleanly out. She held out the lungs, dappled black and blue and noted, ‘This could be a sign of infection but I think it’s from bad slaughtering practice, the black could be from inhaling the dirt from the ground during slaughtering’. She split open the kidneys and liver and both appeared smooth. She then began looking inside the carcass in order to locate cysts. Sanyu believed she would just know if the carcasses were infected. She explained, ‘Cysts are rare. The traders will not go to those places because they know the meat will be condemned. To see cysts is not common but that doesn’t mean they are not there’. She proceeded, ‘If there were cysts here you would see them embedded in the heart and inside the muscle’. Sanyu pierced the heart and pointed, ‘See the heart looks fine’. She highlighted where one of the lymph nodes was enlarged and darkened, she poked at it with her knife, ‘and this is probably from injury during transportation’ she concluded. She stamped the carcass with blue ink – ‘fit for human consumption’ (Figure 26 & 27). During the times I accompanied Sanyu, no carcasses were condemned and no samples were taken. Instead, Sanyu’s stamp was applied all over the hollow carcass with the ink running, making an illegible blue smudge. Despite visible abnormalities in one carcass, Sanyu did not remove samples for testing or condemn any parts of the meat. Instead, she recognised that traders could still sell the meat despite it potentially displaying early signs of an ASF infection.

Alex Nading argues that for hygienists (food safety inspectors) in Nicaragua, ‘The technical and material task of monitoring food production is inextricably entangled with the social task of telling jokes and giving gifts’

(2017: 479). In Nicaragua, hygienists attempted to 'orient' people, an active engagement that Nading describes as, 'crafted bureaucracy' (ibid). This, Nading postulates, produced a mutually satisfying science of inspection and surveillance. Drawing on this assertion in *Wambizzi*, I suggest that Sanyu passed ASF as low-grade meat as she recognised the economic consequences of condemning meat for traders and workers in the slaughterhouse[15]. For Sanyu, maintaining relationships with the workers took precedence over condemning a lightly infected carcass. This was coupled with the fact that Sanyu knew ASF was not zoonotic. However, through passing meat with clear signs of a disease, she aligned to the slaughterhouse workers' idea that sickness in pigs could not infect humans. This reinforced to workers that meat with signs and symptoms of sickness was simply less marketable than pork without signs and symptoms of sickness.

Figure 26. A carcass post inspection in the evisceration room. Photo by author.

[15] Bardosh et al. (2016) also noted that low quality meat was passed in Moroccan slaughterhouses and that this meat was stamped in a different colour.

Figure 27. A carcass stamped in the slaughter hall. Photo by author.

In her report, Gloria noted that the meat inspectors both agreed the principal reason for the condemnation of a carcass was finding *T. solium* cysts in the meat. However, the visibility of cysts in pork is complicated by the fact that the number of cysts as well as their location in the muscles of the pig varies from animal to animal (Gomes et al. 2007). Thus, inspectors who make incisions at only particular points or shallow into the surface of the pig's muscle are likely to miss positive cases. While inspecting, Sanyu was confident of her ability to identify cysts in the pork. Yet, while taking breakfast one morning she elaborated, 'We can only identify the cysts which are large enough to see with our own eyes but those small cysts that are just starting we may not be able to observe'. Unlike slaughterhouse workers who did not believe sickness was in pigs, for Sanyu some cysts were invisible. Sanyu knew cysts were potentially in the meat and spoke of samples that had established that this was the case. However, Sanyu had to rely on her eyes alone to detect them.

The limit of the *Wambizzi* meat inspectors' ability to diagnose cysts based upon visual observations becomes clear through a scientific study on T. *solium* in pork carcasses, conducted in 2014 (Nsadha et al. 2014b). The study, which was carried out over a four-month period, found that the *Wambizzi* meat inspectors detected less than ten infected pigs per year. However, blood samples taken from every fourth pig slaughtered detected an antigen sero-prevalence of 42% (ibid). The fact that the cysts remained invisible to meat inspectors despite the opening of the carcass indicates how TSTC could potentially creep (cf. Lowe & Munster 2016) out of *Wambizzi* and into the pork supplied by butchers. Thus, while laboratory diagnostic tools such as enzyme-linked immunosorbent assays (ELISA) allow veterinarians to enact TSTC as a pathogen contained within pork, without the same tools, the meat inspectors were incapable of making the pathogen visible through their inspection practices.

As Sanyu and Bahati rarely observed cysts, they also claimed to rarely condemn meat. If meat were condemned then the trader would lose money with no compensation offered. The way in which traders would lose money became clear as Sanyu elaborated on her experiences of identifying cysts in pork meat. As she explained:

> We see it most from the North and East of Uganda – Soroti, Mbale, Lira. Sometimes by the lakeshores and from pigs brought in from the Tsetse Islands. We do not see it that often. If something is infected then we are meant to pour paraffin on it and burn it. That is the trader's loss. So if a pig comes and I see cysts I condemn the carcass and I know traders will not go back to that farm.

Through this observation, Sanyu illustrates how the trader faces financial loss if a pig is condemned. This loss occurs because (as illustrated in chapter three) traders collect live pigs from up to thirty different farms on a single trip. This makes it difficult to trace single pigs back to their farm of origin. Without any means of compensation, trading live pigs into *Wambizzi* was consequently a risk for traders if meat was condemned. Sanyu was therefore sympathetic towards traders, who could lose money due to her ability to condemn a carcass. Consequently, it would only be in extreme cases, in which signs of diseases were highly visible, in which the meat inspectors would condemn the meat.

This link between the trader's financial loss and the meat inspector condemning meat was explicitly captured during a conversation with a meat inspector from the MAAIF. The inspector discussed how he had once tried to condemn and destroy some pork that was infected with cysts. However, during the process the trader who had bought the pig approached him with a sharp knife asking, 'How many lives do you have, do you see this knife, do you see how sharp it is?' Despite this threat, the meat inspector still condemned the meat and the trader subsequently stopped bringing pigs to the slaughterhouse.

The meat inspector's account of confrontation illustrates the extent to which slaughterhouse workers and traders did not expect meat to be condemned. It also echoes accounts from a Moroccan slaughterhouse in which local butchers resisted inspections, as they perceived the results to threaten their potential for making profit (Bardosh et al. 2016: 100). In Uganda, this resistance by traders and workers was particularly evident if the pig appeared to be outwardly healthy when it was brought to *Wambizzi.* This expectation that meat would be passed was complicated by the fact that meat inspectors often bent the rules, passing meat as low-grade and therefore at a cheaper wholesale price. Accordingly, when meat was condemned due to disease, this shattered the 'crafted efforts' (Nading 2017) of the meat inspectors to actively engage with and align to the same ideas about sickness as the slaughterhouse workers and traders.

Mukono Meat Inspection

Outside of *Wambizzi,* the systematic inspection of pork was limited. In Mukono, meat inspection was carried out by government-employed para-veterinarians, like Joseph, who travelled around a selection of local pork joints. At the time that I was conducting research in Mukono, a veterinarian named Robert carried out meat inspection in the sub-counties of Mukono Central and Goma.

When we first met, Robert had recently been involved in a training led by ILRI, Veterinarians Without Borders (VWB), and MAAIF. The training, like Gloria's, was provided to deliver education on pork hygiene, sanitation, handling carcasses, and biosecurity practices for butchers within Mukono town. To aid the training, four veterinary students from an American university and one from Makerere had visited in order to produce a manual for pork butchers. This manual would eventually be distributed throughout Uganda. At ILRI, I was told the American veterinary students had been invited to give training in Mukono because the butchers needed 'more vigorous' training on the topics of hygiene, biosecurity, and food safety.

I first met Robert during an early morning meeting with the Mukono DVO. Robert was just about to start going around the pork joints and we decided that I would accompany him the next time he was carrying out meat inspection. Around two weeks later, Robert and I met at the government veterinary headquarters and set out towards a nearby cluster of pork joints. As we made our way by motorbike, Robert clarified that meat inspection only happened when he had the time and he had been 'very busy recently'. As we reached the first set of pork joints Robert noted, 'Butchers don't observe the rules and regulations. They are always slaughtering sick animals. If you are not there to inspect, then that butcher is going to serve that pork to customers. As production increases it is obvious that zoonotic diseases will also increase'. As slaughtering often occurred early in the morning, by the time we reached the first pork joint the butcher had already sold half of his carcass to another butcher.

Robert was in an almost identical position to Joseph. He shared the same university qualifications of a national diploma in animal production and management and a bachelor's degree in biomedical and laboratory technology. Like Joseph, Robert both identified as a veterinarian and did not have a permanent position within the government veterinary services. As he stated:

> These days I have to look elsewhere in order to get a living. Last week I was in Mityana [a town west of Kampala] so when I am not around I

> do not inspect meat. I have a deal with the government so this week I have been able to go [to inspect meat] but I will not go again until next week. I cannot inspect the meat every day because money does not allow.

Robert was paid UGX 30,000 (£6.45) by the government every time he carried out meat inspections. However, as described in chapter two, with a limited government veterinary budget he had to make a living elsewhere. While he acknowledged the importance of meat inspection as well as the impact that not carrying out inspections could have, meat inspections did not pay him enough money to sustain his family.

As we drove between the clusters of butchers, Robert spoke of a time in 2014 in which he had last seen cysts in pork. He recalled that at that time he was finding cysts up to three times in a month. However, he clarified that since 2015 the meat had been of 'good quality'; he elaborated, 'We condemned the meat that can cause the tapeworm. I bought paraffin and set the meat on fire. Then the butchers stopped buying pigs from the villages deep in Mukono'. Despite condemning the infected meat, Robert expressed how he did not have the time or resources to trace the pork back to the live pigs on the farm.

Robert entered into the first pork joint to greet the owner. He took his stamp and ink inside. After a few minutes he called me in and specified, 'Good meat is like this, fleshy and pink. Meat that is red or black indicates an abnormality. So first you should look at the colour of the fats and colour of the meat itself'. He then lifted a large piece of thigh meat that the butcher was about to cut. He continued, 'To inspect meat you have to make some strategic insertions. Then you use your smell and your sight'. He poked at parts of the carcass with the butcher's knife that had been left lying on a chopping stump.

Robert asked the butcher if he could look at the kidneys and the liver. He explained as he took a slither off the kidneys, 'Most diseases cause disorder in secretion so you will find fluids or stones here. We can look for other pathological signs of diseases, like African swine fever which makes the liver black.' He picked the lungs off of the table and described how they were white and pink. He noted, 'If you feel nodules in the lungs that could be TB. This one is a bit patchy probably because when the pig was slaughtered it was improper and it suffocated before it died. That causes the lungs to look like this'. He then hovered the knife over the top of the skin, 'If you have a good look at the skin you will see that scabies affects the quality of the meat. If it is severely affected the pork will be poor quality and will sell for a cheaper price'.

Robert turned back to the fleshy parts of the carcass and remarked, 'To check for porcine cysticercosis we should insert here in the back legs but the butchers do not want me to because it spoils the best part of the meat. We could check the tongue though'. He picked up the pig's tongue that was floppy and green from its last meal. Cutting through the skin it appeared clear and smooth. Robert observed it and stated, 'This means that this meat is safe'. Robert proceeded to cut the teats off the carcass and stamp the meat with blue ink – 'MUKONO 01 MAAIF PASSED'. Through inspecting the superficial quality of the pork and by not cutting certain parts of the meat, Robert implicitly suggested that he knew the economic importance of pork for butchers and aesthetically what type of meat customers valued. Commenting on the pork's 'good' appearance and ensuring that the back leg remained untouched, he focused on ensuring the meat remained looking good, as opposed to ensuring that no cysts were contained within it.

Robert continued on his rounds visiting three more butchers. Each inspection took no longer than five minutes and all the meat in the pork joints was stamped with the same blue stamp. In each butcher, Robert would comment on the visible quality of the pork. He showed me parts of a 'good kidney', 'good liver', and 'good tongue'. Eventually we arrived at the last cluster of pork joints. The time was 10am and the meat was already being sold and eaten by customers. As Robert observed, 'See there is no set time for the meat to arrive. Now I just have to check to make sure the rest is good meat'.

The first butcher was busy chopping pork whilst also drinking a cup of tea and eating a chapatti. The butcher, who had received the recent ILRI training asserted, 'Look I am practicing good hygiene, see the brush we are using and even this towel is wet. It is working'. The wife of the butcher was outside frying pork from the day before and the meat on the plate had started to grey. Inside, their baby was sleeping on the floor. Robert entered the butcher and immediately commented, ‘This is a terrible environment, see look even the baby is just here on the floor’. In every pork joint that we had visited previously, Robert would comment on whether the butcher was hygienic and therefore capable of producing good meat. For him, the baby sleeping on the floor was emblematic of the butcher’s inability to produce a fully hygienic space and this meant that he also questioned the quality of the meat. Robert subsequently asked the owner where he stored his meat. He replied, ‘We have a fridge but because the electricity goes on and off, when we bring it back to room temperature it becomes bad and starts smelling very quickly’. The butcher thought it was better therefore to leave it at a constant room temperature, as it would last for longer. Robert decided that as the meat did not yet smell and was only a day old it was not necessary to condemn it. He advised the butcher to remove the baby, clean the space, and use the meat by the end of the day.

As with the meat inspectors at *Wambizzi,* Robert predominantly looked for obvious clinical signs of disease. However, he also occasionally passed meat that did not look ‘good’, as evidenced in the example above. This practice led to confusion when he did actually condemn pork or close down pork joints. As Robert later told me:

> We usually advise we do not usually condemn. The butchers do not feel free and open with me. They think I could do something terrible for their businesses. It is because they remember that I once shut one butcher down. I was part of the team. We had advised them and they did not change so we had to apply stringent measures. We had warned this person about bringing substandard pork [infected with what Robert described as African swine fever] but he failed to change, so we went there and shut the store. He was so upset. No one understood why we had shut him down.

As Robert discussed condemning the pork joint, it became apparent that he sympathised with the butcher. He placed emphasis on the fact that he had advised the man to change his practices and explained how the other butchers had become distant towards him since he had closed the pork joint. As Bardosh et al. similarly established in Morocco, veterinary technicians in rural slaughterhouses thought it was, 'unrealistic to impose strict food safety measures for endemic diseases…as taking meat from butchers who were poor, was not right' (2016: 102). Robert also implicitly suggested that maintaining relationships with butchers was a significant part of his meat inspection. This informed the way in which he enacted only certain signs and symptoms as diseases. Half way through inspecting the next pork joint Robert was called back to the central office by the DVO. He clarified, 'We will do the rest later. It will just take five minutes at the office'. Two hours later Robert finished his meeting at the central office and apologised. He concluded, 'Now we will have to wait for another day. All the meat will be being eaten so it is too late for inspection'.

Robert had spent time working with ILRI. He had attended butcher trainings and had in-depth knowledge of TSTC and other zoonotic diseases. However, he did not enact signs and symptoms of diseases in pork in the same way as Gloria. Through his avoidance of cutting the best parts of the meat during his inspections and focusing almost entirely on the appearance of 'good' meat, Robert enacted the same version of healthy meat as the butchers. He focused on observing the outside of the meat and rarely condemned meat in an attempt to maintain good relationships with butchers. Thus, in practice, his inspections reinforced that signs of sickness in pork made the pork less marketable as opposed to being a potential threat to human health.

Conclusion

This chapter has illustrated the types of networks that are necessary to bring different diseases into existence (Kirksey 2015; Latour 2000). It has demonstrated, more specifically, how TSTC is dependent upon among other things; veterinarians, meat inspectors, knives, diagnostic tools, and microscopes in order to be made in practice.

In the first half of this chapter, I illustrated how veterinarians, particularly those who worked at or in collaboration with ILRI, created 'facts' about diseases in pigs and pork. These veterinarians then attempted to translate these scientific results into everyday food safety practices. The examples of Dr. Lutalo, Gloria, and Erica indicate how veterinarians sampled pigs and pork to construct knowledge and epidemiological data around zoonotic diseases. The results of these studies indicated to veterinarians which diseases they should attempt to make visible to people working with pigs and pork. For example, in her training, Gloria focused on the bacteria, *E. coli*, developing a strategy in which butchers could see the multiplication of the pathogen. She did this through mimicking what occurred in the laboratory under the microscope. Despite Gloria's training, butchers such as Luka believed that serious sickness could only occur when the environment of the pork joint was dirty. Many butchers reiterated that customers desired a clean pork joint, as this implied that the meat would also be clean. Gloria's training reinforced this idea as she continually reiterated that sickness was a result of poor hygiene practices. Butchers in turn continued to express that the sicknesses of pigs could not infect humans, as long as the environment of the pork joint was clean and the pork looked pink and without obvious abnormalities.

The second half of this chapter has shown the tensions that emerge when different actors are unable to enact diseases in pork carcasses and pork meat. In *Wambizzi*, Sanyu knew that pathogens were potentially contained within pork meat and yet she was often unable to make them visible. This was because she did not have the same diagnostic tools as scientists in the laboratories. This was evidenced by studies that indicated that *Wambizzi* meat inspectors were not identifying or condemning infected meat (Nsadha et al. 2014b). The *Wambizzi* meat inspectors attempted to align to the same ideas of pathogen free meat as Dr. Lutalo, Gloria, and Erica and yet in practice they produced the same version of meat as that of informal slaughterhouses. This was because they had to base their inspection on signs of diseases that visibly affected the outside of the carcass.

While the meat inspectors in *Wambizzi* did attempt to identify visible cysts, during the Mukono meat inspection, Robert focused on observing 'good' meat. Robert's inspections were limited as he frequently left Mukono to seek other employment throughout Uganda. When he did conduct meat inspections, he did not cut pieces of meat that would affect a butcher's ability to sell it. Through doing so, he reinforced that butchers could serve meat as long as it appeared to look 'good'. The lack of inspection and limited insertion into pieces of meat potentially suggests why Robert had not identified cysts in pork for over a year despite epidemiological studies that demonstrate its prevalence throughout Mukono (Kungu et al. 2016).

The inspection of pig carcasses post slaughter was the only point along the pig supply chain in which T. *solium* cysts became visible on the outside of the body. Despite this, veterinarians and meat inspectors could not consistently enact the signs of TSTC as a disease. This has profound implications for human health. As if people consume infected pork, Ugandan doctors were also unable to enact TSTC as a pathogen in humans in clinics and in hospitals (chapter six & chapter seven).

Chapter Five

Meat as Medicine: Pork Consumption and the Cultivation of Healthy Human Bodies

Vehicles moved slowly on the main road between Mukono and Kampala. The trucks carrying produce and people from the East had worn a continuous rut into the road which the smaller minibuses, cars, and motorbikes bounced over as they weaved between the traffic. Either side of the road, shops, restaurants, pharmacies, and markets had sprung up to cater for the continual flow of passengers. On this main road, running straight through Mukono town, clusters of pork joints[16] were intermittently placed along the verge. The wooden structures, painted various tones of light sky blue and teal, faced the road with open hatches full of hanging meat (Figure 28). Between five to ten pieces of pork dangled from the open booth of each butcher. On my first visit to one cluster, four of the six butchers rushed out calling, 'Welcome customer, kilo *meka*? (How many kilos), come, mine is the best pork'. Behind the first line of booths, butchers had arranged wooden structures for frying and roasting meat and for customers to sit down and eat.

Moving along the main road into Kampala, pork joints remained ubiquitous. Almost every street boasted at least one small structure with a window full of meat. The joints, covered in words describing their pork as 'tasty' or 'delicious', were plastered with pictures of alcoholic beverages and 'enjoy with a beer' posters (Figure 29). It was in one of Kampala's many pork joints that I first met Roho, a twenty-five year old butcher. One afternoon, as Roho and I finished a plate of fried pork, he remarked, 'We don't just eat pork because we like it, we eat it because it's our medicine'. He pressed a toothpick into the gap between his two front teeth and continued, 'Ugandans really love pork. Compared to beef it's so delicious, it's the cheapest meat, and it reduces HIV'.

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[16] Pork joints were the spaces in which pork was sold and consumed. Pork was rarely sold outside of pork joints and never alongside the meat of other livestock.

Nearly all of my interlocutors shared Roho's love of pork. Drawing on observations from within multiple pork joints and interviews with pork butchers and pork consumers, this chapter discusses why customers 'loved' and therefore chose to eat pork over other types of meat. Aside from pork being cited as 'delicious' *(ewooma nnyo),* I argue that pork has become a valued food item in Uganda as it was perceived by people to transform sick human bodies into 'healthy bodies' – bodies that did not have external signs or symptoms of sickness or that were 'slim' or wasting. Pork fat, in particular, was cited as cultivating healthy bodies particularly those of individuals infected with HIV. In accordance, butchers strove to achieve the maximum price for their pork and ensured that the appearance and taste of their pork suited their ever-growing customer base.

Uganda was the first place in which the African HIV/AIDS epidemic was recorded (Thornton 2008). This means that since 1987, networks around the virus have been established and entrenched throughout the country (cf. Kirksey 2015; Latour 2000). From the accessibility of HIV rapid diagnostic tests, through to posters, TV, and radio shows discussing HIV prevention and treatment, HIV is consistently being enacted as a virus. In accordance, people also spoke about HIV as a virus, which had specific signs and symptoms. Recognising that HIV was a virus that lived within the body, my interlocutors would discuss the ways in which they cared for their virus and how this in turn allowed them to ensure their bodies remained healthy. These accounts illustrate how one can live with (*kubeerawo*) a diagnosed pathogen as long as the pathogen does not cause any signs or symptoms of sickness.

As pork consumption was linked to the transformation of sick bodies, butchers and consumers conceptualised pork as an inherently disease free meat. As discussed in the previous chapter (chapter four), ILRI veterinarians led butcher trainings in an attempt to make zoonotic diseases such as *E. coli, Trichinella,* and TSTC visible in pork and to improve the hygiene practices of butchers. Outside of these training sessions, butchers and consumers never described pork consumption as a potential cause of sickness. Thus, while food safety training attempted to keep diseases and uninspected meat out of bodies, butchers were more concerned with what type of meat their customers needed and in what ways pork (or the fat of the pork) was nutritious for their bodies. Both food safety officials and Ugandan butchers were concerned with what pork consumers ingested and how this affected their health. Yet butchers constantly described pork as a delicious and nutritious product, a product that Ugandan bodies actively needed in order to become and remain healthy.

Figure 28. A pork butcher in Mukono central. Photo by author.

Figure 29. A pork joint in a suburb of Kampala. Photo by author.

Meat Eating and Ugandan Pork

Meat products are overwhelmingly depicted by researchers as vessels of disease and a threat to human health (cf. Yates-Doerr & Mol 2012). Whether *E. coli h7: 0157* in beef steaks from the United States (Baillie & Dunn 2004: 27), *Echinococcus granulosus* in cuts of cattle, sheep, and goats from Morocco (Bardosh et al. 2016) or campylobacter in factory farmed chickens from the UK (Hinchliffe et al. 2016), meat is often portrayed as an infection risk to human bodies. This threat is not just confined to the abundance of pathogens found within meat but also in relation to antimicrobial resistance, with the overuse of antibiotics in livestock reportedly causing a rise in resistant genes found in humans (Donovan 2015; Landers et al. 2012). It is, furthermore, not just human health that meat consumption threatens. Increased livestock production has also been linked to environmental degradation, the loss of global ecosystems and biological diversity (Machovina, Feeley & Ripple 2015; Steinfeld et al. 2006). Meat consumption, it would appear, is a highly risky practice both in relation to human and environmental health.

There is, however, a meat paradox. Although meat consumption threatens human bodies and the health of the environment, it is simultaneously a highly valued food product (Gewertz & Errington 2010). In Uganda, pork consumption has rapidly increased over the past fifteen years and the country is now one of the highest consumers of pork across the African continent (Tatwangire 2014). This desire for pork is evident in daily newspaper articles which have voiced that, 'Ugandans' raving appetite for pork makes them the biggest consumers of pork in Africa' (Agencies 2016). In light of this evidence, this chapter considers what is driving this rise in pork consumption and questions why Ugandans are increasingly choosing to eat pork over other types of meat.

Throughout Kampala and Mukono, pork was available in many forms and almost the entirety of the pig could be sold. Aside from kilos of fresh meat, the cheap sale of heads, legs, and liver meant that pork was not prohibitively expensive for the employed, urban population. Every butcher I visited sold both raw and cooked pork. In 2015, a kilo of fresh meat sold at around UGX 10,000

(£2.15). A kilo of pork accompanied with added *matooke* (plantain), onions and cabbage cost between UGX 11,000-13,000 (£2.35-£2.80), while a skewer of roasted pork sold for between UGX 2,500-3,500 (54p-75p). Outside of pork joints and often located on the streets, female meat vendors (who were also present in slaughterhouses) cooked offcuts and organs, including the pig's legs, head, and liver. From female meat vendors, pieces ranged in size and price from UGX 500-1,000 (11-22p). Due to the range of prices many of my informants stated that, regardless of not working in a high paying job, they could afford to eat some form of pork on a nearly daily basis.

The food that people choose to eat has been described as reflective of their shared values and identity (Fiddes 1991; Paponnet-Cantat 2003). Throughout Mukono and Kampala, pork eating was often described as a particularly 'Ugandan' habit. As one butcher articulated, 'People prefer pork to beef. Pork is sweeter than beef. Here people don't want other meat. Ugandans just like pork'. As the butcher highlights, it was often a specific taste and texture of pork that Ugandans described as desirable. Pork was associated with a sweet taste, as evidenced by the most consistent initial reply to the question 'why do you choose to eat pork?' being *ewooma nnyo* (it tastes sweet/delicious). As one customer stated, 'Pork has a sweet taste every time. You can eat chicken three times in a week and you will get bored but with pork you can't tire'. Pork was most often eaten by hand either collectively on a large plate or from a skewer (Figures 30 & 31), with many consumers remarking that, 'pork should be eaten with friends', or 'it is better to share pork with friends than to eat alone'.

The popularity of pork was cited as to why it had many nicknames. As a butcher in Nakulabye claimed, 'It's the same as if you like a child and you call it by many different names. Pork is the same because people like it so much'. While in Luganda, pork is *nyama ya embizzi* (the meat of a pig), it also has a number of other common nicknames. These include; *kasoloke gw'e gwanga* (animal of the country), *mutambuza dembe* (it walks gently), *munaba gwokya* (to bathe with hot water), *nyama ya Daudi* (Meat of David) a code name which excluded Muslims, P1G (P one G) and Ipsam, a brand of Toyota car that resembles the appearance of a pig's nose. When asked how these came into use, people claimed that they had grown up using the first four names, with P1G and Ipsam emerging within the past ten years.

Consumers of pork were employed in a range of jobs, from businessmen and doctors through to drivers, security guards, and builders. Consumers of pork, particularly those in urban areas, did all have a small amount of disposable income and were often being paid on a daily or monthly basis. With a vast number of urban inhabitants consuming pork, butchers have supplied the demand by starting pork joints. These in turn have become valuable enterprises. All butchers reported to sell a large quantity of pork particularly on Friday nights and the weekend where most butchers expected to sell between 50-100kgs of meat a day[17]. Across the pork joints, leftover meat was described as rare and any pork that was not consumed on the day of slaughter was always sold by the following morning.

Figure 30. Eating a plate of fried pork. Photo by author.

[17] On weekdays this number was reported as being between 30-50kg of meat a day.

Figure 31. Roadside barbeque and pork skewers. Photo by author.

Pork Butchers

Roho was visibly proud of his newly established pork joint. By mid-morning, he could often be found perched on a wooden stump directly outside its doorway, a place from which he could easily greet passersby and potential customers. The structure of Roho's pork joint was made entirely of corrugated iron and was lodged in an alley behind Owino, Uganda's largest open market. Lines of maize grinders flanked the entrance and the machines churned permanently, covering the surrounding paths, buildings, and people in a bright white, maize husk residue.

Inside the space, a previous store for chicken food, it was cool and dark. Minute holes covered the ceiling and let beams of light fall in specific areas. The floor was made of compressed mud and Roho had assembled chairs and a long table to run through the centre. At the back of the room there was an open fire surrounded by bricks and slanted skewers of cooking pork. On top, three large frying pans were precariously placed full of pork and spitting oil.

Roho worked continuously preparing plates of meat often accompanied by a side salad of chilli and onions coated in lime juice and salt. Without electricity, Roho could not work late into the night and he left every day at exactly 9pm. One evening he explained how he was afraid a thief could easily target him in the dark, taking everything as one had done once before.

This was the second pork joint that Roho had owned. The KCCA had closed his first within six months of its opening. As Roho claimed:

> They came and destroyed my business completely. I had no compensation. I had to rest for four months, collect capital again and now I am back. They sometimes come down here to inspect, two or three people. I give them some beers and 2kg of pork [to eat for free] and then they leave again. I do not pay them I feed them. If you refuse they just close you down, so it works for me. They could close your business that day otherwise.

Throughout all the pork joints in Kampala, butchers would commonly discuss bribing the KCCA, whether through pork, alcohol, or money. Like Roho's comment, other pork joint owners suggested that having your pork joint closed was more of a sign that you had not been bribing well as opposed to having food safety or hygiene issues. With bribing described as largely inevitable regardless of a butcher's quality of meat, it had become a skill that, aside from cutting pork, butchers had to develop in order to maintain a successful business.

With the rising demand for pork, butchers like Roho would often claim that pork joints were the best business for making 'serious' and constant money. As Roho remarked early one Saturday morning, 'I love this business. I have no plan at all to leave it. I want to promote my business get a better place and grow rich. I need more capital but I will make it. I keep being knocked down but coming back stronger'. As he spoke, a young man came up the alleyway towards him. He joked with the customer as he cut and bagged a kilo of pork and then he continued, 'I make so much money. I can survive so easily. I have a wife and a two-year-old child. I never rest. I work every single day from 8am-9pm. I have two machetes though and I change them every other day'; he laughed, 'it [the machete] rests more than me'. Unlike on the farms where pigs were frequently described as covering specific costs such as health bills and school fees, money from pork joints was described as being constant and providing a higher quality of living. With a constant flow of customers, cutting pork was therefore framed as a way to cultivate a future that was financially stable for butchers as well as their families.

The majority of the butchers I visited had to work constantly from morning to evening, often seven days a week. The potential money to be made meant that I never heard a butcher openly complain about the intense or long hours involved in owning a pork joint. This was the case with Mama Zawadi, a butcher who worked in a place colloquially known as 'Soweto'. Soweto straddled Uganda's main railway line and either side of the tracks, houses, bars, shops, and butchers had been packed into tiny pathways. Outside competing tunes of hip-hop, R&B, and gospel boomed from an assorted size of speakers. Every Tuesday a clothes market was held and the already congested alleys became blocked with sellers, tarpaulin sheets, and bundles of second-hand clothes.

I first met Mama Zawadi, one of two female butchers who I visited in Kampala, five months after the death of her husband. Mama Zawadi insisted on always wearing a white chef hat and a matching apron. Every weekday between 9-10am, a trader [traced back to Kasozi's informal slaughterhouse] brought 40kg of pork in a bag on the back of his *boda boda*. Mama Zawadi explained how she always got the blue stamped meat, as, 'If you get the meat without a stamp they will arrest you and close your butcher'.

The interior of Mama Zawadi's pork joint was painted bright orange and the glass window, which had recently been installed, had cracked leaving her hanging meat exposed. Immediately behind the window, Mama Zawadi strategically hung larger chunks of meat while placing pre-cut smaller chunks of pork on a flower patterned vinyl tablecloth. Once the customers had selected their pork, she fried and roasted it directly behind where it was cut. A brick chimney had been built but, like Roho's butcher, the space was permanently filled with a smoky haze. In the small adjoining eating area, rats ran along the wooden slats in the roof, small kittens snaked between the feet of customers, chickens pecked at the crumbs on the floor and two dogs often lazed in the doorway.

During the day, Mama Zawadi worked alongside two young men who she had hired to work for her. One she had employed for a year, while the other for a little over four months. Mama Zawadi and the men took it in turns to work from 7am until 11pm. Because of the late nights and because she did not entirely trust the men with money, every afternoon Mama Zawadi gathered two blankets and slept under the pork counter, next to a pile of cabbages.

Mama Zawadi and her husband had become pork butchers after finishing secondary school and had developed the pork joint together in Soweto for over eight years. As she explained, 'We came to Kampala to look for jobs and then we made our own pork business. We started selling 2 or 3kgs [of pork] a day. Now on the weekends I can sell up to 80kg. I make money. That is why this is the perfect business'. Since her husband's death, Mama Zawadi had continued to work at the pork joint every day. She commented, 'My husband died from a liver problem. He was thirty-two years old. The hospital said he was drinking too much Ugandan *waragi.* He started drinking *waragi* like that when he started cutting the pork and people in the pork joint were always drinking'.

Throughout the day, the chairs at Mama Zawadi's were constantly full. Customers inside her pork joint were predominately male and by midmorning, most would have already started drinking sachets of *waragi* or bottles of beer. Occasionally women would come, usually with a man who would buy them a beer and a plate of pork. As Mama Zawadi once remarked, 'Mostly men are here, ladies don't want to use their money for pork. All the women who come here are with a boyfriend. There are very few women that will eat pork at a pork joint alone'. Mama Zawadi's comment echoed my observations, in which women were often present in pork joints and yet it was rare not to see them accompanied by men. Moreover, it was typically men who would buy fresh pork and take it back to their wives to cook at home. Thus, while it was not just men who ate pork, it was typically men who selected and bought it.

Since the death of her husband, Mama Zawadi had sent her two children, aged sixteen and twelve, to live with her mother in Mbarara, a district in western Uganda. In Mbarara, Mama Zawadi and her late husband had invested their money from the pork joint into a ten-acre *matooke* (plantain) farm. Mama Zawadi asserted, 'I use the money from the pork and put it back into the farm. If the *matooke* is not going well then the pork joint saves everything. The pork joint definitely makes more money than the *matooke.* The pork joint is much easier to maintain, makes more money and you are in control.' For Mama Zawadi, the money from pork directly supported her children, her mother and her *matooke* farm. She acknowledged that she had to send her children to her mother in order to work longer hours in Kampala but that the money she earned was providing her family with long term opportunities, education, and land.

Mama Zawadi was explicitly aware of the gendering of butchery and cutting meat. She noted how most of the butchers were men and that butchery was considered to be a 'man's job'. She claimed that some customers could not believe that she would cut the meat or question whether she could cut meat as well as a man. As she explained:

> Customers come and say this woman will not cut good meat, where is the man? – But the man is not here. I now have to do a job that belongs to men but there is work here to be done and I need the money. I cannot just ignore money when it is right here waiting because I am worried that people will make a fool of me. My husband taught me how to do it. Now he has died. I have no choice but to cut the meat.

Although some customers mocked Mama Zawadi for cutting meat, her pork joint was always full and her meat was never leftover. Selling pork economically empowered Mama Zawadi and this access to money and the opportunities for her family altered how she perceived the gendering of roles for women in urban Uganda. As she remarked, 'Cutting pork is fine, women are even riding motorbikes now. Things are changing in Kampala'.

Customers, Taste, and Preservation

Amongst all the butchers I worked with, the amount of money that could be made through owning a pork joint was a regular topic of discussion. In order to ensure the maximum amount of sales, butchers had to provide their customers with a particular taste. Customers determined what pork would taste like based on the appearance of the meat. This meant that if meat did not look 'tasty', then customers would pay less money or reject the meat entirely. This became clear when I observed a customer inspect his freshly chopped pork and assert, *'Nedda sebo* (no mister) this piece is too red'. Conversely, meat that looked good was always pink, without abnormalities such as lumps, and had an equal balance of fat and meat.

The appearance of the meat was central to assessing how pork would taste. This was why the butcher would first assess the meat when it arrived from the slaughterhouse and then the customer would assess the meat before it was sold. There was, however, a point late in the evening in which a lack of light combined with alcohol consumption, meant the customers would not be as concerned with how their pork appeared. It was at this point in the night in which 'low-grade' pork was often sold. As a butcher in Bukoto remarked, 'That meat that is the wrong colour, you can only sell it in the middle of the night'[18]. The butcher's comment indicates that all meat could be sold but that butchers attempted to limit the visibility of aesthetically displeasing meat.

When selecting pork, Ugandans would comment on their desire for 'sweet'/delicious meat. As Yates-Doerr and Mol observed in Spain, butchers believed that the consumers of their meat could taste from the flavour whether an animal had 'lived well' (2012: 51). In Uganda, rather than signalling that a pig had 'lived well' the sight of pork was used to determine the quality of the meat and the health of the pig prior to slaughter. In order to sell quality meat, butchers had to assess whether the meat was 'sick' and in turn not 'sweet'. In

[18] During my fieldwork, bright blue pork was circulating in Kampala. What caused the blue meat was unknown but ILRI veterinarians named this phenomenon, 'blue pork syndrome'. Butchers claimed that they would sell blue pork but only ever in the 'dead of night'.

America, the industrialisation of livestock production means that the 'industrial eater' has little knowledge over animal husbandry and welfare (Weiss 2016). In turn, local, pasture raised meat is becoming increasingly desirable (ibid). Unlike in America, in Uganda the vast majority of pigs were produced on local, smallholder farms (chapter one & two). Ugandan customers were, nevertheless, concerned with the breed of a pig, with many people claiming they preferred the pork produced from a local breed. This was because customers, like farmers, believed local breeds were less likely to suffer from diseases. This resistance to disease, in turn meant that farmers were more likely to have left local breeds to free-roam, meaning that local pigs had a diet full of fresh vegetation. This diet, customers claimed, resulted in tastier pork that consisted of equal measures of fat and meat.

Pork was not only described as having a specific taste but also a specific texture. As a customer once explained in the presence of the butcher, 'This man knows how to make it [pork] delicious. It is the soft taste of the meat that makes a good pork joint'. Within pork joints in Uganda, consumers often claimed that pork was sweeter and softer (*egonda*) than other meats. Whyte similarly describes Ugandans' desire for soft food in her case study of food and HIV (2014). In her account, individuals desired 'soft food' – such as *matooke*, rice, or Irish potatoes (ibid: 207). These food items, described as 'cosmopolitan', were linked to an increased commodification of food, particularly in urban areas (ibid: 212).

Drawing on this distinction between hard and soft food, my interlocutors described pork as a 'sauce' (*enva*) and maintained that sauces always had to be soft. Pork could accompany 'hard food' (*emmere algakuba*), like millet, cassava, or maize or 'soft food' (*emmere egonda*) like sweet potato, *matooke,* or rice. For my interlocutors, particularly those who were farmers, hard food was often linked to strength. As one pig farmer claimed, 'If you eat soft food and you dig then you'll be hungry in an hour'. While pork could be eaten with both soft and hard food, the more food that pork was accompanied with the more it was considered to be a meal. For example, the combination of pork, pounded maize (*posho*) and cabbage was considered to be a complete meal, while a skewer of roasted pork on its own or with a side salad was considered to be a snack. Regardless of how it was prepared and eaten, pork itself always had to be soft.

In order to demonstrate to customers that their meat would taste sweet and soft, across all the pork joints it was imperative that butchers made their meat highly visible. Accordingly, pork was always hanging in the window or the open hatch of the pork joint. Butchers would often comment on the display of pork and how it would appear and appeal to customers. As a butcher in Ntinda remarked, ‘If you try to hide the meat from the window then no one will come to the pork joint. You have to have it out’. This meant that even in pork joints that had electricity and refrigerators, butchers would still place their meat in open windows. This need to have meat on display also meant that fly nets, previously distributed by ILRI, had been taken down with butchers complaining that nets obscured customers view of the meat. Butchers instead had developed techniques that would ensure that the meat could be kept hanging and looking fresh for as long as possible. This included rubbing salt into the pork or smoking the meat as soon as the traders delivered it. As a butcher in Mukono central explained, ‘If the meat has to hang for more than one day we put salt on it and hang it outside. This makes sure that the meat gets fresh air. It will not smell if it gets fresh air’.

The practice of hanging meat attracted flies and most butchers argued that when working around meat, flies would always be present. As a butcher in Nakawa observed, ‘Where ever there is meat there will be flies but too many flies are bad for the meat’. An abundance of flies, especially certain types of flies such as the ‘blue ones’, found in toilets, were observed to spoil the quality of the meat. As Adapon (2008: 56) observed during the slaughter of a lamb in Milpa Alta, Mexico, people said that any presence of flies could ruin the meat as they caused a ‘bitter flavour’. While in Uganda, flies were not described as directly affecting the taste of pork, they highlighted to the customer whether the meat was spoiling. As a butcher in Goma, Mukono commented, ‘The flies come when the meat has stayed for a long time. The longer meat takes to sell there is a higher chance of many flies’. As another butcher in Mukono central stated, ‘Flies like bad smelling things. It is not good for customers to see flies on the meat because they might think that the meat is bad’. Butchers were therefore aware of what the presence of flies meant in terms of the quality of their meat. As a regular customer at Mama Zawadi’s pork joint claimed, ‘If I saw many flies then I would know the pork was dirty’. Similarly another customer in Mukono central claimed, ‘I went into one pork joint and the meat was covered in flies and because of them the meat turned brown’.

Butchers had to keep meat hanging where it could be seen by customers while also preventing too many flies from landing on the meat. This was why many butchers worked in a smoky environment. The first time we visited Roho’s pork joint, he stated that he did not really need windows or a chimney. However, despite the small holes in his ceiling, his pork joint was constantly filled with an oppressive amount of smoke. When the meat was cooking, it was difficult to breathe and everyone’s eyes began to itch. Acknowledging that some people complained about the smoke, Roho claimed that it was positive as it ‘chased the flies away’. He elaborated, ‘Flies and meat go together but the smoke is good for keeping the flies away, if there are too many flies they start to annoy the customers but if you hide the meat then no one will come [to the pork joint]’. As stated previously all meat would sell but any abnormalities in the meat could potentially cause it to sell at a lower price. Butchers were therefore caught between displaying quality meat in order to attract customers while also ensuring that their meat did not spoil.

This focus on producing visually pleasing meat suggests why when there were abnormalities in pork, butchers would cut them out, sell the meat for substantially less, or sell the meat very late at night. As a butcher in Bukoto once stated after I showed him a picture of *T. solium* cysts in meat, ‘I have seen pork like this but we just cut it off and threw it. I think it happens when the injection of medicine doesn’t work and it gets stuck in the meat. I don’t think it would taste nice to eat so that is why we throw it’. Another in Goma, Mukono commented, ‘People will not buy that part if you hang it here. When you cut it a lot of water splashes out, people will not want to eat that’. While in response to the same picture another butcher in Mukono central claimed, ‘I have seen pork that is very red and there will be lots of clots on the meat. There was one day I bought a pig and it had those clots. I didn't sell that part though. I just cut off that part...The rest of the meat was sweet'. From these accounts, it is clear that rather than aesthetically displeasing pork simply not selling, visible abnormalities in meat could have long-term effects on the butchers business and the way in which customers imagined their pork would taste. Ensuring that pork was pinkish in colour and was without obvious abnormalities was in turn valuable for butchers. Butchers in turn strived to provide this type of pork in order to make money and sustain their livelihoods

From these observations, it becomes clear that consumers defined what would taste good based on how it looked. Throughout Ugandan pork joints, consumers were involved in a requalifying process, assessing what counted as quality meat (cf. Foster 2008: 7). This meant that judgments of taste were based on judgements of sight. These judgments filtered back into the supply network, with what customers chose to eat affecting slaughterhouse practices (chapter three) as well as the way in which meat was marketed and sold from butchers. As will be discussed next, people demanded a particular quality of meat because aside from tasting delicious, many consumers believed pork could cultivate a healthy human body.

Pork as Medicine

Off the shores of Katosi in Mukono and a short walk from Mama Ajiyo's pig farm was a locally renowned pork joint. The owner of the business, Daniel, had been given the nickname 'Doctor' and had owned the same pork joint for over seventeen years. The inside of Daniel's pork joint was completely wooden, with cracked beams as a floor and a low iron ceiling. Bundles of chillies were drying from the roof and customers picked at them freely (Figure 32). Outside, where the pork was cut, Daniel also collected a pile of pork fat. One afternoon as we chatted about his pork business, Daniel commented, 'Once in a while someone will come and buy all the fat for cooking oil, for strength, or for measles.'

Figure 32. Daniel's pork joint. Photo by author.

Like Daniel, every butcher I visited commented on the medicinal qualities of pork and in particular its *amasavu* (fat). Food has traditionally been used as a medicine with certain products considered as integral to people's health and healing (Caldecott 2011; Jennings et al. 2015). Healing foods are, however, often discussed in relation to medical traditions, most notably Chinese, Ayurvedic or Greco-Islamic (Chen 2008). Often these studies are limited to medicinal plants, spices, and herbs.

While there is an abundance of literature on the taste and texture of certain foods and the effect of this food on human bodies, there is less on the medicinal properties of meat. This could be because over consumption of fatty meat is often depicted as unhealthy for human bodies, contributing to rising obesity levels and non-communicable diseases (Kearney 2010; Malik et al. 2013). The way in which fatty meat can be conceptualised as both a positive and negative part of an animal's carcass is clear in other research conducted by anthropologists. In Uganda, the fat of pork was often used as oil. As Susan Reynolds Whyte documents in Eastern Uganda, her interlocutors believed food fried in oil was a luxury, as it tasted better and satiated the body more than boiled food (2014: 154). Despite public health officials' concern regarding oil consumption and non-communicable diseases, Whyte asserts that oil was understood as *obutu* 'the nice little thing' (ibid). Brad Weiss similarly illustrates people's desire for fatty, oily foods and how in the American South, the quality of a pig's fat indicated how the pig was reared. In one of his interviews, a chef articulated that he was 'looking for a pig with some fat on it' (2016: 198). For the chef, pork fat had a specific taste, which was a sign that the pig had been reared locally as opposed to on an industrial farm.

In converse to this desire for fat, Gewertz and Errington claim that 'no one grows a sheep for its [fatty] flaps' (2010: 12). In their study on fatty lamb and mutton flaps throughout the Pacific Islands, Gewertz and Errington demonstrate the politics of how meat travels, with cheap flaps being transported away from Australia and New Zealand and 'dumped' into the Pacific Islands. While some under-nourished individuals, particularly in Papua New Guinea, considered the lamb flaps to be a nutritionally dense snack, others in Fiji blamed the flaps for their obesity crisis and rise in chronic diseases. This subsequently led Fiji to ban the sale of flaps in the year 2000 (ibid).

Pork fat in Uganda did not have the same origins as the fatty flaps eaten throughout the Pacific Islands. As carcasses were produced and sold in Uganda, there was no distinction between better and therefore more expensive or fatter and therefore cheaper cuts of meat. Instead, pork fat, like pork meat, was described by consumers as a desirable product. As Daniel once commented, 'People like the fat and oil so much. Sometimes they come specifically for the fat and then they fry it to make oil and then cook in that sauce'. Consequently, under or at the edge of many butcher counters there was a pile of fat for customers to come and buy. The demand for pork and pork fat was attributed, in particular, to its ability to fashion a resilient and healthy human body. As Mama Zawadi asserted, 'When you eat pork fat you will rarely fall sick. Whether it is malaria, typhoid, or even HIV the body will be too strong to be attacked'. Similar explanations were multiple and every butcher and their customers had their own theories as to how pork fashioned a healthy body. As a *boda boda* driver at a pork joint in Mukono central claimed, 'Pork fat is medicine. Sometimes I will eat the fat when I have a cough because it softens the chest. The fat gives you energy. It can even cure the diseases you don't know are there'. A shop owner in Kampala similarly remarked, 'My parents liked to use the pig fat like an oil, if we had a skin problem or illness they would smear the pig fat on our arms or wherever there was a problem'. The medicinal power of pork and pork fat was therefore its ability to cultivate visually healthy bodies. This could even occur without an individual being diagnosed with a specific ailment.

A widely discussed way in which pork fat healed the body was in relation to alcohol consumption. When alcohol was consumed, pork fat was considered to transform drunk bodies back into sober bodies. Alcohol consumption was widespread within pork joints and beverage choices ranged from spirits to lager to locally brewed millet beer. Alcohol was not just consumed by customers, like Mama Zawadi's late husband, butchers would also drink during the day. Roho, for example, would often have a bottle of the beer 'Nile Special' perched next to the chopping board. He joked, 'Pork goes with alcohol perfectly. Everything that Muslims call evil go so well together. You know evil goes with evil'. As he finished one of the customers interjected, 'You just can't eat pork without a drink'. Aside from the complementary taste of pork and alcohol, alcohol was also thought to cut down the fat of pork. This had two benefits. One, consumers did not think they could gain weight if they both drank spirits and ate large quantities of pork. Two, pork fat was thought to absorb alcohol, which allowed for continual drinking. This meant that customers could drink more alcohol without becoming inebriated. As a teacher in Bukoto clarified, 'Pork combines well with alcohol, the meat neutralizes the alcohol. It balances the equation so you can't get drunk'.

As pork fat was thought to absorb alcohol, some customers specified that their meat should be undercooked. This was attributed to the fat of fully cooked pork dripping off and therefore being unable to fully 'neutralize' alcohol. As one of Roho's customers explained, 'The fat reduces a hangover. If you roast it fully then all the fat will drip off but with the half roasted the fat remains and it sucks up the *waragi* in your stomach. With half cooked you will become sober in a minute'. Half cooked pork was never considered to be an infection risk but instead a positive way in which individuals could cure hangovers.

Aside from reducing the intensity of hangovers, throughout Mukono (significantly not Kampala) pork fat was also used as a medicine for 'measles'[19]. As Daniel once explained, 'Pork cures measles. If you have measles you take a small, small amount of fat. You can cook it in soup or you can spread it on the skin. I do not know how it works but even my grandparents were doing it. It worked for me and for many of the children here'. He continued, 'If you walk around here everyone will tell you pork fat cures measles. Everyone has to have measles and most of the time children get it. It doesn't make you die but people want to get it over as quickly as possible and the fat helps you do that'. The function of pork fat was that it made the skin soft and this allowed a rash to come out on the skin. As a pig farmer and customer of Daniel's clarified:

> Yes, pork fat cures measles. It is because the fats of the pork transfer all over the body. That makes the body very soft. When the body is soft the measles are able to come out. Lots of fat loosens the stomach and you have diarrhoea, once you have diarrhoea the stomach becomes even softer. The problem with measles is it causes a lot of heat inside the body so when the pork fat makes the body softer all the heat has to come out and that lets the measles come out easily. If you retain the hardness and the heat then you will become very sick.

With no specific treatment for measles, it was important to ensure that the sickness did not remain trapped in the body of the child. As a butcher in Goma remarked, 'Pork fat does cure measles very well. When you give the child a drop of fat, very quickly it will come out on the skin. It is because the fat is very smooth and can be turned quickly into a liquid. The liquid spreads through the body quickly. Most people are sure it works'. Throughout Mukono, pork fat was seen to negate the possibility of a child developing a serious complication from

[19] There have been national measles control strategies in place in Uganda, including routine immunization and mass vaccination campaigns for children aged 6 months to 5 years (Nanyunja et al. 2003). Many people in Mukono discussed 'measles' but this word may have been used interchangeably for chickenpox based on the symptom of body wide rashes in children.

the result of measles. Thus, whether used to cure skin rashes, reduce hangovers, or soften the bodies of children infected with measles, the properties of pork fat were believed to act upon and transform sick bodies.

HIV and Slim Bodies

The ability of pork fat to transform sick bodies suggests why pork as a product was so valuable and why pork joint businesses, as described above, were so lucrative. While pork was perceived to treat a range of ailments, it was pork's ability to manage HIV/AIDS that was cited as a particular driving force behind its expediential growth. As Daniel once observed, 'My pork business is always going up. I started with a much lower price per kilo and now it has gone right up. Pork is delicious and it brings down the power of AIDS. Here so many people are suffering from HIV and they are eating my pork a lot'.

Daniel's pork joint was in Katosi, a site that like Ugandan fishing villages in general, has been recorded as having significantly higher rates of HIV than the Ugandan average (Kiwanuka et al. 2014; MoH 2011). The complications, secondary infections, and deaths from HIV/AIDS were subsequently a regular topic of conversation throughout Katosi and many village members I met were quick to disclose their HIV positive status. It was within Katosi pork joints that I first heard the connection between pork consumption and HIV and it was also the place in which people first discussed living with, caring for, and feeding their virus. From subsequent conversations throughout Kampala and Mukono it became clear that eating pork was less about surviving a fatal illness and instead on living with a healthy body that could be shared positively with a virus.

By the year 1987, Uganda was recorded to have one of the worst HIV epidemics in the world (Thornton 2008; Whyte 2014). Uganda was the first place in which the African HIV/AIDS epidemic became visible and in response the government, led by Museveni, adopted a swift, open and progressive approach to the outbreak (Setel et al. 1999). Despite successful HIV prevention programmes throughout the 1990s and early 2000s, an HIV positive result was still indicative of rapid death. It was not until 2003 when anti-retroviral drugs (ARVs) first became widely free throughout Uganda that accounts of HIV survivors and 'second chances' began to circulate (Whyte 2014). ARVs have since been described as giving people a second chance or bringing people 'back to life' (ibid). However, with increased access to ARVs people expect to have fulfilling and long lasting lives, not just to survive. In this shift away from simply surviving towards living a long and healthy life, pork consumption has become vital.

There is a well-established link between managing HIV/AIDS and eating a particular and balanced diet (Whyte 2014). This is evident in a study conducted by Rödlach (2011) in Bulawayo, Zimbabwe. Rödlach illustrates how people perceived food insecurity and a lack of traditional food consumption to lead to an increased amount of sickness and rising HIV rates. He observes how people with HIV were not considered to develop AIDS if they had access to and consumed traditional foods, such as indigenous beans, grains, and tubers. This was because HIV positive individuals believed traditional foods would boost their immune system and even individuals with AIDS could recover if they committed to changing their diets (ibid: 227). This link to eating certain types of foods to prevent the onset of AIDS and strengthen the body was central to why HIV positive individuals chose to consume pork throughout Mukono and Kampala.

With pork consumption considered to be integral to managing HIV, informants would also regularly state that eating pork was central to the advice being given by doctors. As a female shop owner in Kampala remarked 'The doctors advise someone who is sick to eat half a kilo of pork every day'. Despite plenty of similar claims, when I asked a doctor in Mukono about the link between HIV and pork consumption he replied, 'it's a myth', before moving on to another topic. A counsellor from the nutrition programme at 'The AIDS Support Organization' (TASO) echoed the Mukono doctor's dismissal of a positive association between pork consumption and HIV.

When I first discussed pork at TASO, the counsellor immediately started laughing. He commented on how the link between pork joints and HIV/AIDS had become so strong that he had found pork joints in the east of Uganda named 'TASO'. 'That is how strong the association is between eating pork and HIV, pork joints are becoming HIV clinics!' he exclaimed. Yet, the counsellor continued:

> At TASO, messages are given regarding positive living. In terms of nutrition we give information on eating a balanced diet, which for our clients seems to translate into eating a lot of proteins. The clients come with that belief that if I eat a lot of proteins, especially pork, then I will be healthy. Out in the community pork is seen as an ideal meal for people with HIV. I think it is because pigs look so healthy. Clients think if they eat pork they will look as healthy as the pig. They want to grow fat and healthy like the pig.

In Uganda, pork was perceived as a way in which to prolong life, gain strength, energy, and to retain a 'healthy' appearance. As Farquhar argues in relation to Chinese medicine, there is a connection between the experience of the flavour of a food and the experience of a bodily change (2007: 294). This is reflected, for example, in a study by Pieroni et al. (2007) in which Pakistani migrants living in Bradford used 'bitter' vegetables and in particular Karela (bitter melon) in an attempt to offset sweetness and thereby control or potentially cure diabetes.

Throughout Mukono and Kampala, the eating of pork was not directly medicinal but pork consumers similarly believed that pork consumption generated specific bodily changes. As one butcher explained, 'Most people who have HIV want to eat the liver or the fat. They have a vision of becoming fat'. Many of my interlocutors similarly associated eating pork with creating a healthy body as opposed to a 'slim' body. In Uganda, HIV is commonly referred to as slim or *siliimu*, a Luganda name which originated during the first outbreak of HIV/AIDS. During this period, victims were observed rapidly losing weight before dying (Thornton 2008). While Thornton in his discussion of the term questions whether *siliimu* can be considered a direct borrowing from the English word slim (ibid: 117), informants throughout Kampala and Mukono used the two terms interchangeably. Moreover, the term was used in relation to people's bodies and the appearance of the body. Thus, whether or not the word *siliimu* was derived from the English word slim, the term has now come to represent a certain type of thin and wasting body.

Whilst ARVs have been discussed as making HIV patients appear 'heavier' and 'stronger' (Whyte 2014: 196), many of my informants attributed their weight gain to pork and not pharmaceuticals. This use of pork as a way in which to cultivate a certain type of body led into discussions over whether pork itself was a component of ARVs. As a butcher in Kamwoyka inquired at the end of an interview, 'ARVs are made from pork, right?' Or as a *boda boda* driver in Kiwatule claimed, 'They say even if you spend a month not taking ARVs but eat pork then you don't get any symptoms. It is because pork is like an ARV'. Pork as a type of ARV was also repeated by the counsellor from TASO, yet he observed, 'There is an idea that some of the earlier ARV trials were tested on pigs. Some people think that the medicine has been contained in the meat and is in small amounts in the pork. Still, I have never had a client openly claim to stop ARVs in favour of pork'. The fact that pork and ARVs were used together to manage HIV was why a range of prices in pork was considered to be so important. With pork perceived as a way of living with HIV, HIV positive individuals needed regular and cheap access to the meat.

The accessibility of pork for urban individuals despite limited income became clear after finishing work one morning at Kasozi's slaughterhouse. After cleaning, Kasozi took me on a ten-minute walk out of the valley and towards the main road back into Kampala city centre. We reached a vast, muddy clearing with two women under a large eucalyptus tree. I had met the women earlier at the slaughterhouse, there they had been busy collecting organs and body parts to cook and sell on as street food (Figure 33). One of the women, Safiya, had been working on the plot of land every day for three years. That morning she was cooking legs, head, and liver with prices ranging from UGX 500-1,000 (11p-21p). She was also preparing *matooke* and beans. Safiya started cooking at 10am and finished serving by 4pm. However, as she had to first collect the pork from the slaughterhouse, Safiya started her day at 6am. Asking why she did not build a structure to cover her as she worked, Safiya stated:

> We used to have a small area but KCCA came and destroyed it and now we are forced to cook outside. They say they want development in the city, that they will arrest us for doing our job. They said they wanted a proper building and they gave me three days. Then a team of them came and kicked it down. Now I work outside. They improved nothing they just made it worse.

Safiya continued, 'Most of our customers are drivers, security guards, builders they all come. The way we cook it is much better than the pork joint. These parts are so cheap. *Nyama* (meat) is expensive to eat every day. At the most expensive our pork is UGX 1,000 (21p) and almost all the people can afford that price'. In her account of food and HIV/AIDS, Whyte observed that eating enough food throughout the day was difficult for her informants. She contended that the medical advice of eating a balanced diet merely put HIV positive individuals' poverty into sharper relief (2014: 203). Safiya, on the other hand, believed that her cheaper prices meant that her pork was widely accessible and not confined to a wealthier section of society. Nevertheless, Safiya's customers despite not being wealthy did all have jobs in Kampala. This meant that there was an overlap between earning money, eating well, and cultivating a healthy body.

Figure 33. Safiya cooking pork, *matooke*, and beans outside. Photo by author.

As Safiya prepared the food, men started to gather and together began to discuss why they enjoyed eating pork. As one builder remarked, 'I have HIV and I am living but I still worry about dying. Now it is eating pork that brings me happiness and hope that I can carry on living'. He continued, 'I eat pork while also taking the drugs, the food adds more than the drugs but you have to take the drugs too. People who are infected know the pork is keeping them alive because people who take the drugs without eating pork die'. Similarly, the ability of pork to help the body in recovering from the side effects of ARVs was frequently discussed in relation to pork consumption. As Safiya herself claimed, 'Most of the people with HIV use ARVs. ARVs make you weak but if you eat pork then you do not feel sick. So you can walk, talk, and take your ARVs if you are a pork eater. If you don't eat pork then you be sleeping all the time'.

The combining of ARVs and pork was not only confined to the pork joints of Kampala. In Mukono town, a pork customer similarly argued, 'For twenty years I have been with HIV and I'm alive because of pork…Yes, I take the ARVs too but when they change, the pork always helps your body to recover'. Thus, for many customers at pork joints, pork was complementary to taking ARVs. While pork was described as creating bodies that no longer suffered from *siliimu,* this was not because of over consumption. Instead, pork was considered to cause actual bodily changes. Consuming pork was not just about preventing a slim body but about cultivating a body that could live with (*kubeerawo*) a virus contained within it.

Living with HIV

All the HIV positive customers I spoke to in pork joints framed pork consumption as an integral part of life when living with HIV. While all informants claimed to use ARVs in conjunction with consuming pork, pork was framed as the real reason as to the increase in their health and well-being (*obulamu*). As a bus driver once explained, 'When you are diagnosed they teach you to not think of the virus as a bad thing inside of you. You start to think positively'.

Accounts from Zimbabwe similarly highlight how counsellors encouraged individuals with HIV to conceptualise the virus as something they have to live with for the rest of their lives (Rödlach 2011: 223).

In Uganda, pork has been incorporated into a world in which people have to learn to live with and care for their bodies in order to prevent symptoms and signs of a virus. During discussions, people recognised and described the HIV virus as part of their body. This meant that the consumption of pork transformed the body of the virus with a satisfied virus generating the appearance of a healthy human body. As a farmer in Mukono explained, 'Pork is very special. It is different from other meats. Pork even reduces the effect of *siliimu*. I think if you eat the meat then you still have meat in your stomach so then the virus is never hungry. I know very many people who eat pork for that reason'. Pork consumers would often describe how they fed the virus pork, with the virus eating the meat before the human body. This was also considered to be an important function of pork fat. As a butcher in Mukono central noted, 'Fat is important, it reduces the power of AIDS in adults. HIV eats the fat of the pork inside the person. When there is a lot of fat in the body you can live happily because the virus will eat the fat not the flesh directly'. As another female shop owner in Bukoto established, 'When you eat pork, the virus eats the fat of the pork first so then it doesn't attack the body. The body stays strong and you don't become slim'. People did not only describe pork being eaten by the virus, they also claimed that pork made the virus sleep. As a fisherman in Katosi commented, 'Pork makes HIV sleep and that means very many people with HIV are still able to remain strong'. Through these claims, my interlocutors illustrate the ways in which people were conceptualising the virus as a living entity within their body. Keeping the virus in balance was therefore important and without pork, the virus could 'wake up' or grow hungry. This in turn would lead to a slim and therefore sick human body.

Pork consumption was a way of balancing the life of the individual with the life of the virus. If the balance between the two lives was lost then the human body could develop AIDS. As a butcher in Mukono town explained, 'They say pork stops AIDS. If you have that virus in your body then pork fat will thin it. I have a younger sister, she is sick with HIV but she eats pork every day. I take home half a kilo every day and if you see her it is like she is healthy'. A butcher in Ntinda made an almost identical claim, stating, 'Eating pork means that you don't get AIDS. My customers say that the fat gives you energy and that means that it is difficult for the virus to overcome your body'.

Pork was never described as a 'cure' for HIV but instead a way to reduce the 'power' of the virus. This meant that pork could and should be consumed continually for long periods of time. As a butcher in Mukono central argued, 'I have been positive for four years and pork reduces the symptoms of the virus. I don't get sick – ever – because it strengthens the white blood cells like soldiers who then fight against the HIV inside the body. I am alive because of this pork'. The metaphor of white blood cells as soldiers or warriors was mentioned across several pork joints. This metaphor was also mentioned by Meinert and Siu's informant, Robinah, who described how her, 'body defence soldiers (CD4 count) were only 2' (Meinert in Whyte 2014: 29). Whilst Robinah started ARV treatment and credited biomedicine for her return to health (ibid), throughout pork joints dramatic increases in CD4 counts or long lifespans despite being HIV positive were attributed to pork consumption. In another account, Rebecca Marsland (2012) noted a similar association between CD4 counts and food. In Marsland's research in Tanzania, people connected the rise and fall in their CD4 counts to food and the social networks that allowed them to buy enough of the right kinds of food. When relationships failed and people could not access good food, they perceived their health to decline (ibid).

In Uganda, people claimed to have eaten pork for years in order to maintain a strong and healthy body. This meant that without pork, people believed they would have died. As a shop owner in Kiwatule remarked, 'Some people reach the end and are looking into their grave and then they eat pork and stop complaining. Pork develops cells very fast and the pork oil from pork fat collects the HIV virus in a single unit so it doesn't circulate in the body system'. Another HIV positive pork consumer, a mechanic and a regular at Mama Zawadi's pork joint, ate half a kilo of pork every other day for this reason. He stated how he had started eating this amount of pork since being diagnosed with HIV. One afternoon during a conversation over the increasing popularity of pork, he stated, ‘Pork is delicious. You do not need a fork to eat it because it is soft. It does not get stuck in your teeth. Everything about it is great. Even more, it stops *siliimu.* Ten years I have been with HIV. Pork keeps me alive’.

Pork consumption was a way in which to care for and to live positively with HIV. Pork strengthened the human body through changing the dynamics of the immune system and increasing energy within the body. These internal changes externally produced a human body no longer slim, a sign traditionally associated with the onset of AIDS. As a butcher in Ntinda concluded, ‘Pork gives you strength, you can’t be slim. Most people who are sick eat pork so you will no longer know which one is sick with HIV’.

Conclusion

During my research, many people in Uganda articulated their love for pork. In pork joints, consumers demanded a certain quality of pork that tasted soft and sweet. Meat was, therefore, not appealing if it was overly red or brown, with an abundance of flies, or with visible abnormalities. Butchers recognised customers’ demands and transformed meat into something that was marketable. This in turn generated lucrative businesses, sustaining butchers livelihoods and the lives of their families.

In this chapter, I have argued that pork joints were a particularly valuable business because consumers believed that pork consumption transformed sick bodies into healthy bodies. In Uganda, the networks of associations (Latour 2000) that made HIV real as a specific virus were well established. This meant that people across the pork joints enacted the HIV virus as a pathogen, a sign of which was a slim body. The high demand for good quality pork was because pork was considered to act upon the body, creating changes to both human bodies and the body of the virus. This allowed people to ‘live with’ (*kubeerawo)* HIV without it becoming visible through signs and symptoms on the outside of the body. Thus, through eating pork, Ugandans with HIV were healthy. This chapter illustrates that in Kampala and

Mukono, healthy bodies were not those without diseases such as HIV, but bodies that could remain healthy and strong despite sharing their lives with the lives of certain pathogens.

Chapter Six

Living with Worms: Generic Worms and the Human Body

While waiting for his family's three remaining piglets to fatten and to fund the rehabilitation of his brother, Hamna decided it was time to start selling the family's coffee beans in Kampala. Accompanying Hamna and myself as we picked the coffee beans were his two young daughters. His youngest, Suubi, continuously picked fallen mangoes off the floor. She tore a hole into the skin of the ripest fruit to suck the juice out, leaving only a shell of skin surrounding the stone. Hamna joked how with Suubi constantly eating things from the ground it was good that she was given free medicine for worms at school. He remarked, 'I think every person in the world must have *njoka* (generic term for worms) at some point because everyone eats raw fruits. If everyone has had worms, they can't be that dangerous. *Kituufu* (it is true)?'

Hamna's understanding of *njoka* was similar to many of my informants living within Mukono and Kampala. *Njoka* were conceptualised as a generic pathogen that was easily treatable and caused little damage to human health. *Njoka* were always cited as living within the stomach (*olubuto*) and were rarely described as dangerous or as presenting a threat to people's lives or livelihoods. Instead, during discussions, people would make comments such as 'worms can't kill you' or 'nobody ever dies from worms'. Worms that remained contained within the body, without causing signs or symptoms of sickness, were something that could be 'lived with' (*kubeerawo*). Nevertheless, living too long with worms could create problems in the stomach such as blockages and pain. This meant that despite not being depicted as life threatening, once worm infections became evident on the outside of the body they could no longer be 'lived with'. Accordingly, if people suspected worms, then they sought treatment, often the consumption of bitter products, which would purge their bodies and the worms contained within it.

Treatment for *njoka* was deemed to be quick, cheap, and effective and this meant that diagnosis for specific worms within laboratories was rare. In turn, doctors rarely identified or treated *T. solium* tapeworms (*enfaana*), which are often asymptomatic (Croker 2015)[20]. My interlocutors claimed that in order to only diagnose a worm, the process of providing a stool sample for laboratory analysis was overly expensive and in the majority of cases pointless. This meant that stool samples were rarely provided and the diagnosis of a tapeworm within laboratories was virtually non-existent. Instead, within clinics, doctors transformed worms into a generic pathogen that could be easily treated, often with a single dose of albendazole[21].

This transformation of worms into a generic category was further entrenched through the terminology used by international development agencies during Mass Drug Administration (MDA) programmes. International agencies have increasingly adopted MDA programmes to target the 'other', often neglected diseases cited within the sixth Millennium Development Goal (MDG)[22]. In Uganda, through observing MDA in practice, it became clear that specific worms became clustered under the umbrella term 'soil-transmitted helminths' (STH). This term refers to the infection of either or all of the following intestinal worm infections: *Necator americanus* (hookworm), *Ascaris lumbricoides* (roundworm), and *Trichuris trichiura* (whipworm), all three of which can be treated with a single dose of albendazole. MDA programmes have been promoted as a cost effective way through which to eliminate a host of neglected diseases, with advocates claiming that such interventions are capable of 'healing the world' (Sachs & Sachs 2008: x). However, in the case of *T. solium* in Uganda, MDA programmes reinforced that all worm infections were treatable with a single dose of albendazole.

During MDA programmes, children, particularly those that lived in close proximity to fresh water lakes, were treated with praziquantel for

[20] There are two single-dose options recommended for treating the pork tapeworm: Niclosamide, adults 2g once, children 50 mg/kg once, or praziquantel, 5-10 mg/kg once. Once treated reports suggest that the stomach should be purged with electrolyte-polyethylene glycol salt (EPS) to ensure that the scolex (head of the tapeworm attached to the bowel wall) is not retained and subsequently allowed to regenerate (García et al. 2003).

[21] An anthelminthic medication used for the treatment of a variety of parasitic worm infestations. In large-scale preventative chemotherapy without diagnosis, the World Health Organization suggests an annual 400mg dose for controlling soil-transmitted helminths.

[22] The sixth MDG aimed 'to combat HIV/AIDS, TB, malaria and other diseases'.

schistosomiasis. Praziquantel is also a treatment for *T. solium* tapeworms and therefore it has been suggested that TSTC control could be integrated with schistosomiasis control programmes (Braae et al. 2015; 2016). However, when infected with neurocysticercosis (NCC), praziquantel causes cysts to disintegrate and die. This potentially induces cerebral oedema, seizures, and severe headaches (Braae et al. 2015) [23]. For this reason, the WHO states that all treatment for TSTC with praziquantel must be undertaken in a hospital setting, with the co-administration of steroids recommended (Winkler 2012). As MDA programmes cluster worms into a generic category, the *T. solium* tapeworm as a specific pathogen would never be diagnosed prior to the mass use of praziquantel. Thus, MDA programmes would not only transform *T. solium* tapeworms into a generic infection, the drugs distributed could also potentially trigger seizures. As will be discussed in the next chapter, seizures without treatment were a sign of serious sickness. This was because seizures created uncertainty around people's pursuit of health, wellbeing, and life (*obulamu*) into the future.

Through observing treatment regimens across multiple spaces it became clear that worms were being transformed into a generic pathogen that could be cheaply treated through herbal medicine or a single dose of albendazole. Whereas Geissler in Kenya (1998), and Moran-Thomas in Ghana (2013), highlight the tensions between biomedical or humanitarian worm eradication programmes and local understandings of worms, I conversely illustrate how local and biomedical understandings aligned to transform worms into a generic and easily treatable sickness. This meant that pig supply chain actors, doctors, laboratory technicians, and MDA programmes all enacted signs and symptoms of worms as the same generic sickness that required the same treatment. In accordance, I ask, can treatment for worm infections be effective in cultivating healthy bodies without the use of diagnostics?

Along the pig supply chain and within clinics and hospitals, my interlocutors deemed distinguishing specific worms to have little worth. In this

[23] Studies have recorded the rapid onset of neurological side effects after praziquantel distribution (Flisser et al. 1993).

chapter, I show how the networks that have been cultivated enact worms as a generic sickness. However, the *T. solium* tapeworm, as a specific case, illustrates the problems that can arise if doctors continue to enact symptoms as a sign of only one generic, broad category of worm infection. This is because although *T. solium* tapeworms were often asymptomatic and consequently did not cultivate outwardly sick bodies, my final chapter (chapter seven) illustrates what happens to human bodies when tapeworms are not diagnosed and when the eggs of the *T. solium* tapeworm reach the human brain. While there are few studies on human *T. solium* infections in Uganda (Kisakye & Masaba 2002), there is data on the final stage of human cysticercosis – neurocysticercosis (NCC) (Alarakol et al. 2017; Katabarwa et al. 2008). In order for NCC to occur, people have to ingest *T. solium* ova excreted in human faeces. Thus, as cases of NCC have been reported in Uganda, this indicates that there must also be *T. solium* tapeworm carriers in the country.

Normal Worms

My interlocutors described the symptoms of *njoka*; a grumbling stomach, overeating, small weight loss, or an itching anus, as generally unremarkable and common. As Hamna once remarked, 'I cannot worry about worms; I should worry about TB, malaria, and typhoid. Worms are the least of my worries. Here people cannot afford to go to hospital unless they are really sick. Worms don't make you hospital sick'. This distinction between sickness that required hospital treatment and sickness that did not was largely based on whether the person in question displayed significant signs and symptoms of a sick body. Sickness such as TB and malaria caused a phenomenologically sick body (Leder 1990: 79), whereas worms often did not. This became evident when comparing bodies infected with worms with bodies infected with malaria or TB in which people claimed visible symptoms, such as fever, fatigue, and weight loss, were more pronounced.

In conversations with my interlocutors, worms were never described as an entity that could affect an individual's livelihood or prevent someone from earning a living. Worms were often described in English as 'normal' or in Luganda as 'not an emergency' (*njoka ezitalina buzibu*). As the urban pig farmer Amos expressed, 'People don't think you can die from worms; it is just normal for worms to come and go. It does not take anybody's time. People do not waste any time thinking about worms'. Or as a butcher in Kampala concluded, 'People are never going to care about worms because worms will never stop you from getting up or kill you'. As these remarks demonstrate, worms were not perceived to be detrimental to the overall health of the human body. This resulted in a consensus that worms did not often produce symptoms or signs of anything serious contained within the body.

Amy Moran-Thomas (2013) describes how in Ghana, people conceptualised the guinea worm as a permanent fixture of the body. During the course of the Ghana Guinea Worm Eradication Programme, one of Moran-Thomas's informants told her that in Ghana they believed 'worms were in their blood already, that people were just born with them there' (ibid: 207). While in Uganda, my interlocutors did not believe that they could be born with worms, they did not regard worm infections as an emergency. Moreover, like Moran-Thomas's informants, they depicted worms as 'just part of their lives' (ibid). As Irene, the pig farmer iterated, 'Many people have worms but it's not an emergency. Worms might cause a stomachache but a stomachache is very normal'.

With worms described as 'normal' within the body, people had different ideas about their physical attributes. *Njoka* were often depicted as 'white' (*enjeru*), 'long' (*empamvu*), and living in the 'stomach' (*olubuto*), however, these descriptions varied from person to person. Occasionally informants did mention specific types of worms including tapeworms (*enfaana*) (discussed in chapter four). Despite people claiming that *enfaana* was more dangerous than *njoka*, people also believed that both produced similar symptoms and therefore could be treated in the same way. As Hamna detailed, 'Some worms have a black mouth and the tail is long and white, there can be many of them roughly the size of a finger or just one really long one.' As his mother, Mama Ajiyo concurred, 'Worms are usually long, straight and white'. In Kampala, Amos also claimed, 'All worms live in your stomach. You might get many small, white worms or it might grow into just one long white worm like an earthworm. When the long one grows you will see both of the ends become sharp'.

Despite differences in the quantity of *njoka* within the stomach and difference in their general appearance, people always described *njoka* as coming from dirt (*ekijama*), raw fruits (*ekibala*) or vegetables (*ebivavava*). This link between raw fruit, dirt, and worm infections was also mentioned by one of Lotte Meinert's interlocutors, a boy aged twelve from Kwapa, eastern Uganda. The boy articulated, 'If you eat raw fruit or drink dirty water, worms will develop in your stomach and you will look very ugly with a big stomach' (2009: 112). While all my interlocutors described worms as coming from dirty environments, they never described them as coming from pigs. As a pork consumer in Kampala once exclaimed, 'Worms from the pig? You have to ask the farmers about that. Here it is our job to just enjoy the meat!' While many individuals considered it to be possible to be infected with the same worms as pigs, this was from consuming contaminated fruits or water and not from the pork meat itself. As Hamna established, 'I have never had any problems as a result of eating pork and I have been eating pork for years. I sometimes get a firm stomach but I think that is just from overeating'. He continued, 'Worms stay in pig stomachs but you can only get those ones from sharing the same dirty environment not from eating pork'. Similarly, Roho the butcher from Kampala claimed, 'I have never heard of worms inside pork meat. None of my customers have ever said they have had worms from the pork. For fifteen years I didn't deworm and I have never fallen sick. I know people can get worms in their stomachs but they only come from dirty things'.

In Mukono and Kampala, my interlocutors did not believe that *njoka* caused the body to become phenomenologically sick. In turn, worms were enacted as a generic category based on the symptoms they produced. These symptoms were considered to be mild, normal, and not detrimental to the body or the pursuit of a good life. This meant that worms could be 'lived with' (*kubeerawo*) as long as they remained contained within the body. As a consequence, it was only when worms became excessive and visible outside of the body, that they were deemed to be a threat. This visibility of worms outside of the body was what caused people to seek treatment.

Strong Bodies and Excess Worms

I first met Grace, a pig farmer from Goma sub-county, on an early, crisp Saturday morning. Grace's farm was positioned at the top of a rocky, steep hill that was only accessible on foot. When I arrived, Grace was busy cleaning her pigsty with a shovel and a bucket of water. The mud had already splattered up her wellington boots and stained the rim of her long, red dress. As she worked, I asked Grace if she saw any worms in her pigs' faeces. She looked up, grinned and then continued shovelling the dung directly from the pigsty into her adjacent *matooke* farm. When she had almost finished cleaning, she replied, 'I would have to do deworming then you will always find them here – they would be walking around. They look exactly the same as the ones found in children', she threw down the last dregs of the muddy water and concluded, 'You know, only pigs and children get worms'.

As with Grace, my interlocutors predominately described *njoka* as found within children's bodies. As a female farmer in Mukono central remarked, 'Children are more likely to have worms because they are not clean enough. Worms like to live in dirty environments and children like to play in dirty environments'. As Hamna also commented as we watched Suubi eating mango after mango off the floor, 'Children are like animals; they eat everything. Children, pigs, hens, dogs, and ducks, they are all the same'. 'I think my girls always have worms', he asserted with a smile.

Worm infections as a child were often considered as positive for cultivating a 'strong' and healthy adult body. As Safiya from Kampala remarked, 'Children have to have worms otherwise they will not get strong bodies. That is why children get so sick; they are not like their elders who have already eaten many things'. Safiya's comment is similar to those made by

Lormier (2017) in his account of the hookworm. Lormier highlights the paradox of hookworm infections with attempts made to pathologise both its presence and its absence. Lormier subsequently considers the benefit of hookworms as a helminthic therapy for ‘epidemics of absence’. This microbe-based intervention is increasingly being advocated for addressing conditions such as asthma and allergies, conditions that are growing markedly within America and the UK (ibid: 553). Through his account of hookworms, Lormier (ibid) indicates the way in which worms can be considered as mutalists; microbes that people can live with in order to strengthen their bodies and their immune systems.

In Mukono and Kampala, people also articulated how the presence of worms could be beneficial for the body, however, it was essential that worms remained contained within the body. Once signs or symptoms of a significant amount of worms became visible, or audible, they were no longer a normal part of the body and had to be treated. While symptoms of worms were normal, in rare cases they could become excessive. If people saw worms outside of the body, then this was a sign that they were excessive worms inside of the body. As Mama Zawadi established, ‘I only really knew I had worms when I saw something walking in the toilet’. While a butcher in Kampala remarked, ‘I have heard of people who had worms coming out of their noses and even their eyes. That many worms in your body would probably kill you eventually’. Thus, a healthy body should not have signs of worm infections outside of the body as this indicated an excess amount of worms which could threaten a person’s health. As Grace once described:

> One Sunday I saw a child in a nearby farm. She was uncomfortable. She didn’t want to sit. We kept asking her “Can you sit?” “Can you sleep?” She kept telling us “NO!” She was just standing there and then we saw that a worm was just coming out of her. She was just feeling it coming out. It was so long [she traced the length of her arm], it kept coming out from inside her. I just felt there must have been so many inside her because she was standing, not even squatting.

In order to establish whether an excess of worms was building in their children, parents used tricks in order to make their children’s worms visible. As Hamna explained, ‘I once heard that if you stick tape on the child’s anus then when the child sleeps the worms come out and attach to the tape'. This tape test was described to me multiple times by parents and was considered as one of the best ways in which to diagnose an excess amount of worms in children. In accordance, if worms were visible on the tape then the child should definitely be treated.

In conjunction with visible evidence of excess worms, many individuals also relied on bodily sounds in order to diagnose worms. As Hamna noted, 'When I was a child I saw worms in the toilet. For a month before I saw them, I had been feeling a biting in my stomach. Now, I would only deworm if my stomach started to grumble or purred like a cat. My body would make those noises to warn me of the worms growing inside'. This recognition of the audible signs of worms echoes Geissler's (1998) account of worms amongst the Luo of western Kenya. In Geissler's study, his informants claimed, 'My worm scream' and 'my worms bite' (ibid: 63). As a pork joint customer in Kampala established, 'Worms feel like something is talking in your stomach. Until the worms grumble you can live happily because if they are not grumbling they are not harming your body'.

Treatment was therefore usually only sought once signs of worms became visible or audible on the outside of the body. This was because at this stage the worms could develop into a mass that would block the stomach. As Mama Zawadi claimed, 'There are some good worms which help digestion but the long ones can become too strong and block the stomach'. She continued, 'It is normal to have worms but it can be dangerous once your stomach becomes blocked. Then the stomach becomes very big and your mouth stinks like a rotten egg'. Similarly, Amos the urban farmer stated, 'If you have too many worms you start vomiting all the time and you will get skin rashes like rings where the worm is escaping. If there are too many in the stomach, they might move into your lungs or your liver. It is not healthy to have that many worms'.

The claims above all illustrate how certain signs and symptoms indicated when *njoka* were present within the body. The more signs of worms there were, the more severe the infection. Mild symptoms were not a sign of a severe sickness and this meant that people considered *njoka* to be normal and even beneficial for children's bodies. This meant that individuals did not feel it was necessary to diagnose specific worms. Instead, people would look for signs of excess worms, which in turn would make the body appear sick. Seeing or hearing *njoka* were therefore the only signs individuals would need before seeking deworming treatment.

Deworming

On a farm in Nama, a petite, lively, village elder named Saada, spent her evenings sorting the herbs and leaves that she collected in piles outside her house. Earlier that evening I had accompanied Saada as she herded her four cows down the road. As she guided her cows, she gathered greenery from the surrounding trees and bushes. The green of the leaves contrasted with the vibrancy of her bright orange *Gomsei*[24]. That evening as we walked, Saada proudly claimed that over the past fifty years she had birthed the majority of the villagers in Nama. She credited both her medicines and her small hands to saving many women and their babies during difficult births.

Outside her house, Saada dried, ground, and boiled the plants to make a collection of medicines. She commented, 'People trust my medicines more than tablets around here'. For treating worms, Saada claimed that she used either papaya seeds or *mululuza* (*Vernonia amygdalina),* known in English as bitter leaf. To demonstrate the efficacy of *mululuza*, Saada called over her eight-year-old granddaughter and gave her a cup of the medicine. Saada claimed that the bitterness of the plant would flush the worms out of her granddaughter causing almost instant diarrhoea. As she asserted:

> It must be very bitter. It has to be so bitter it is like poison. But I know it is not poison when prepared properly. You have to soak the leaves in water because alone it is dangerous. I think alone the bitterness would break the intestines. You take a full cup. Soon after the diarrhoea starts and the stomach will stop grumbling.

[24] A traditional Ugandan dress.

Like Saada, many informants claimed to deworm using bitter products, the most popular of which was *Aloe vera* (occasionally referred to in Luganda as *kigaji*)[25]. In relation to worms, *Aloe vera* was cited as being bitter enough to have an all over cleansing effect, flushing all worms (and other ailments), outside of the stomach. As Mama Zawadi elaborated, 'To reduce worms I use one cup of *Aloe vera* every day for four days. *Aloe vera* is better than tablets [from clinics]. The tablets do not make the diarrhoea come and so the worms stay trapped inside'. Similarly, a farmer in Mukono central remarked, '*Aloe vera* is better than tablets. When you take *Aloe vera* it is very bitter and it goes straight to your stomach so you really feel it. Then you get sharp pains and then the diarrhoea brings everything out'.

Aloe vera, alongside other bitter products, was believed not only to be more effective but also cheaper than tablets prescribed from clinics or hospitals. People would therefore often treat *njoka* within the home using a broad selection of herbal medicines. As a customer from Luka's butcher in Kympasi stated, 'Every six months I try and deworm my family but I use a local medicine not tablets. I use *Aloe vera* or papaya seeds sometimes I put charcoal in water that definitely reduces the worms because it drags the worms down'. He continued, 'I can't afford tablets for my whole family. If it is UGX 4,000 (85p) and someone is sleeping hungry and you tell them to deworm then they have to refuse. Especially because worms do not usually disturb you.' Similarly, many of my interlocutors considered medicines such as albendazole as too expensive or less effective than bitter, local products in treating *njoka.* This was especially evident with medicine in tablet form. As a pork consumer explained, 'Pills go straight through the stomach. You will see that pill in the toilet the next day but the worms will still be inside'. These assertions correlate with literature from Tanzania, in which injections of medication were perceived

[25] *Aloe vera* is frequently used as a medicine throughout Uganda and is believed to cure many illnesses including malaria, abdominal infections, skin diseases, and allergic reactions (Adams, Eliot & Gerald 2014). In a study in Western Uganda, *Aloe vera* was also the most frequently cited herbal medicine used in managing HIV (Lubinga et al. 2012). This reflects studies on HIV in South Africa (Babb et al. 2007) in which *Aloe vera* was frequently used by patients.

by patients to be more potent and therefore more effective than swallowing pills (Green 2000). In Uganda, liquids were similarly thought to be more effective as they spread out from the stomach into the entire body. Accordingly, syrups, herbal teas, and liquid based biomedical treatments were perceived to be the most effective treatment for worms as they completely cleansed the body.

The ability of certain liquids to purge the stomach of worms, relates to how many pork joint customers claimed to drink alcohol in order to avoid infections and in particular *njoka*. As a pork consumer in Namuwongo explained, 'Alcohol kills the worms. It chops the worms inside of you'. A butcher in Bukoto similarly remarked, 'If you have a stomachache take *waragi*. *Waragi* makes stomach acid and it burns the problem in your stomach and reduces problems like worms'. Many pork consumers expressed a similar idea, with strong liquor such as *waragi* preferred for deworming. As a butcher in Mukono central stated, 'There is a chemical in *waragi* that makes the worms drunk. When worms get drunk they get disturbed and they come out. Worms are living so the *waragi* affects them like a human. When the worms are sober they don't come out'. This assertion, that worms had the potential to become inebriated or remain sober alongside their human host, highlights how people conceptualised worms as something that lived within the body. Keeping worms under control through the consumption of alcohol meant that they would not become in excess and affect the health of the body.

As noted above, another significant factor as to why individuals did not deworm or decided to use certain products was often because of cost. This was why many individuals claimed that they no longer had to worry about worms since the government started deworming children for free. As a female farmer in Katosi claimed, 'I try and regularly deworm my children but usually I wait to get free medicine from the government hospital'. A pork consumer in Kampala similarly emphasised, 'I have never dewormed. I think my children are dewormed for free at school. That is the government's responsibility'. As discussed at the beginning of the chapter, it was widely assumed that children were more likely to develop an excess amount of worms, causing them to become sick. This was because they were more frequently in contact with 'dirty things'. As the government had taken responsibility for deworming children, parents in turn believed that it was children and not adults who were at risk of developing serious sickness from excess *njoka*. This outlook was further entrenched as international agencies often rolled out MDA programmes in schools.

While people assumed that the government carried out deworming for free, Mama Suubi discussed how children might still not be receiving this treatment. As she claimed:

> I had to take Suubi to get a vaccination but I watched what they gave her and I saw albendazole. I know that they are deworming because I know that product. They are not telling us. They know people are not deworming. They know that if they tell someone to go to town for a dewormer then people will not go. People will only go for a vaccination, so they have to do the two together. People think worms will not kill their children, so they just do not care. People are never going to care about worms.

Mama Suubi's example illustrates how with worms perceived as 'normal', treatment was not considered to be a priority even when provided for free. Mama Suubi's account also suggests that medical professionals, carrying out national vaccination programmes, were not enacting worms as a potential cause of sickness. This reinforced that preventively treating worms was not a priority and that worms in general would rarely ever cause serious sickness.

Specific Worms

In Mukono town, one of the biggest health centres was a 24-hour private clinic. Outside the clinic, two long rows of fixed, blue, plastic chairs lined the back of a covered veranda. The chairs were always full with patients and family members, even in the night when insects swarmed the entrance's two small spotlights. Inside the clinic, flimsy sheets of plywood separated the reception and pharmacy at the front and a consultation and treatment room at the back. The corridor between these rooms led to a long ward that was constantly overflowing with patients, many more than the thirty-bed capacity. At the back of the building, the corridor opened up onto a courtyard that was filled with donated and disused medical equipment – wheelchairs, hospital beds, and a single incubator. A washing line ran through the middle of the courtyard with x-rays pegged up revealing the hazy outlines of pulmonary TB, blocked fallopian tubes, and a fractured femur.

In the back corner of the courtyard was a door with 'Laboratory' printed in bold, blue letters. Inside, the room was small with just enough space for two wooden chairs. Along the worktop the lab technicians had lined up two microscopes, a centrifuge machine, boxes of slides, pipettes, staining liquids, and vessels of used blood. At the back of the room was a small refrigerator stocked with vaccines and a sink filled with overflowing glass containers. The frequent power cuts throughout the day meant the refrigerator beeped incessantly and the microscopes could not be continually used.

Next to the sink were tubes filled with blue dyes and red staining fluid into which the lab technician, Okot, was busy dipping blood slides. Okot was a medical laboratory technician who had recently graduated from a three-year diploma from Mengo hospital in Kampala. Okot worked the daytime shift in the clinic, which involved twelve-hour days, six days a week. He worked largely alone but was occasionally assisted by a trainee laboratory technician named Hope (Figure 34).

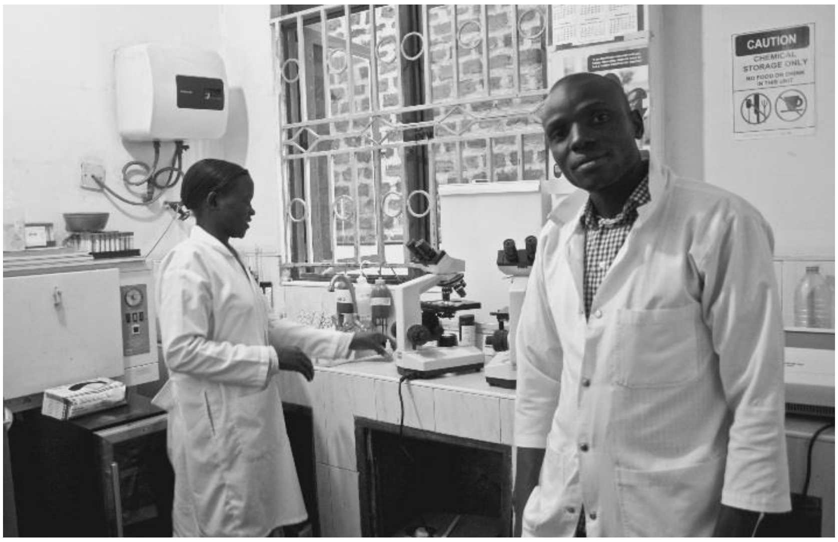

Figure 34. Okot and Hope in the laboratory. Photo by author.

In Uganda, the laboratory was the only space in which technicians could potentially diagnose and enact specific worms under a microscope. Unlike in the private clinic in which Okot worked, the laboratory in the government hospital in Mukono town did not have a working microscope. As the laboratory technician in the public hospital stated, ‘This is Africa – everyone has worms. It’s so rare for anywhere to test stools so I have never seen a case of *T. solium* in the two years I have worked here; but then again stool samples are usually only done at the request of the patient and that never happens’.

The rarity in which stool samples were requested became clear during the time that I regularly spent with Okot in the laboratory. Over three months there were only five stool samples requested by the doctor. These patients had symptoms including persistent stomachache, dizziness, and weight loss but not a fever. Three were positive with hookworms and one with a *T. solium* tapeworm. As Okot only intermittently conducted stool samples, he had to use a chart to ensure he made the right diagnosis. Before one sample, he explained:

> I should look for the eggs of 9, 11, 14, and 16 - that is roundworms, hookworms, *T. solium* and *H. nana* (the dwarf tapeworm) – because in my studies I was told they are the most common in Uganda. I should study the book first so that I know what I should look for under the microscope. It is only through microscopy that I can identify the morphology and characteristics of each worm.

Okot’s comment indicates the type of knowledge necessary to make certain pathogens visible as well as the rarity with which specific types of worms were diagnosed within the laboratory. On the occasions in which he did test for specific worms, Okot took a small bottle that had been reused from the pharmacy. He explained how it was too expensive to buy singular stool pots, especially as after one was used it had to be thrown away. Okot remarked:

> We do not need the equipment anyway most people will say that they cannot give a sample. I think it is embarrassment. I think most people would rather just take the dewormer and hope that they are treated. The only time people feel no shame to give a stool is if there is blood in the stool. People think blood is always serious.

As in Mukono district, specific worms were also rare in the main laboratory of Mulago general referral hospital in Kampala. As an assistant technician clarified, 'Tapeworms alone would not cause enough problems for someone to come to Mulago, so we only ever find them in a patient who is suffering already from maybe HIV or severe malaria'. She concluded, 'But really I think it's only drunkards who get tapeworms because they are the only ones who eat roasted pork. Most people now are modern. They know how to cook and how to take dewormers so they don't need to be checked'.

Despite the private clinic and Mulago having access to the facilities necessary to diagnose specific worms, patients and doctors alike focused on diseases that had serious signs and symptoms. As Hamna claimed in the section above, worms rarely made people 'hospital sick' and Okot similarly argued that most patients came to the hospital to be diagnosed with 'serious' diseases such as malaria or typhoid. As Okot claimed one morning, 'Blood samples are the most common. Most people come wanting to test for malaria they do not care about anything else'. In discussions, interlocutors claimed that the main symptom of malaria was fever and the sickness was also known in Luganda as *omusujja* (fever). People along the pig supply chain recognised that *omusujja*, particularly *omusujja* that was not responding to medication, should be diagnosed and treated within a clinic. Malaria was therefore often the only thing people would check for when they came to the clinic and different malaria causing parasites (most commonly Plasmodium falciparum) were overwhelmingly the most frequently diagnosed pathogens within the laboratory.

Along the pig supply chain, people defined *omusujja* as having a very specific set of symptoms; fever, followed by headache, body pains, and loss of appetite. These symptoms were signs of a serious sickness that often required hospital treatment. Worms, on the other hand, had significantly milder symptoms. As Okot asserted:

> Most people do not think worms are a big problem because they are not bedridden. They are walking about so they do not even realise there is a worm inside them. I recently tested a man who claimed he had self-

> medicated a persistent stomachache for six years with local leaves and roots. The doctor gave him one albendazole tablet and the stomachache went. That is the challenge, most adults come complaining of malaria or typhoid but the root cause of the stomach pains could be worms. But still people continue to ignore the worms and just medicate the other diseases without doing a diagnosis.

Okot continued, 'It is not in people's custom to deworm, they think deworming is for children. They will say I am mature, I eat from a plate, and I wash my hands. If you meet one hundred adults maybe only two or three of them will have dewormed in the past year'.

As many patients actively avoided stool samples, doctors often diagnosed and treated worms based on the presence of patients' symptoms such as a persistent stomachache or an itching anus. Even if worms were not in the body, doctors perceived deworming treatment to cause no harm if used preventatively. Consequently, if a doctor suspected a worm infection based on a patient's symptoms, then they would often deworm the patient without their explicit consent. As Okot articulated, 'People are very stubborn so the doctors just don't tell them and give them a dewormer disguised as a malaria drug'. Susan Reynolds Whyte also observed medical professionals withholding consent in eastern Uganda (1997: 213). As she argued, 'It is striking that health workers seldom inform patients and families about the diagnosis. There seems to be an understanding that this is not the patient's concern. This may partly reflect an assumption on the part of health workers that patients are not interested in or able to understand biomedical diagnoses' (ibid). This however, assumes that health professionals are able to administer the correct treatment without carrying out diagnostic investigations. From working in clinics, it became clear that doctors relied on patients' symptoms as signs of a worm infection. This echoes the accounts of Whyte who observed how in practice, patients told health workers their symptoms and were given the corresponding medicine. A 'swollen abdomen' would therefore indicate the treatment, mebendazole, a dewormer (ibid: 212). With worms presumed to be a generic infection, doctors were deworming patients with an easy, quick, and cheap fix. This suggests why worms were so rarely diagnosed within laboratories, as doctors often generically clustered worm infections and treated patients with or without their consent.

As a doctor who worked the afternoon and evening shift in the Mukono private clinic explained, ‘I mostly give medications based on symptoms. But I also think people should regularly deworm even without classic symptoms. So I usually advise patients to take one 400mg tablet of albendazole or for children maybe 500mg of mebendazole syrup. One hit and the worms will go’. On the topic of tapeworms, the doctor continued:

> To treat a tapeworm this dosage would not be enough to kill either the adult worm or the larvae, you would have to take it daily for a month. I would only suspect a tapeworm in an adult who ate pork regularly. The tapeworms will always affect the pork consumers more than the pig farmers. Maybe I would think about a tapeworm if the patient had a running stomach and other tests like typhoid came back negative. In that case, I should prescribe praziquantel but you should know that is so rare.

The doctor’s comment illustrates how giving a standard dose of deworming medication was easier than testing for worms but yet he also recognised that the tapeworm, as a specific worm, needed specific treatment.

In the clinic, administering a standard dose of deworming medication was the most common method for treating worms. As Emmanuel, a doctor from a privately owned clinic in a suburb of Kampala remarked, ‘We have a microscope but we never do stool analysis. If worms are suspected then we treat all the same. Some people just come and take the drugs from the pharmacy without even consulting me first’. Emmanuel explained how when patients did come for consultation he would have to diagnose worms based on symptoms alone. The common symptoms that he looked for were: a stomachache, itching of the skin and anus, loss of appetite, weight loss, nausea, and skin rashes. If a patient were to report any of these symptoms, he would in turn prescribe albendazole or mebendazole.

Emmanuel claimed that basing his diagnosis on patients’ symptoms was in order to keep costs low. As Emmanuel asserted, ‘Stool analysis is around UGX 10,000 (£2.15) and most people cannot afford to pay that. Even those who can afford are not willing to pay if I tell them that the problem is most likely worms. My patients would say, "You are making me pay for what, you already told me the problem"'. He continued, 'This means tapeworms are rare but then we do not know if they are there or not because we are not testing'. The cost of stool sampling plus the expectation that a doctor should be able to clinically diagnose worms meant that doctors were not enacting tapeworms as a specific pathogen. This meant that if they were present inside the body, they remained untreated.

Apart from consultation costs and the costs of stool samples, the price of medication was also stated as a deterrent to deworming. While deworming with *Aloe vera* or papaya seeds was essentially free, prices of deworming tablets ranged from UGX 2,000 (45p) to UGX 7,000 (£1.50). As Emmanuel stated, 'One person per family maybe gets treatment but really everyone in the family should be taking dewormers. I have met people who refuse for their child to take free dewormers from the government so you can imagine if that dewormer then costs UGX 2,000 (45p). People are sometimes so foolish they would rather die than pay'.

As discussed in relation to liquid deworming products outside of the clinic, Emmanuel also claimed his patients regularly asked for syrup deworming treatments over tablets. He commented, 'My patients think liquid covers the body evenly whereas the tablet stays in one place. If it stays in one place, it is thought to be ineffective'. He also believed that syrup was seen to be a more of a 'natural treatment' that was more like the 'herbal medicines' patients were used to. Emmanuel claimed liquid products were also favoured because of a fear of taking multiple pills at once. As he stated, 'Many patients fear taking pills. People ask why do worms make you need to take five pills at once'. Yet, Emmanuel concluded, 'I don't think you can overdose on dewormers because worms are not a serious problem. That means that the medicine is also not serious. Bacteria are worse for the body than worms and that is why antibiotics are more serious than dewormers'.

Inside and outside of the clinic, worms were not perceived to be a 'serious sickness' and the vast majority of patients received deworming treatment based on their symptoms. Laboratory technicians rarely conducted stool samples and this meant that doctors very rarely enacted *T. solium* as a specific pathogen. As a consequence, in clinics that I visited, *T. solium* did not exist as a pathogen potentially contained within Ugandan bodies.

Mass Drug Administration

Building on the evidence above, this section illustrates how MDA programmes also clustered worms into a generic sickness. Through doing so, these programmes further entrenched an idea that worms were predominately associated with children's bodies and that worms could be easily treated through a single dose of medicine. Thus, along the pig supply chain, in clinics, and in MDA programmes, people consistently enacted signs and symptoms of worms as a generic sickness that was cheap and easy to treat.

The transformation of worms into a generic sickness was evident in the MDA campaigns led by the Ugandan government and international agencies. As is clear through the section above, patients deemed diagnosing specific worms as too expensive. Similarly, in public health interventions, it is cheaper to assume that worms can be clustered together and treated with a single drug. As Allen and Parker articulated in response to case studies of MDA carried out in Tanzania and Uganda, 'It is much less expensive to provide drugs to everyone in endemic locations than to set up and sustain diagnostic facilities' (2011: 96). Moreover, drugs are often supplied for free by pharmaceutical companies (ibid: 141). Diagnosing specific worms would therefore become expensive, costs which international agencies are unwilling or unable to cover.

MDA programmes were formulated in response to the WHO's global plan that by 2015, all programmes relating to Neglected Tropical Diseases (NTDs) share at least one of three goals – control, elimination, or eradication (ibid). In accordance, the WHO published a series of interventions that focused upon advancing surveillance, mapping infections, vector control, and preventative chemotherapy delivered through MDA or 'rapid impact packages' (WHO 2010). These suggested interventions in turn shifted the production of evidence towards measurements and data targets. As a consequence, vertical, quantifiable interventions have been privileged (Allen & Parker 2011). Tracing the implementation of these global health interventions, Allen and Parker illustrate how a commitment towards eradicating NTDs does not necessarily translate into suitable programmes in local contexts (ibid). Building on Parker and Allen's critique of MDA interventions in practice, I demonstrate how in Uganda, clustering and treating STH with albendazole enacted only generic worm infections. This means that MDA programmes, like doctors, did not enact *T. solium* as a specific pathogen potentially contained within human bodies.

The MDA launch I attended was based at the village primary school in Katosi. The school was located directly between Mama Ajiyo's house and the edge of Lake Victoria. Behind the school was a large rubbish pit where pigs roamed throughout the day. On the shore edge, fishermen were constantly present, repairing their boats and nets to catch fish again throughout the night. Katosi was the launch site for the 2015 MDA campaign, which would be followed by a two-week programme that spread out throughout the rest of Mukono district. The morning of the MDA launch, a group of women had gathered on the shore to mourn two men who had drowned on the lake during the previous night. Far in the distance, a storm was brewing and the wind was beginning to roll through the trees. Black clouds filled the sky and the waves of the lake lapped at the banks. 'The rain is coming but because of this rain we have many fruits. Let us be thankful for that', Godfrey, a teacher, shouted as he set up a stall for the launch. The launch, funded by USAID, was being led by the Ugandan Ministry of Health and RTI international (a non-profit research institute based in the United States). The latter were implementing their ENVISION programme of integrated preventative chemotherapy for NTD control.

The school teachers had erected white tents and set up a sound system which boomed out music. At around 3pm white cars, which had travelled from Kampala, began to arrive. The cars were filled with Ministers and foreign aid workers including the president of RTI, the head of NTDs from the Ministry of

Health, Ministry of Health delegates, the Mukono sub-county chief and the Mukono district commissioner. Schoolchildren stood outside the tents displaying their handmade soaps and distributed booklets on controlling NTDs. The booklets were written in English and presented pictures and information on the following NTDs: bilharzia, river blindness, elephantiasis, soil-transmitted helminths, and trachoma. The same diseases and the methods as to how they could be controlled were displayed in English on large posters that had been erected around the school grounds (Figure 35).

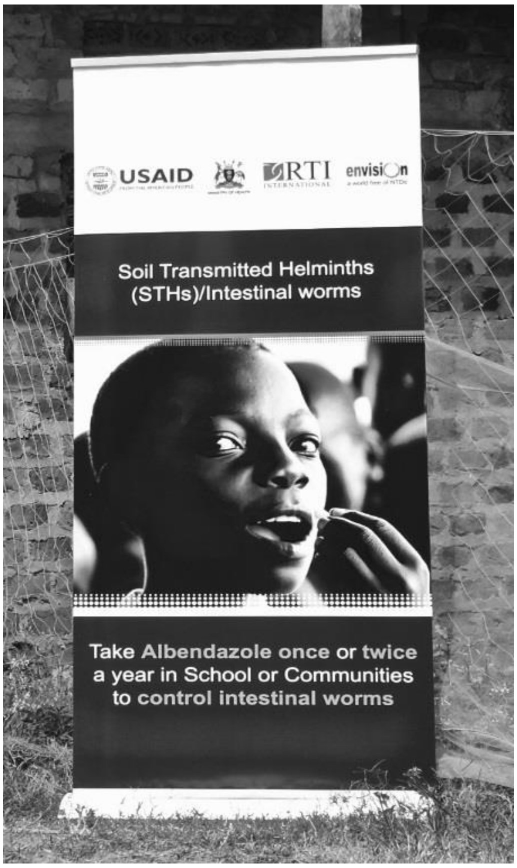

Figure 35. A billboard displaying a child taking medication for STH. Photo by author.

A doctor from the local sub-county clinic was sitting next to me and as the officials and community members filled the school grounds he commented on the impact of the different NTDs in Mukono. He observed how since 2007, RTI international in collaboration with ENVISION had been working alongside the Ministry of Health to implement the NTD programme. He explained, ‘Mukono is a hyper endemic area and people are competing with Kampala which is relatively free of NTDs. We do not want people stuck in rural life forever. They need to be healthy so that they can compete with their colleagues in places like Kampala and those outside of Uganda’.

Discussing the separate diseases, the doctor claimed that STH and bilharzia were the main neglected diseases within many of the fishing villages that lined Lake Victoria. He described how the NTD programme had been annually treating students with a single dose of albendazole for STH and praziquantel for bilharzia. He claimed, ‘I think it has been a success. I have heard that children are performing better in schools but for me NTDs are still a significant concern in the community’. Although we spoke at length about all the NTDs listed in the booklet, when I mentioned TSTC he paused and then briefly remarked, ‘That one is a *really* neglected disease. I read that it was reported on the islands around Katosi. I can see the pigs here but I do not even know if that disease is also here. I just have no idea’.

After a round of introductions and the singing of the national anthem, an official from the Ministry of Health began to address the audience. He explained how NTDs were a particular threat to school pupils and asserted, ‘People are ignorant of their cause, spread, and control. However, the Ugandan Ministry of Health and USAID are working together to eradicate NTDs. Here, in Katosi, we will focus on bilharzia and STH’. He continued, ‘We are here to deworm pupils and community members. Before we started, we had to sensitize district leaders and mobilize team leaders. We have had radio programmes to mobilize the masses to prepare for this event’. He highlighted how after the treatment, the Ministry of Health would carry out data collection in order to summarise what had been achieved through conducting the MDA.

As he spoke, children and community members rapidly started to gather around the outside of the school waiting to receive the medication. The official continued citing the challenges that had previously prevented individuals from taking part in the MDA. He spoke of severe reactions to medicines and illiteracy amongst parents who refused to let their children take the drugs. Yet, he assured the community that the drugs were both ‘safe and effective’. He concluded, ‘We have made a big step forward. We work as one – under one umbrella. That is why we have made these achievements. That is why NTDs have been drastically reduced and we are optimistic that by 2020 they will have been eliminated’.

As the storm loomed overhead, the Ministers cancelled the remaining speeches and teachers began to measure the students on a dosing pole and handing out the corresponding tablets (Figure 36). Immediately after the first student received the treatment, the foreign visitors and Ministry of Health officials left for Kampala.

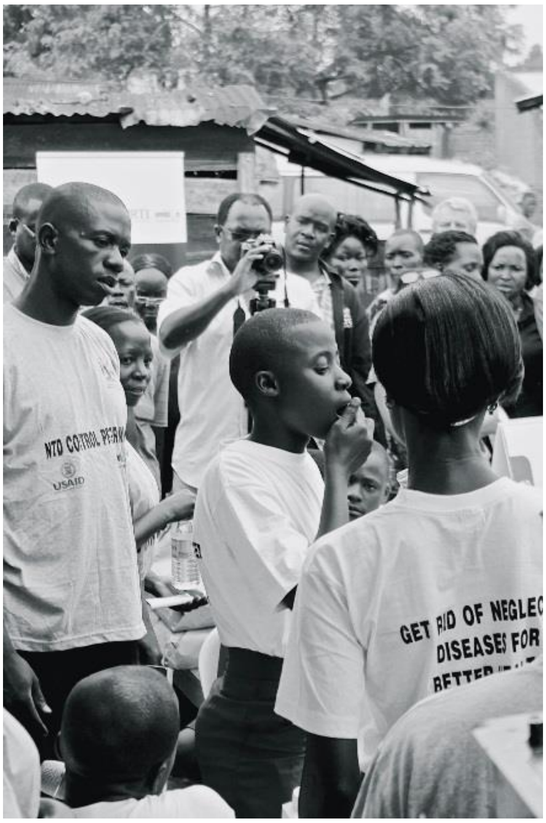

Figure 36. A school pupil being treated during the MDA. Photo by author.

A week after the launch I returned to the primary school used as the MDA launch base. I spoke with two teachers, Apollo and Godfrey, who had been leading the drug distribution during the launch. It was the teachers who were expected to volunteer their time in order for the MDA to take place. As Godfrey remarked, ‘On the day of the launch we got a free T-shirt and an allowance of UGX 5,000 (£1). We wish for good health in our community so we work willingly but it is a lot of work to carry out. Then we have to tally the book. It can take a week to make it perfect and we still have classes to teach’.

Apollo and Godfrey started to discuss why they believed that Katosi was an important site for health interventions. They stated that most people in Katosi were ‘not learnt’ and that there were very low literacy rates and poor general hygiene. They both believed that the majority of sicknesses were spread through the lake water, people walking around barefoot, and the lack of latrines. As Godfrey commented, ‘Some people cannot afford latrines, there is only one communal toilet and it costs UGX 200 (4p) per visit. There might be one toilet for a large number of people and many people are not patient to wait. They are forced to run into the bush or into the lake’.

The teachers also discussed how despite the official stance that the focus of the MDA was on all ‘community members’, they believed that it was only children who were targeted during the launch. As Apollo noted, ‘Very few adults come, they think these events are for schoolchildren. We also thought the drugs were just for the school but that day the Minister announced it was for the whole community. If the government gives little time for people to prepare or only gives brief announcements then adults will not attend’. Apollo’s comment echo those made by Hastings (2013), who also highlighted how health education accompanying an MDA programme in Tanzania was not sufficiently disseminated to local leaders and parents in time.

In order to prepare for the MDA, Apollo and Godfrey described how they had been taught by the district health officers about distributing drugs and measuring children in order to ensure that they distributed the correct dosages. Apollo who had worked in Katosi primary school for over ten years asserted:

> The district health officer taught us about all the NTDs. He has been coming here for eight years. At the beginning there was a lot of fear, some parents would refuse for their children to take drugs especially when they caused headaches and body weakness. Now there has been a change, I think because people trust that the government will successfully treat their children at school every year.

Apollo and Godfrey spoke at length about STH and knew specific parasites including hookworm, roundworm, and tapeworm. They believed that the drugs distributed during the MDA treated all of these worms. As Godfrey established, ‘Tapeworms like all other worms stay in the soil so they will be treated through taking albendazole. You know all worms are treated during the MDA’. Godfrey’s final comment encapsulates the power of the term STH and how MDA programmes reinforce an idea that worms can be clustered generically as a single sickness and treated as one.

Conclusion

Throughout Mukono and Kampala, worms were not perceived to be a dangerous or a life-threatening condition. My interlocutors described worms as a normal, almost expected infection especially amongst children. Through discussing worms and deworming methods across pig farms, pork joints, clinics, laboratories, and during an MDA launch I argue that worms have become a generic sickness. From the Lugandan term *njoka* to the international term STH, worms regardless of their specific morphology have been clustered together and enacted in the same way. This creates an assumption that all worms can be treated in the same way, using the same dosage and type of medication.

This categorisation of generic worm infections meant that *T. solium* tapeworms were not enacted as a pathogen and if present, remained contained within the human body. The invisibility of tapeworms as a pathogen in humans was embedded at a local as well as at an international level where categories such as STH, created a cycle in which tapeworms were never treated. While an individual can live with a tapeworm for years (Croker 2015), if pigs consume the eggs of the tapeworm this continues the parasite's lifecycle. Moreover, if humans, as the definitive host, consume the eggs then the larvae can migrate to different parts of the body. This final stage of the TSTC lifecycle will be discussed in the next chapter.

Chapter Seven

Seizures as a Symptom: Uncertain Futures and Diagnosing Neurocysticercosis

It was before noon and yet the wooden benches that lined Luka's pork joint were crowded with customers. Joviah, Luka's neighbour, was busy outside boiling water for the large pot of *marua* (millet beer), which was positioned in a rounded dip in the centre of the pork joint floor. Joviah added the muddy-brown fermented millet and with a large wooden pole turned the foaming liquid over and over. She refilled the drinking pot by bucket as the customers sucked the beer through long, slim bamboo straws. The boiled beer left a sour smell in the air.

Joviah worked every day preparing the alcohol to support her three young children. Her husband had died suddenly a year earlier after a period of sickness that had ended in a prolonged seizure. Different stories of Joviah's husband's death were circulating within the pork joint and everyone was still unsure as to why exactly he had died. After finishing a fresh batch of alcohol, Joviah sat down and explained:

> He had been sick for months. We had taken him to hospital, a doctor checked him for malaria. We thought it was malaria that had hit the brain. But the test said "no malaria". The doctor injected him anyway and told us that if the seizures stayed we had to look for another way [outside of the hospital].

After a brief interlude, Joviah described the day her husband died. As she recounted:

> One day he went to fetch water and he had a shower. Then he went to watch the football. He came home early at 8pm and then he fell down. He started shaking for the whole night. I was watching him the whole night. I decided I would take him to the clinic in the morning because there was no one here to take him at night. By 6am he had already passed.

Joviah's husband had previously worked in Luka's pork joint and despite Joviah's later assertion that her husband's death had not been caused by witchcraft, in Luka's interpretation of his death, he concluded that witchcraft was the only possible cause. As Luka explained, 'He was working and then suddenly he fell down. We thought it was probably because of malaria, because malaria can climb to your brain. We took him to a hospital (*eddwaliro*) and they injected him but it did not work for him. He went back to stay in the village to receive treatment in the church'. Luka believed there were two possible causes for Joviah's husband's seizures. He explained, 'Once the medication did not work I knew those seizures must have been inherited through his family or they were the product of 'bad spirits' (*omwoyo omubi*)'. Luka concluded, 'Usually you would know if someone's father had it and then that's definitely in the family. If it comes suddenly and you do not have a fever then it is probably bad spirits. When bad spirits possess you it is difficult to know why the seizure started'. Luka and Joviah, along with the other customers, continued to grapple with the potential causes of Joviah's husband's sudden death.

Throughout Mukono and Kampala, my interlocutors described seizures as a clear sign of a 'serious sickness'. This was because people could 'fall' (*okugwa*) at any moment. Through following different accounts of seizures along the pig supply chain, I argue that when signs and symptoms of sickness were highly visible, people searched for a cause that could be treated with biomedical treatment. This was because a treatable condition, such as malaria, alleviated uncertainty around providing for the family into the future. In contrast, seizures that could not be treated damaged people's pursuit for a good life, meaning that individuals and their families increasingly lost hope for the future.

When I discussed seizures with individuals, many would first discuss the initial search for a biomedical treatment, often for malaria. If the medication for malaria was unsuccessful, people would search for other causes behind the seizures most often those rooted in failed social relationships. This follows Whyte's observation amongst the Nyole that when symptomatic treatment stopped working, the symptoms were no longer mere phenomena in themselves but instead, ‘signs indicative of problems in relationships to people or spirits’ (1997: 26). In line with these observations, this chapter asks what happens in Uganda when doctors and biomedicine fail to treat signs and symptoms of serious sickness.

In this chapter, I discuss the implications of humans becoming accidental hosts of TSTC. TSTC has two stages a larval, intermediate stage and an adult, definitive stage. The intermediate stage occurs in the primary host, pigs, and causes porcine cysticercosis. Humans can become accidental hosts if they consume *T. solium* tapeworm eggs, which then migrate to muscles, the brain, liver, and other tissues. If cysts localize in the human brain this results in neurocysticercosis (NCC). NCC has been described as the ‘most feared manifestation’ of TSTC (Sotelo 2003). It also remains the most common cause of adult-acquired epilepsy worldwide (Nash et al. 2013).

It has been more than two decades since the International Task Force for Disease Eradication declared neurocysticercosis (NCC) as eradicable (ILAE 1993). Despite this ambitious target, the World Health Organization still recognises NCC as a ‘major neglected disease’ (Daumerie & Savioli 2010). The neglect of NCC is evident in epidemiological studies, which provide little data on prevalence rates of the parasite across Africa. Although limited, epidemiological studies do indicate that NCC is present across multiple districts in Uganda (Alarakol et al. 2017; Katabarwa et al. 2008), as well as sub-Saharan Africa more generally (Blocher et al. 2011; Githigia et al. 2002; Mafojane et al. 2003; Newell et al. 1997; Nsengiyumva et al. 2003). In these studies, prevalence of NCC varies, with results ranging from 40% of a 972 study population in Burundi (Nsengiyumva et al. 2003), through to 16.5% of a 212 study population in Tanzania (Blocher et al. 2011). Although information is scant, these studies suggest that TSTC is a significant cause of onset epilepsy throughout East Africa.

NCC can be treated symptomatically, through definitive therapy, or through surgery (Singh & Prabhakar 2002). Symptomatic treatment involves controlling the seizures which are secondary to the NCC infection. Medical advice specifies that if cysticerci are diagnosed in the brain, then the patient should be treated with antiparasitic drugs (such as praziquantel or albendazole) in order to accelerate the death of the parasite (ibid). If possible, surgeons should subsequently remove cysts or use a shunt placement in order to prevent hydrocephalus (ibid). Definitive treatment for NCC is therefore dependent upon diagnosis. During my fieldwork, NCC could only be definitively diagnosed in hospitals through specialist brain imaging technologies such as computerised tomography (CT) scans. This type of equipment was often inoperative in public hospitals and prohibitively expensive in private hospitals. Doctors rarely suspected NCC in Ugandan hospitals and even if patients travelled to Kampala with signs and symptoms of TSTC, it remained too complicated for doctors to diagnose. This meant that doctors would often symptomatically treat epilepsy, typically using the anti-epileptic drug carbamazepine.

Seizures have multiple causes (Delanty et al. 1998). In accordance, I am not arguing that NCC caused all adult onset seizures in Uganda. However, I observed that doctors never linked seizures to NCC. As a result, doctors and laboratory technicians never enacted the *T. solium* tapeworm (chapter six) or NCC within hospitals, laboratories, or clinics. The fact that doctors did not link seizures to any diseases other than malaria had implications for controlling TSTC more generally. For my interlocutors, if their seizures could not be treated in the hospital then this suggested that the cause of their sickness could only be found outside of a clinical setting. Thus, if NCC was causing their seizures then patients would be discouraged from attending a hospital. This led to a cycle in which doctors in Uganda never diagnosed TSTC as a cause of seizures.

As discussed in chapter four, the responsibility for controlling zoonotic diseases and ensuring food safety has been shifted onto international and Ugandan veterinarians. In line with this, during discussions with doctors they framed TSTC as either absent in Uganda or as a veterinary issue. Thus, despite attempting to make TSTC visible to farmers, butchers and slaughterhouse workers, veterinarians could not influence the ways in which doctors treated seizures in hospitals. This meant that there was not a sustained network that linked signs and symptoms of sickness in humans with signs and symptoms of sickness in pigs.

In accordance, the final section of this chapter discusses the positioning of a diagnostic test for TSTC. In an effort to control TSTC, the International Livestock Research Institute (ILRI) have collaborated with the University of Edinburgh, Arista Inc., and Astel Diagnostics to develop a prototype, rapid diagnostic test (RDT). The test has been designed for pigs and to detect porcine cysticercosis using blood or serum. As the RDT enters the final stages of development, the researchers involved are exploring possible intervention sites and potential users of this kit. The main question to be answered is where along the pig supply chain the test should be placed. I suggest that if only veterinarians use the diagnostic test then this will strengthen an idea that sickness in pigs does not cause sickness in humans. As I will illustrate throughout this chapter, while veterinarians recognised the presence of TSTC as a threat in pork meat, doctors had limited diagnostic facilities to enact it as a pathogen in human bodies. This invisibility of TSTC within hospitals means that, if present, the pathogen remains untreated within the human body. Through drawing on Latour (2000) and Kirksey (2015), I therefore suggest that placing the diagnostic test in hospitals would start to create the networks that would allow TSTC to become a pathogen that is potentially contained within human bodies.

Seizures

As Roho, the pork butcher, once specified, ‘I know people who have seizures. It develops in their body until they fall down, shake, and the urine comes out. That urine is a real sign of something bad. Maybe it will start coming once every year and then it will start coming every month. It becomes worse and worse until that person dies’. Across Mukono and Kampala, people similarly claimed that seizures caused people to fall down, shake, foam at the mouth, and urinate. Although the WHO (2016) labels two or more unprovoked seizures as epilepsy, this difference in terminologies was not shared by my informants who instead referred to all types of seizures, whether one off or recurrent, as *ensimbu*.

In Tanzania, there is a documented distinction between *degedege,* a seizure related condition of childhood and *kifafa,* 'epilepsy', or 'little death', a condition that can afflict both children and adults (Whyte 1995: 228). In Uganda, there was reference to seizures that only affected children and these seizures were cited as being caused by the moon not by malaria. As a farmer in Goma, Mukono explained, 'People have seizures here. In children, some will fall sick about once a month. When the moon is not in the sky, you will see problems in those children. When the moon comes back, they will stop having those problems'. Similarly, in Kampala, Mama Zawadi claimed, 'The moon affects the brain of children. When there is no moon the brain stops working properly and then certain problems like seizures start to come out'. However, Mama Zawadi remarked, 'That is only a problem with children. Adults are not affected by the moon'. Seizures that occurred in children during the phase of a New Moon were perceived to be less problematic as there was a direct cause and these seizures ceased after childhood. If these seizures persisted during the day, past childhood, or became more frequent during the month then they were a sign of something more dangerous.

Although previous accounts of epileptic patients in Uganda discuss the ways in which epilepsy is contagious (Orley 1970), not one of my interlocutors described *ensimbu* in this way. While not described as infectious or contagious, people still described *ensimbu* as very dangerous (*kyabulabe nnyo*). As a slaughterhouse worker who had suffered from occasional seizures as a child explained, 'I couldn't tell my friends I had that problem. I was very shy. I could fall down anywhere and people would run away from me. I could urinate on myself. I was like a mad person. It was a very serious problem for me'. The slaughterhouse worker explained how one year as a teenager the seizures had suddenly stopped. 'My family would always pray and God took it away', he remarked. The worker claimed that it must have been God's intervention that stopped the seizures. This was because in his experience seizures did not have a biomedical cure. As he asserted, 'They can't treat *ensimbu* in the hospital, they can help you with some medicines that make you sleep, but they can't cure you'.

The only time in which people talked about a cure for seizures was in relation to malaria. The relationship between malaria and seizures has been documented extensively within East Africa (Langwick 2011; Waruiru et al. 1996). In this literature, there has been a particular focus on '*degedege*', which translates into English from Swahili as bird-bird. *Degedege* is used as a broad description for convulsions, which are often associated with children (Langwick 2007; 2011). Studies on *degedege* discuss multiple factors as to what triggers this type of seizure, with causes ranging from spirits in Kenya (Mwenesi et al. 1995), to a child ingesting dirt from sucking on the umbilical cord during birth in Tanzania (Makernba et al. 1996). Langwick further argues that in Newala, Tanzania, 'the "traditional" malady known in Kiswahili as *degedege* has come to be translated as the "modern" malady of malaria' (2011: 175). This, she continues, is a result of public health narratives which 'draw an equivalence between *degedege* and malaria by insisting that these maladies refer to the same physical condition caused by the same biomedically recognised entity' (ibid). While anthropologists, like Langwick, have described *degedege* as a condition that only affects children, in Uganda people often linked the sudden onset of seizures in both children and adults with cerebral malaria. In accordance, the majority of my interlocutors initially attributed all seizures to high fevers particularly those caused by malaria. This was particularly the case if the seizures began suddenly. While malaria was not the only or sole cause of seizures, that malaria was nearly always mentioned highlights how powerful and widespread the public health narrative which links malaria and seizures has become. It also highlights the way in which biomedical professionals and public health narratives come to create networks around signs and symptoms and the diseases that cause those signs and symptoms.

To illustrate, in Katosi, Hamna claimed he knew one man who from the age of twenty-six began to suffer from seizures. Hamna believed that some people's bodies were more likely to suffer from high fevers that overheated the body leading to the onset of a seizure. He attributed this extreme overheating to malaria that 'climbed to the head'. Similarly, Mama Ajiyo described how seizures (particularly in children) came from '*eyabwe*', a high fever that triggered foaming at the mouth and shaking of the limbs. Mama Ajiyo believed that if this fever, typically caused by malaria, was left untreated then it could take the subject into a coma leading to almost certain death.

The owner of an informal slaughterhouse in Kampala also expressed the way in which seizures could be caused by the body overheating. However, unlike the examples above, he claimed that a specific type of malaria was triggered by the body's exposure to heat. As the owner stated:

> You can get a type of malaria that moves towards your brain and it gets worse when you go near to the fire. The heat wakes up the malaria. When you have that type of malaria you can take the medicine and capture it before it goes deep into the brain. You cannot cure that malaria, even with medicine. The medicine stops the malaria from reaching all of the brain so you will not die. We had one worker here who fell next to the fire and then it persisted and he was doing it weekly so he had to go.

People often cited malaria, fevers, and heat as the principal cause of onset seizures. As previously discussed, malaria was also the condition for which most patients claimed to visit the clinic. In Luganda, fever and malaria are both *omusujja* and therefore my interlocutors claimed that the onset of a fever, which caused a seizure, should be treated with malaria medication. This is the reverse of Langwick's account of *degedege* in Tanzania, in which doctors and nurses suggested that there was a tardiness amongst parents who first took children displaying 'malarial' symptoms to a traditional healer (2011: 179). Unlike Langwick, I observed that malaria was considered to be a primary cause of seizures and this meant that treatment for malaria was immediately sought after the onset of seizures.

The link between malaria and onset seizures meant that people rarely discussed other sickness that could cause seizures. When asking about pork and seizures, multiple individuals used Muslims as proof that pork could not cause the condition[26]. As Hamna claimed, 'A pig cannot cause that sickness because Muslims still get the same seizures so where would they get it from? They don't eat, touch, or even look at a pig'. Equally, Mama Zawadi concluded, 'I have heard Muslims say that the pork causes seizures but Muslims are eating pork now so they cannot be that scared'.

Out of all the people interviewed across Mukono and Kampala, only one butcher in Kympasi, Mukono discussed how pork could potentially cause seizures. The butcher was at first adamant that pork could block the brain leading to a temporary loss of consciousness and foaming at the mouth. He claimed, 'I know of one customer who kept falling down, I think it's because he once ate too much pork and it blocked the vessels taking fresh air to his brain'. After making this assertion, the butcher became unsure as to whether this was definitely the cause of his customer's condition. He further remarked, 'But no one else is becoming sick from eating pork and there are many reasons for seizures so I cannot be sure'. Although the butcher suggested that there might be a link between pork consumption and seizures, he also highlighted the uncertainty around what exactly triggered the onset of seizures.

When doctors could not find a cause for seizures or there was a failure of treatment, people often attributed the onset of *ensimbu* to relationships outside of the individual body. As Luka reasoned at the beginning of the chapter, seizures that began suddenly during adulthood and could not be treated through malaria medication or explained through genetics were attributed to other causes such as bad spirits. Interpretations of such bad spirits were multiple and the following case as spoken by Amos, the urban farmer, illustrates a typical account.

One particularly hot afternoon, Amos decided to erect an impromptu extension to his ever-growing pigsty. As he worked, he began to recall how his stepmother had once found nine free-roaming pigs in her farm digging up her cassava and eating her potato vines. Amos began to act out the story. He started by detailing how his stepmother had called the owner of the pigs and

[26] Studies have documented that non-pork eaters have as great a chance of NCC infection as pork eaters (Mafojane et al. 2003).

how they had begun to quarrel. The situation escalated and resulted in Amos's father going first to the LCI (local council chairman) and then to the local police station. The police told the owner of the pigs that she had to pay Amos's family for the damage that the pigs had left on their farm. After the disagreement, the owner of the pigs left the town without paying Amos's family. As soon as the owner of the pigs left, the health of Amos's father began to deteriorate. Amos began to describe his father's symptoms. He recalled, 'He said there was a weight on his chest and his legs stopped working. He complained more and more there was a thing sitting on his chest. His muscles became weak and his skin started to hang down. Then he started having seizures everyday'.

The family decided to take Amos's father to a local health centre. There, Amos explained, 'They found nothing. They never knew what was wrong with him. All the doctors said, "We don't know what this *Mzee* [old man] is suffering from"'. The family decided to take his father to the village church where they prayed for him but after two weeks, his health had not improved. Before his father died, Amos noted how he had told him that it was the owner of the pigs that caused his suffering and that he should move away from that land. Amos concluded, 'That woman left and cursed my family with bad spirits, it took only a year and my father was dead'.

Amos's story highlights how important diagnosis is for determining the cause of seizures. If patients were taken to hospital and doctors deemed their condition untreatable, then people started to explore other explanations and causes of the sickness. This lack of diagnosis suggests why informants throughout Mukono and Kampala frequently mentioned the link between seizures, bad spirits (*omwoyo omubi*), witchcraft (*eddogo*), and demons (*mayembe*). This is similar to other studies on epilepsy in sub-Saharan Africa, which emphasise how epilepsy is often attributed to 'bewitchment, witchcraft, poisoning and black magic' (Keikelame & Swartz 2015: 8). In Uganda, some of these attacks were said to be so sustained and powerful that they eventually caused people to become mad (*omulalu*). As a pork consumer in Katosi established:

> I really do not know what causes lasting seizures but I think it is demons. You know, some people fail to perform cultural practices or they fail to perform rituals and then the demon follows them. When it is a Christian suffering then people pray to try and help them get better. Sometimes people start to go mad. After the seizures, they might even start to walk around naked or talk to themselves. It is common in this community.

Throughout Mukono and Kampala, seizures that occurred without an established cause, resulted in a chronic, untreatable condition that people frequently linked to mental health and 'madness'[27]. In his book *The Quest for Therapy in Lower Zaire*, John Janzen similarly describes how amongst the BaKongo, severe epilepsy could result in madness (1978: 179). Janzen illustrates further how in Zaire, family members or the 'therapy managing group' (ibid: 4) negotiated treatment regimes, acting as a broker between sufferers and medical practitioners. In the process of deciding which therapy was necessary for a sickness, the BaKongo would make a distinction between a natural 'illness of God' and a human caused 'illness of man' (ibid: 8). Janzen illustrates how the presence of certain signs shifted the etiology of the illness (from God to human) and this in turn altered the therapeutic process.

The importance of the family in deciding the underlying cause of seizures and therefore the therapeutic response was also clear in central Uganda. For my interlocutors, if seizures could be treated with biomedicine this limited familial uncertainty around potentially wider and more complicated causes. Once it was clear that a doctor could not cure a person's seizures in the hospital, the person's body became permanently sick. In turn, they increasingly lost hope for the future. The way in which the causes behind seizures shifted from malaria, to bad spirits to madness becomes clear through the following case of Moyo, a 20 year old from Nama sub-county. Moyo was the son of Kato, a pig farmer who I regularly visited.

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[27] This is reflected in a survey (Kaddumukasa et al. 2016) on knowledge, attitudes and perceptions of epilepsy amongst adult respondents in the urban and rural Mukono district in which the majority (61.3%) of informants did not know any causes of epilepsy. The survey found that a minority believed that seizures were caused by insanity while a third believed they were a result of mental illness.

Moyo

One afternoon after harvesting and feeding his pigs potato vines, Kato and I walked the short, sandy path back to his house followed by his dog Benny. When I had arrived earlier in the day, Kato had briefly commented that his son, Moyo, had been suffering from seizures on and off for the past two days. As we walked towards his home, Kato began to explain how Moyo's seizures had first started a year ago.

Kato described how during the previous year he had taken Moyo to a hospital in Mukono and how at that time they had seen a laboratory technician. The technician had tested Moyo for malaria and had found nothing. Kato reiterated what the technician had told him then claiming, 'She told me these seizures are common. She said you can't find his treatment here, go back home and find something else'. Kato remarked, 'There is nothing we can do now, he has come out of it before, he will come out of it again. Last year he would be out the whole day and then the next day he would be Moyo again'.

When we reached Kato's house, a floral patterned cloth obscured the view for the growing number of women who had gathered on a mat directly outside. As we passed, the women called out to Kato and immediately began enquiring into why Moyo's seizures had returned. Inside the house, Moyo lay flat on the clay floor covered only by a blue *kikoi* (sarong). His mother, Letaa, who had stopped her work collecting tea in the nearby plantation, had stayed sitting next to him for the entire forty-eight hours. Throughout the period that I stayed inside the house, Letaa continually called out Moyo's name trying to get him to respond. She commented on how during the previous day he had not fully gained consciousness or opened his eyes.

Kato explained how a doctor had recently diagnosed his two youngest children with malaria and so they had been using their left over medication. The yellow pills had since been scattered across the armrest of their only chair, leaving two left in a small, resealable plastic bag. Kato opened a worn notebook and claimed that the drug was named 'Coartem'[28]. Letaa asserted

[28]An artemisinin-based combination therapy.

that she had given Moyo the drug two times a day since the end of the first seizure. In addition to the malaria tablets, Letaa mixed glucose sachets and boiled water in a used Coca-Cola bottle and squeezed lemon and passion fruit juice onto a spoon. Despite Letaa persistently trying to feed Moyo the juice, after a mouthful he would immediately start to vomit. Throughout the hours that passed, Moyo moved from one seizure into the next. Even when he stopped moving his body remained oddly contorted and his heart visibly pumped through his chest.

Later that evening, walking to the village shop to buy *mukene* (Lake Victoria sardine) to cook for dinner, Kato commented on what he believed caused Moyo's seizures to begin so suddenly. He first explained how Letaa believed that the seizures had started when Letaa's grandfather had died and they had not paid a cow or the corresponding amount of money to her uncle. Letaa believed that the hospital medicine was not working as they had not finished paying that debt and that Kato needed to make the journey to Aura in Northern Uganda. Unlike Letaa, Kato believed that the true cause was closer to home. As he continued, 'There is a man from outside the village and he shaved Moyo's head on that day that his first seizure started. The man who shaved Moyo's head was a night dancer (*abasezi*)'. Kato elaborated:

> Night dancers speak with spirits. Those spirits make them leave the house naked and the whole night they just walk around creating problems. Sometimes in the night they start to eat dead people. Those people who are night dancers also do witchcraft. That night dancer sent a spirit into Moyo and now the village is saying he is bewitched (*muloge*). That night dancer sent that thing into my house.

The next day Moyo had started to incoherently mutter. That afternoon, a neighbour came to offer the family support. She discussed how much money it would be to take Moyo to Mulago, the main public referral hospital in Kampala. Moyo had since taken the remaining malaria tablets and Letaa exclaimed, 'If we take him to Kampala we will spend money and they will see nothing there. The doctors know what is happening. They will say go home and finish this problem at home. The doctors will tell me, "that sickness is not coming from anything in his body"'.

Two days later and four days after the seizures had begun, Kato's uncle, a businessman who split his time between Mukono and Arua, decided that a 'rare' type of malaria had affected Moyo's brain and was almost definitely causing his seizures. He sent the money to pay for Moyo to be taken to the hospital in Kampala.

The next morning I met Kato and his younger son who had together brought Moyo into Mulago. It had taken them over four hours to get from their home in Nama to the hospital and by the time they arrived they were too late for Moyo to be admitted. They had spent UGX 20,000 (£4.29) taking public transport to Mulago and were deliberating whether to go home and try to arrive earlier the next day.

Moyo was no longer talking and his body moved uncontrollably. He was lying on a nearby bench without shoes and deep sores had begun to develop around his mouth and nose. Kato explained how when they had arrived at Mulago they were directed towards the mental health section. Kato claimed that the doctor had told him that seizures come from the brain and are therefore a mental problem. The doctor had informed Kato that there was nothing that could really be done for Moyo and that the only real option was to take him to Butabika, the psychiatric national referral hospital. With limited options and a fear of Moyo becoming identified as *omulalu* (mad), Kato explained how he knew a woman from the village who had been working as a nurse in Mulago for many years. After a round of telephone conversations, Kato was given her number and called her. She told him that every Wednesday morning there was a neurology clinic in Old Mulago and to bring Moyo to see a doctor there for examination.

The next day after staying with family in Kampala, Kato, his younger son and Moyo arrived at Mulago at precisely 6:30am. The building was already crammed with expectant patients; the alleyways outside of the clinic were packed with people who stood, sat, and lay down wherever space permitted. Many of the patients had their own blankets but others lay flat on the concrete floor. Kato explained how patients were given a bed in Mulago yet blankets, sheets, and all other provisions had to be brought by the family.

At noon, a doctor examined Moyo and took a short medical history. After a brief, five-minute assessment, Moyo was admitted to casualty in New Mulago, a short walk down the hill. When Moyo reached casualty he was placed at the back of the queue and had to sit in the corridor for a bed space to open. The open walkway outside the casualty was full of patients. One patient, who had bought a chicken, unwound the string that tied it legs and left it to peck at the concrete floor. The bird flared its feathers as buckets of bleach were poured down, the liquid seeping under people's feet. As we waited outside the swinging doors which led into the casualty, Kato turned and remarked, 'In Mulago nothing is an emergency. The doctors have seen these things so many times'. Two hours later, Kato decided to bribe a nurse for the next available bed. As he prepared to find someone he stated, 'I do not want him to have those seizures on the floor any longer'.

Kato came back and carried Moyo into the crammed ward. A doctor who quickly moved between the beds assessed Moyo and wrote a prescription with the drugs that he needed; sodium valproate and carbamazepine (both antiepileptic drugs). The two drugs prescribed were not in stock in Mulago. This meant that Kato's younger son had to spend the evening in the pharmacies of central Kampala in order to buy the drugs, an additional cost of UGX 60,000 (£12.90). The next morning, after treatment had begun, Kato began to worry about the increasing amount of money needed to treat Moyo. When I arrived he immediately told me, 'They said he needs a test on his heart which will cost UGX 60,000 (£12.90) and I don't know why he needs that, the problem is in his head'. Kato subsequently decided not to run the tests but instead treat Moyo with the drugs that the doctors had prescribed. Despite not being able to work, Kato, his younger son and Moyo stayed in hospital for five days. When Moyo was discharged his seizures had stopped and he had regained his speech.

Three months later, Kato called me to say that Moyo's seizures had returned. Back on his farm Kato explained how in Nama the drugs that Moyo needed were not always stocked in the health centre and for the past two weeks he had to keep checking to see if they had arrived. Kato reflected on how while Moyo was in hospital the doctors had found no cause for his seizures and therefore Kato believed that it would be pointless to take him back to Mulago. The fact that the seizures came back despite treatment in Mulago was proof for Moyo's family that they could not be treated in the hospital and should be managed at home.

In the final month of my research, Kato took Moyo to a traditional healer who told him that the spirit of Letaa's grandfather was causing the seizures. The traditional healer slaughtered a hen and told the spirit to stop disturbing Moyo. Kato explained how in the following week this act had temporarily stopped Moyo's seizures. However, it was a fleeting solution and he was now in the process of saving money to make the journey back to Aura to finish paying the debt to Letaa's family. He asserted, 'There is no more hope unless I can find that money'. Six months after my final visit, Moyo died aged 21.

Through accompanying Moyo the uncertainty that seizures generated became explicitly clear. First, I observed that there was reluctance by Moyo's family to go to the hospital, as they believed from both previous medical advice and the local community that seizures could be treated in the home. Furthermore, once in Mulago, accessing a neurologist was difficult and certain health professionals also suggested that seizures were associated with mental health and were only treatable in mental hospitals[29]. Once Moyo was admitted to Mulago, the drugs and tests that he needed were expensive. This meant that Kato was forced to choose between buying drugs to treat Moyo's seizures symptomatically and performing diagnostic tests to determine the possible causes of the seizures.

As Alice Street illustrates in Madang Hospital in Papua New Guinea, without the facilities to make definitive diagnosis, doctors informed patients that they did not have the medicine for their sickness (2014: 158). Despite the doctors' belief in the efficacy of biomedicine and the biological causes of sickness, the suggestion that treatment could not be found in the hospital

[29] This finding is in line with Bishara (2008) who noted in Uganda that although epilepsy is described as a neurological disorder, cases were nearly always treated in psychiatric services.

reinforced a distinction between 'village sickness' and 'hospital sickness' for patients (ibid). Similarly in Tanzania, Langwick notes that nurses diagnosed *degedege* and referred patients 'outside of the clinic' when hospital medicines for malaria appeared not to work (2007: 89). Drawing on these accounts, in Uganda, seizures that doctors could not diagnose or treat with biomedicine, were always framed by my interlocutors as a sickness that could only be treated at home. This in turn suggested that doctors and biomedicine had little efficacy in treating chronic seizures and that the true cause of the condition was social and not biological. Through tracing the way in which different individuals responded to Moyo's seizures, I suggest that Ugandan doctors treat the majority of seizures symptomatically. This means that if NCC were the cause of a seizure, it would continue to go undiagnosed in hospitals and therefore potentially untreated.

Clinics

The health system in Uganda consists of public and private institutions. The public sector is based on a referral system and is comprised of district level health centres, regional hospitals, and national hospitals. In Nama, the village where Moyo lived, there was a health centre – the first rung of the system. In charge of this health centre was a nurse who provided an outpatient clinic in which she treated diseases, most commonly malaria, as well as providing antenatal and postnatal care.

Throughout the course of his life, Moyo travelled from this health centre to the public hospitals in Mukono and in Kampala. Although technically free of charge, it has been documented that in Ugandan public hospitals there is a lack of resources, drugs, and staff (Bouchard et al. 2012; Yawe & Kavuma 2008). This echoes Maia Green's account of public hospitals in the Ulanga region of Tanzania, in which she found that medicine was often unavailable and basic diagnostic facilities were absent (2000: 409). As in the case of Moyo, Green also found that once in the Tanzanian district hospital, patients had to 'purchase drips, drugs and dressings from the newly established chemist's shops' (ibid: 410). This lack of drugs and diagnostic facilities had a direct impact on what doctors in public hospitals could realistically diagnose or treat.

This lack of facilities also had implications for the way in which medical professionals dealt with seizures. This was evident in the sub-county clinic in Nama in which Moyo had been taken when his seizures had first begun. In the clinic, the nurse claimed that epilepsy was a common condition in Nama. As she explained, 'People have sudden seizures. They get given tablets and once they are finished they start having seizures again. Some have not had it for most of their lives and then they suddenly start. Others have just one seizure and then completely recover. That problem cannot always be treated with medicine'. The nurse explained how often there was no medicine stocked for seizures in the clinic. Thus, as in the case of Moyo, people would have to travel from Nama to Mukono town in order to buy broad-spectrum antiepileptic medication from pharmacies.

Aside from being referred from public health centres to hospitals, sick individuals could directly visit a private hospital. Yet, for seizures, even in private clinics diagnosis and treatment was complicated. Private clinics in Mukono, while providing more facilities than the public hospital did not have diagnostic devices such as brain imaging technologies. This meant that in both private and in public settings most doctors treated seizures symptomatically. As a doctor in a private clinic in Mukono town explained, 'For recurrent seizures the best we can do at the clinic is give them a medicine to control the seizure, make them rest, boost them with glucose, and monitor their vitals'. This claim suggests that in Mukono, going to a private clinic in order to establish the cause of a seizure would simply add additional costs with the same outcome as in a public hospital. This illustrates the power that medical professionals have in framing what is treatable within the hospital. When Moyo's seizures were deemed untreatable, his family believed there was no hope left in biomedicine. This meant that taking Moyo to the hospital became expensive and ultimately unnecessary. Furthermore, hospital costs were fruitless if family debts were left unpaid in Aura.

In all of the clinics of Mukono when I asked about human cysticercosis, I was told by doctors that the only place in which the condition could be seen in Uganda was in Kampala and more specifically in Mulago. It was, moreover, only in Kampala in which doctors ever discussed the link between seizures and NCC.

A week after Moyo had been taken to Mulago, I arranged to meet one of the doctors who ran the neurology clinic at Old Mulago. Every Wednesday, the neurology clinic was packed full of patients, however, on other days of the week it remained relatively empty. The doctor and I began by speaking about the different perceptions of epilepsy. She claimed, ‘People are ignorant and witchcraft is the easiest explanation. Others think that it is a cultural problem and that the problem might be in their clan so they think they have to go back and settle that dispute. Really I don’t have time to explain the actual problem to them’. Through choosing not to explain to patients what may be causing their symptoms, the doctor reinforced that the sickness may not be treated by doctors within the hospital.

On the topic of NCC, the doctor began to list the common signs and symptoms she would look for in patients; persistent headaches, fever, and seizures. She continued, ‘I think NCC is not a common diagnosis. Here we mostly get strokes, brain injuries from accidents, epilepsy, and general seizures but I have never seen NCC’. I asked if when people presented with seizures this would be explored further. She explained:

> If someone is seen by a physician but then keeps coming complaining of a headache or seizures we would probably recommend a CT scan. The problem is the CT machine in Mulago is not reliable. It was actually down since January [2015]. I think it is back running now but now there is no contrast. Even when everything is working then the cost is so much, maybe UGX 120,000 (£26) for a scan and that is the cheapest. When you go to a private clinic the price really goes up and most people can’t afford that. But for the diagnosis of NCC, a CT scan is vital and I really think with the scan you will maybe begin to see more cases.

This doctor’s claims indicate how NCC could not be enacted by medical staff in the public hospital due to a lack of diagnostic facilities. The doctor may have never seen NCC in a patient but equally the infrastructure in order for her to enact the pathogen and make it visible was absent. As a male laboratory technician from Mulago similarly concluded:

> Cysts in the brain would probably only ever be seen post mortem and even those investigations rarely happen. CT scans are so expensive and doctors are always hesitant to ask someone to pay for one. What if they pay and there is nothing there. It's such a waste of money. CT scans only ever happen when a person is in a coma, or right at the end, then maybe it is seen as necessary.

This notion that cysts would only ever be seen during post mortem inspections was expressed by many of the doctors throughout both the private and public hospitals of Kampala. This reflects scientific studies which highlight how prior to CT and MRI scans, doctors' diagnosis of NCC was limited to external signs visible to the naked eye and those observed during post-mortem inspections (García et al. 2002; Gripper & Welburn 2017). These accounts all indicate the centrality of diagnostic facilities in revealing the inside of the human body and the pathogens contained within it. In Uganda, the infrastructure to know the inside of the human brain was inoperable or expensive. This meant that prior to post mortem, cysts could remain contained within the brain.

While doctors within Mulago claimed the cost for a CT scan was prohibitively expensive for many Ugandans, this cost significantly increased in private hospitals. While public hospitals had limited equipment, there were private clinics in Kampala in which patients could pay for a CT or MRI scan. The first of which was located in central Kampala, a large hospital, with security scanning all the luggage of the incoming patients. Unlike Mulago where patients were squeezed into every available space, the walkways of the private hospital were empty and patients spaced themselves out along every other of the green plastic chairs. In a bright, top floor meeting room, I met a laboratory technician who assisted in the operation of the CT scanner. As we discussed NCC he stated, 'NCC is totally neglected. I have only seen one case of NCC. The patient was actually asymptomatic he was having sinus problems and small headaches but he was not having seizures or anything like that. The scan showed one cyst in his brain'. He continued:

> It is impossible to know the prevalence because most patients cannot afford to do examinations. This is a private hospital so even though our machines are always working we do not have many cases. In Mulago there are probably many more cases but most patients cannot afford the scan so they are treated on their symptoms alone; headaches, body weakness, and seizures.

The technician's comments echoes the claims of other doctors that I discussed NCC with, all of whom highlighted that it was the high price and limited availability of CT scanners that was behind why patients would rarely, if ever, receive an NCC diagnosis. As the technician in the private hospital explained further, 'The cost of the CT brain scan is UGX 245,000 (£53), the general doctor appointment costs UGX 35,000 (£7.50) and for a specialist, like a neurosurgeon it is UGX 65,000 (£14) per appointment. The price really puts many people off'. The technician continued, 'The price means that most problems stop at lower health centres. Most patients will not be coming to highly facilitated hospitals in Kampala. It is all about money, if the prices were lower or free then we would have more patients'. The technician continued describing how it was expensive for patients to come to a hospital in Kampala. He claimed that family members would usually accompany most patients and this meant they also had to stop working. He concluded, 'Even when you have the diagnosis then the treatment is also expensive and sometimes it lasts for a long time. The patients have to ask themselves for a headache is it worth it?'

The way in which doctors framed the lack of NCC diagnosis as attributable to high costs was made clear during a discussion with a doctor at Kampala Imaging Centre (KIC). KIC was another private clinic in Kampala and one of the largest clinics specializing in medical imaging. KIC had three branches spread out throughout Kampala. Between the three centres, patients could access among other tests, ultrasounds, x-rays, mammograms, and CT scans. As a 'for profit health care firm', the doctors from KIC were constantly busy and despite the higher costs, the waiting rooms were always full.

I arranged to meet a doctor who was both a senior consultant and a founding member of KIC. When we first began to discuss seizures he abruptly asserted, ‘In Uganda there are many, many cases of epilepsy but there are so many different causes. NCC is neglected because it is not very endemic in Uganda and there are many more life-threatening conditions that cause epilepsy’. He looked up from his desk and continued:

> Here a patient usually presents with unexplained epilepsy. The patient has to come with a request from a physician first. A physician has to decide to send them here as a last call, so they will have already visited a neurology clinic and received treatment based on their symptoms.

Through this comment the doctor highlighted the time and cost associated with tests even prior to being referred to KIC. Based on Moyo’s example, the majority of patients would be treated based on the clinical diagnosis made in Mulago. I continued by asking why the doctor believed that cases of NCC were rare in Uganda. He swiftly replied, ‘I think the vets are doing a good enough job and that is why the cases are very low’. He paused and then continued:

> Listen, you will probably only see NCC in post mortem because some people do not have serious symptoms. It depends on how many cysts there are and where they have lodged in the brain. In general practice, I would rarely see cases of NCC. However, there was a study done in Gulu [Northern Uganda] with German researchers. The study was referring patients to us based on clinical history, typically onset epilepsy. We screened about 100 patients and I think we reported around 15 cases. That was about one and a half years ago.

As the doctor discussed the preliminary results of the study, he remained certain that in the central region of Uganda, NCC was non-existent. Instead he believed that NCC would be more common in places with ‘intense dry seasons’ such as ‘Karamoja, Adjumani, and Gulu’ (North and East Uganda). Since finishing my fieldwork, the results from the study the doctor described were published. Across the three Northern districts of Uganda, the results from 300 epileptic patients screened for the seroprevalence of TSTC was between 15 and 13.0% (Alarakol et al. 2017). The results, along with the doctor’s claims, illustrate how it was access to diagnostics through a research project that led to the visibility of NCC as a cause of seizures in Northern Uganda.

As Langwick argues in Tanzania, biomedical practices create diseases as knowable ‘entities’. This she argues forms ‘the basis for determining cures’ (2011: 200). In Uganda, doctors did not define the ‘entities’, or in this case the larvae of *T. solium,* and therefore treatment or a cure for NCC was never discussed. From interviews in clinics and hospitals, I argue that doctors primarily treat seizures symptomatically. This meant that doctors did not attribute seizures to NCC, unless I probed them to do so. Drawing on the previous chapters, I suggest that in Uganda, veterinarians and doctors were not enacting TSTC in the same way across different species bodies. Unlike veterinarians who actively sought to enact TSTC as a pathogen in pigs and in pork meat, doctors in hospitals often could not enact it as a cause of seizures in humans. This meant that if present, the pathogen remained entirely neglected inside human bodies.

Situating Diagnostics

The lack of diagnostic facilities in Ugandan hospitals meant that doctors were very rarely able to enact TSTC as a pathogen. As Masana asserts in relation to ‘new illnesses’ such as chronic fatigue syndrome, ‘medical invisibility mainly results from the lack of biomedical diagnosis or the absence of observable evidence or pathology. If aetiology is unknown and diagnosis unspecific, so too are treatment and prognosis’ (2011: 136). Masana illustrates how when causes behind patients’ symptoms are not found by doctors, doctors delegitimise patients’ experiences. This in turn means that doctors are more likely to frame these illnesses as mental rather than physical (ibid). My findings in Ugandan hospitals similarly illustrate how doctors would treat patients symptomatically when diagnosis was difficult. This was the case with seizures. While there are multiple causes of seizures, treating seizures symptomatically rather than establishing the aetiology of the seizure means that a definite diagnosis and therefore definitive treatment can never occur. Moreover, in terms of NCC, as Ugandan doctors treated seizures symptomatically, the networks that sustain TSTC as a treatable pathogen were not being created or sustained across different species bodies. This had implications for the way in which my interlocutors perceived seizures more generally.

Among my interlocutors it became clear that when ‘seriously sick’, one should search for a cause and in turn a treatment. This was because an uncertain cause of seizures put people’s pursuit of a good life into jeopardy. As has been argued throughout this thesis, people described being healthy as intrinsic to life. As Luka explained to me, ‘Being healthy is the most important thing, more than money, more than anything. You don’t want to be rich with a lot of problems. When you are sick you can’t provide for your family, you can’t enjoy your life’. In line with this claim, the onset of untreatable seizures meant that people lost hope for their lives and for the lives of their families. As Mama Ajiyo similarly commented, ‘If you are healthy you still have hope. Being sick you become hopeless. When you are healthy you have hope to fight for your life’. However, a person could only be healthy if they found a treatment or a cure for their condition. Thus, if doctors in clinics and hospitals were unable to provide this, families began to reassess their relationships with neighbours and family members and discussed how to mitigate potential acts of witchcraft.

From the accounts outlined above, I argue that accessible diagnostics are one way in which to create the networks which would allow for doctors to enact NCC as a potential cause of seizures. During an interview with the doctor at KIC, he described how in his opinion a diagnostic test for NCC would almost certainly increase the number of those diagnosed. As he elaborated, ‘A CT scan is not the first examination of choice for any patient. If someone made an antibody titer that was good enough then that would be cheaper for patients and you would probably see a significant increase in NCC cases’.

In line with the doctor’s observation and in an effort to control TSTC, ILRI have collaborated with the University of Edinburgh, Arista Inc., and Astel Diagnostics to develop a prototype, pen-side rapid diagnostic test (RDT). The scientists have designed the test to detect porcine cysticercosis using pigs’ blood or serum. ILRI scientists explained that the RDT could detect circulating antigens; a sign of an active TSTC infection. The scientists claimed that the RDT could therefore provide a rapid, cheap, pre-mortem diagnosis which would prevent infected pork from entering into the food chain. Despite being designed for use in pigs, veterinarians at ILRI informed me that there was no reason why a diagnostic test for porcine cysticercosis could not also detect cysticercosis in humans.

As the RDT is entering the late stages of development, the researchers involved are questioning where along the pig supply chain the test should be placed. A veterinary epidemiologist at ILRI articulated this dilemma during an interview. As he discussed the diagnostic test, he asserted:

> The farmer thinks that their pig looks healthy. They think “it’s not my problem”. For a farmer who has her one sow tethered beneath a tree, she will not want to pay that money. The trader just does not care. They will not lose money from one cyst. So then it becomes the problem of the consumer. That is when it becomes a public health problem.

In line with the epidemiologist’s comments, I argue that there should be a focus on making the disease visible not just to actors along the pig supply chain but also to doctors. This will only be made possible if adequate, cheap, and accessible diagnostics are introduced in clinics and in hospitals. This means that the novel RDT could be used to detect NCC in hospitals and clinics, targeting epileptic patients who may require treatment for the disease. While the RDT would not prevent infection of TSTC, it would allow networks around TSTC to be developed, meaning that doctors could potentially enact the pathogen as a cause of seizures in humans.

While making the diagnostic available to doctors in hospitals may not lead to its systematic uptake (Asiimwe et al. 2012; Chandler et al. 2014), I argue that if only veterinarians introduce and use the diagnostic, then this would emphasise that veterinarians are able to stop the lifecycle of the pathogen in pigs before it reaches humans. Thus, a diagnostic test for pigs would entrench an idea that serious sickness in humans, such as seizures, does not come from pigs. As the diagnostic is in the final stages of its development, it is important to consider that depending on where the RDT is positioned, it could only serve to reinforce and neglect TSTC infections in humans.

Conclusion

NCC is the leading global cause of onset epilepsy and brain-imaging tests are currently the best way to diagnose the condition (Nash et al. 2013). This chapter has illustrated how NCC in Uganda, despite potentially causing the onset of seizures in patients, remains invisible to doctors in hospitals because of limited diagnostic facilities. In hospitals, diagnosing NCC was either prohibitively expensive or simply impossible due to a lack of diagnostic facilities. This meant that in discussions with doctors and laboratory technicians over NCC cases, it was claimed that the condition was extremely rare, or even non-existent, in Uganda.

In Mukono and Kampala, individuals along the pig supply chain suggested that with the onset of seizures there was a process of elimination behind the potential causes of the seizures. This started from causes such as malaria and moved through to social relationships and witchcraft. The latter of which could not be treated in hospitals but instead in churches and within the home.

From epidemiological studies (Alarakol et al. 2017; Katabarwa et al. 2008), it is evident that NCC is present in Uganda. I suggest, however, that the reason that it is rarely diagnosed in humans is because doctors are unable to enact it as a pathogen. NCC demonstrates the limits of the 'clinical gaze' (Foucault 1973), in isolating pathogens that potentially cause serious sickness in humans. This is because in order to create a network that allows for the visibility of NCC, doctors are reliant upon a whole wealth of associations, including among other things, patients, CT scanners, MRI scanners, and laboratories.

In Uganda, NCC can only become a reality in human bodies when doctors bring it into existence (cf. Kirksey 2015; Latour 2000). At present, seizures in hospitals and clinics are most often treated symptomatically. I conclude by arguing that making NCC visible as a parasitic infection that causes seizures, is vital for re-establishing the link between human and porcine health. If the new RDT designed by ILRI were to be used by both veterinarians and doctors, it would allow for the potential alignment of veterinary and human health. This would start the process by which serious sickness in humans is linked to a pathogen contained within pigs' bodies.

Conclusion

A year and a half after the death of their son Moyo, I visited Letaa and Kato. As we were sitting under the shade of their jackfruit tree, they described how six months after Moyo's death they had sold all four of their pigs in order to pay their debts in Arua. After the sale of their pigs, they had both made the journey to the North of the country, staying with and paying the money to their extended family members. The money from the pigs had, in their opinion, saved their family from further misfortune. Since then they had reinvested in three piglets that they had tethered to wooden pegs outside their home. That afternoon I accompanied Letaa and Kato to gather feeds for their piglets. As Letaa affectionately fed the piglets from her hand, Kato turned to me and proudly described how as these piglets grew, so too did their hope for the future.

Throughout the chapters of this thesis, I have demonstrated how in Uganda, health was indicative of life and how people attempted to transform pigs' bodies, pork, and their own bodies in an attempt to cultivate a good life into the future. My interlocutors articulated that health could be seen through the material quality of the body. This was the same whether the body was a pig or a human body. This meant that it was only sicknesses, which had clear signs and symptoms that people considered to be serious. As signs and symptoms were indicative of which sickness a person was suffering from, when a disease was asymptomatic or the signs were unclear, the person or pig was not considered to be sick. This was the case with TSTC. The signs of TSTC were not understood by people along the supply chain to be signs of sickness. This was largely because for the majority of its lifecycle, TSTC did not affect the outward appearance of a healthy body.

In response to calls for situated scholarship that explores multispecies relationships (Kirksey & Helmreich 2010; Nading 2013), my thesis starts by illustrating the ways in which pigs were part of families' lives and how pigs actively contributed towards the *obulamu* (health/wellbeing/life) of farmers and their family. In chapter one, I illustrated the ways in which pigs provided for and became part of the family and most importantly how money from pigs paid for children’s school fees and the emergency costs of the family. I demonstrated how pigs, particularly fat pigs, embodied a source of cash – money that the family could rely upon in the long term as well as one that was easily accessible in times of crisis. I therefore suggested that the transformation of pigs’ bodies translated into hope for the family into the future.

In an effort to ensure their pigs became and remained fat, farmers adopted practices that would transform pigs’ bodies. This included allowing pigs to access feeds through free roaming and administering specific types of drugs from veterinary drug shops (chapter two). The first of these practices was at odds with the biosecurity measures as advocated by veterinarians. Across pig farms, farmers reported that African swine fever, known in Luganda as *omusujja* was the most challenging disease. While veterinarians advocated practices that would keep pigs’ bodies pathogen free, for farmers a healthy pig body was a fat pig body. A stunted pig was a sick pig and therefore farmers adopted practices to ensure that pigs became and remained fat. The tension between veterinarians and farmers indicates the shifting reality of what constitutes a healthy body. When farmers base the health of their pigs on the presence of symptoms such as stunting, biosecurity measures become increasingly meaningless.

Along the supply chain, *omusujja* was widely known as a sickness in pigs that did not infect humans. As a highly visible sickness that was not infectious for humans, individuals believed that even the most serious of sicknesses in pigs could not cause sickness in humans. This filtered into the practices of traders, who actively sought sick pigs. This was because traders perceived sick pigs to make the most profit. In chapter three, I described how slaughterhouse workers and traders attempted to produce marketable meat for butchers. Chapter three therefore links to chapter five, in which I illustrate how in pork joints, consumers demanded meat that appeared ‘healthy’, with meat consumption closely linked to the production of healthy human bodies. Customer demands fed back into slaughterhouses, where workers produced meat without obvious signs of sickness, which in turn would make it marketable. The practices that slaughterhouse workers used in order to transform meat, involved removing or disguising abnormalities in the meat. Through documenting how sick pigs could be transformed into marketable pork, I argue that similar ideas about what constitutes health and sickness travelled along the entirety of the pig supply chain.

The way in which my interlocutors conceptualised healthy bodies, correlated directly to the way in which they believed they were able to 'live with' different species. My research suggests that these relationships were fundamentally different depending on whether the species in question affected the health of the body. In Uganda, if species lived outside of the body, such as pigs, then they should appear healthy, as their bodies were signs of the future of the family. People described living with something that was external to the body as *kubeera ne.* If the species lived inside the body then it was important that they did not produce obvious signs and symptoms of sickness. People described this notion of living with something inside the body, without signs or symptoms of sickness as *kubeerawo.*

The idea of 'living with' a pathogen was the way in which my interlocutors spoke of HIV infections (chapter five). HIV was something people could live with as long as it did not cause signs and symptoms of sickness. The most significant of which was becoming thin. Pork played an important role in allowing HIV patients to care for their virus and in turn their bodies. As with HIV, people also described worm infections as something that could live inside the body (chapter six). It was only when worms became in excess and in turn caused symptoms that people deemed them to be a sickness and something that could not be 'lived with'. This was, in turn, why people never described diseases such as malaria as something that one could 'live with', as the disease caused clear signs and symptoms of serious sickness, including fever and rigors. Understanding how people lived with different species indicates why for large parts of its lifecycle people did not consider TSTC to be a sickness, as it did not cause pig or human bodies to appear phenomenologically sick (cf. Leder 1990).

The development of beneficial relationships between pigs and people masked the emergence of species which had the potential to threaten human lives. From the point of view of people working along the pig supply chain, TSTC was not a sickness or a pathogen. This differed to veterinarians for whom a 'trained eye' meant that signs became signs of an underlying pathology contained within the depths of a pig's body (cf. Foucault 1973; Law 2010). Veterinarians in turn attempted to enact pathogens, making them visible and creating networks that sustained their existence (chapters two and four).

Starting on farms, in chapter two I illustrated how Joseph, a para-veterinarian, enacted *njoka* (generic worms) through signs that were present on the pig's body. Yet, through Joseph's act of making specific diseases visible, farmers believed they could go directly to veterinary drug shops, buying appropriate drugs and treating animals themselves. This, farmers alleged, cut out the expense of calling out a veterinarian. As Joseph highlighted which drugs treated which signs and symptoms, farmers stopped calling him out to diagnose their animals.

While Joseph attempted to make diseases visible on farms, Gloria in her butcher trainings attempted to scale up pathogens, making them visible in meat (chapter four). In her attempt to do so, she focused predominately on hygiene practices. In accordance, she enacted pathogens as being the result of dirty environments and unhygienic practices. She discussed how unhygienic practices would introduce pathogens, which would spoil meat and butchers' businesses. Through focusing on hygiene and the outside environment, Gloria did not make it explicitly clear to butchers that pathogens were part of the meat and therefore sicknesses in pigs on farms could cause sicknesses in humans who ate pork. In Gloria's attempts to enact pathogens, she reinforced that butchers could prevent the spread of all zoonotic diseases through the adoption of hygienic practices.

Through following the practices of Joseph and Gloria, the difficulties of translating samples generated in laboratories into pathogens contained within bodies became evident. This became particularly apparent when observing meat inspections (chapter four). ILRI led studies informed Ugandan meat inspections. The results from ILRI studies indicated what diseases meat inspectors should be attempting to identify and eliminate. However, in chapter four, I have shown that without appropriate infrastructure, *Wambizzi* meat inspectors were unable to enact diseases such as TSTC. This was reflected in studies, which indicated that despite trained meat inspectors inspecting pork in *Wambizzi*, meat infected with cysts still passed into the food chain (Nsadha et al. 2014b). Despite meat inspectors knowing that pathogens could be contained within the meat, they still passed pork as 'fit for human consumption'. This was because the signs of TSTC (such as small cysts contained within a specific location of the carcass) were not obvious. As meat inspectors only condemned meat with highly visible signs of diseases, this reinforced to slaughterhouse workers and traders that sickness in pigs was highly visible and often (as in the case of ASF) not a threat to human health.

Drawing on the work of STS scholars (Mol 2002; Mol & Law 2008; Law & Lien 2011), this thesis has shown the complexities of enacting a pathogen across different species bodies. Although veterinarians could not always identify TSTC in pigs or pork, they did always discuss its potential presence. Conversely, in hospitals, doctors dismissed the presence of the pathogen in humans almost entirely (chapter six and seven). While doctors did have knowledge of the pathogen, they did not think it was present in Ugandan bodies. Doctors rarely tested stool samples in order to diagnose the specific *T. solium* tapeworm and instead treated worms as a generic infection. This approach was supported by mass drug administration programmes, which clustered worm infections into the generic category of soil-transmitted helminths. In chapter six, I discussed how it was this clustering of worms, into a generic category, that potentially allowed the lifecycle of TSTC to continue thereby allowing the larvae of the *T. solium* tapeworm to reach human brains.

Despite acknowledging that patients were arriving with onset seizures, doctors never enacted NCC as an infection that caused seizures in humans. This, I argue, was because NCC was too difficult to diagnose in humans, meaning that doctors would treat signs and symptoms of the pathogen symptomatically. In Uganda, brain-imaging technologies required to make a definitive diagnosis, such as a CT scanner, were either inoperable or prohibitively expensive. Although epidemiological studies indicate that NCC could be the cause of onset seizures in Uganda (Alarakol et al. 2017; Katabarwa et al. 2008), doctors either denied its presence in the hospital or shifted its control to veterinarians. This meant that despite being a zoonotic disease, it was only veterinarians who were creating the networks that would sustain its existence as a pathogen (cf. Kirksey 2015; Latour 2000). This means that if TSTC were the cause of onset seizures, doctors would never enact the signs and symptoms as NCC, meaning that the pathogen would remain untreated in human bodies. It also means that doctors never link serious sickness in humans with a pathogen contained within pigs' bodies.

In chapter seven, I illustrate the consequences of doctors treating epilepsy symptomatically or with malaria medication. This had a spiralling effect in which people suffering from seizures believed that if the medication did not work, then their seizures were not treatable within the hospital. Instead, people believed that seizures, which doctors could not treat with biomedicine, were the result of failed social relationships and ensuing witchcraft. This became clear through the case of Letaa and Kato, who believed that Moyo's seizures were ultimately a result of Letaa's unpaid debts. As doctors could not diagnose a specific cause of Moyo's seizures in Mulago, for Letaa and Kato, the aetiology of Moyo's seizures shifted from a biological one to a socially determined one. In chapter seven, I argued that through not providing a diagnosis, doctors removed hope for a cure. This created uncertainty around the *obulamu* (health/wellbeing/life) and the future of a person.

Through tracing diseases as they move along the pig supply chain, it becomes clear that the identification of pathogens in Uganda was dependent upon whether networks of association (Latour 2000) had been built around them. This holds true for actors along the supply chain, veterinarians, meat inspectors, and doctors. This, however, leads to the question of how to build networks around TSTC, a parasite which for the majority of its lifecycle remains invisibly contained within bodies. As a possible starting point, ILRI have developed a new diagnostic test for diagnosing porcine cysticercosis. In the conclusion of my final chapter, I ask what this new diagnostic test will make visible and to whom. Considering the way in which TSTC travels, I suggest that the novel technology would be of more benefit in hospitals. Despite ILRI developing the diagnostic test for pig bodies, I propose that the test would also transform the way in which doctors come to know whether the pathogen is contained within the brains of epileptic patients. I do not wish to suggest that the diagnostic is a complete solution to controlling or eliminating TSTC. Instead, I suggest that the diagnostic would allow doctors to construct knowledge around and enact TSTC as a pathogen contained within human bodies. This would be the starting point of aligning serious sickness in humans with cysts contained within pigs and pork in Uganda.

The Future of One Health

In Uganda, TSTC crept along the pig supply chain and into human bodies. The slow pace at which the pathogen completes its lifecycle indicates that it will never threaten the globe in the same way as pathogens with pandemic potential, such as the Ebola virus or the H5N1 bird flu virus. Moreover, with a 'simple' lifecycle, TSTC has been described as globally eliminable and eradicable (Schantz et al. 2003). Despite such ambitious targets, to date, no endemic country has achieved elimination of TSTC (Johansen et al. 2017).

The prevalence rates of TSTC in sub-Saharan Africa are scanty and there is reportedly severe under and misdiagnosis of the disease in humans (Johansen et al. 2017; Katabarwa et al. 2008). This lack of epidemiological data makes eliminating or eradicating the disease difficult. Nevertheless, in an effort to eradicate and eventually eliminate TSTC, global institutions, such as ILRI, have adopted and advocated a One Health approach. Yet, throughout this thesis, I have aimed to illuminate the potential consequences of a One Health approach in practice. Hypothetical studies on TSTC have concluded that even if implemented, a four-year One Health intervention strategy based on targeting the pathogen would not eliminate human or porcine cysticercosis (Johansen et al. 2017). The authors of the study cited, argue that elimination was an unrealistic goal and instead of considering how to eliminate the pathogen, the focus should shift towards an attempt to control it.

What becomes clear through the study above is that One Health interventions target pathogens, regardless of how different actors understand their presence within bodies. Despite creating a renewed focus on the benefits of interdisciplinary research, social scientists and their analyses are still largely absent in regards to One Health projects in practice. In response, people researching One Health have increasingly argued that the work of social scientists is needed in order to understand the socio-economic and local configurations of diseases (Bardosh 2017; Choffnes et al. 2012; Craddock & Hinchcliffe 2015; Galaz et al. 2016; Macgregor & Waldman 2017). As Ian Scoones writes, 'realising the rhetoric of a more integrated One Health approach in practice would require moving beyond the science, towards a better linkage between the disease and those affected by it' (2016: 71). This implies that the job of the social scientist is to articulate the lived realities of local actors and to understand how their practices could be the catalyst behind the spread of diseases. I suggest, however, that through focusing only on 'risky' social behaviours, proponents of One Health make assumptions about the scientific framework upon which the concept is based.

The very idea that there is only 'one' health suggests a universal world that can be connected through the universality of scientific knowledge. This follows, Blok, Nakazora and Winthereik's assertion that in the natural sciences, the 'global environment is often performed as *one'* (2016: 1). Drawing on the work of STS scholars and in particular Annemarie Mol (2002), I suggest that pathogens are never ontologically singular and are always being enacted as 'more than one' (ibid: 55). This is particularly the case when signs and symptoms are enacted differently by different actors, across different spaces, and in different species bodies. Yet, through advocating only one version of health, the One Health agenda implies that medical and veterinary professionals are able to produce the same knowledge about pathogens, have access to the same infrastructure to make them visible, and align to enact the same versions of pathogens. In Uganda, this was not the case.

In regards to TSTC, veterinarians gathered data on prevalence rates and attempted to enact signs and symptoms as the pathogen. For instance, for veterinarians, the presence of porcine cysts in live pigs during an inspection of the tongue was a clear sign of infection. However, for actors who worked along the supply chain, bodily signs and symptoms were interpreted based on how sick they made the body appear. Thus, a cyst contained deep within the tongue of a live pig did not cause sickness in the same way as sickness that caused stunting of the pig's body. Veterinarians' ideas about pathogens did not align with supply chain actors ideas about sickness. This was complicated as doctors were not linking signs and symptoms of serious sickness in humans with signs of sickness in pigs and pork. In hospitals, without diagnostics to make TSTC visible, doctors treated seizures symptomatically. Regardless of whether the pathogen was present or not, how different people enacted the signs and symptoms of TSTC differed radically across different species bodies. Work conducted on One Health by social scientists has highlighted the professional hierarchies that can emerge when human and animal health experts work together (Galaz et al. 2016; Porter 2013). In this literature, veterinarians and their knowledge of animal health is often devalued when compared to doctors and their knowledge of human health. In Uganda, the reverse was happening. Veterinarians were indirectly caring for human health and yet this potentially left diseases neglected in human bodies.

From these observations, I argue that One Health should not simply be framed as interdisciplinary collaboration. Instead, One Health should be a research process that documents different enactments of pathogens and sickness. This means that before veterinarians and doctors implement interventions that target diseases in human and animal bodies, social scientists should map the different versions of diseases and where they align and where they converge. It is only once research indicates how different actors enact disease and sickness differently, that work can be done on coordinating (cf. Mol 2002) or choreographing practices (cf. Law & Lien 2015).

Along the pig supply chain, my interlocutors taught me how to look for sickness in the bodies of pigs and humans. They indicated that it was only sickness that produced clear signs and symptoms that needed to be treated. Applying this same logic to TSTC control programmes, I argue that without knowing if the pathogen is in bodies it is impossible to control or eliminate it. Doctors and veterinarians do not have to collaborate through interventions in order to control TSTC. Instead, they have to enact a connection which makes pathogens and the signs and symptoms they cause, visible across pig and human bodies. This requires epidemiological data and diagnostic facilities. In a system with depleted health infrastructure, doctors in Uganda were unable to enact TSTC in the same way as ILRI veterinarians. As international veterinary scientists at ILRI release new diagnostic technologies, I argue that where they are positioned has significant implications for the visibility and control of TSTC. Without aligning ideas about signs and symptoms, and what they indicate in both human and pig bodies, TSTC will continue to remain contained within human bodies and in turn neglected.

Contributions and Recommendations

This thesis explores the relationship between the health of humans and non-human species. I focus on the lives of pigs, humans, parasites, and viruses, to argue that attention should be directed towards the ways in which different species co-create healthy bodies. This argument takes a lead from anthropologists who have recently conceptualised boundaries between humans and animals as blurred, porous, and fluid (Brown & Nading 2019; Macgregor & Waldman 2017; Van Doreen 2014). The guiding research question of this thesis is; how are healthy human bodies shaped and defined by the lives of other species? This question is pertinent for a growing number of scholars working on multispecies relationships (Brown & Nading 2019; Haraway 2003; 2006; 2008; Kirksey & Helmreich 2010; Nading 2013).

In this thesis, I extend the notion of health and wellbeing and move it beyond the human body. Building on anthropological accounts of human health and wellbeing in East Africa (Meinert 2009; Onyango-Ouma et al. 2004; Whyte 1997), I argue for a rethinking of what constitutes a healthy human body and suggest that human health is contingent upon and constituted by the health of other species. In doing so, I move away from understanding animals as symbols of society (cf. Knight 2005) and towards conceptualising non-human species as integral to the lives and health of humans.

In the chapters presented, I illustrate how people actively care for the health of other species in order to ensure the health and wellbeing of themselves and their families. This builds on work by anthropologists who have previously explored the ways in which non-human species and in particular, parasitic worms, become part of human lives and human bodies (Geissler 1998; Lorimer 2017; Moran-Thomas 2013; Nichter 2008). In line with this research, in this thesis I demonstrate how, in Uganda, the health of the pig was not distinct from the health and wellbeing of the family. For farmers, care for the pig translated as care for the family. Accordingly, the health of the pig became indistinguishable from the health of the family.

The care that farmers gave to their pigs was also described by people in relation to species that lived inside their bodies. In regards to worms, I show

how people described worms as alive, with an ability to talk, grumble, walk, and become drunk. I argue that people could only live with worms when they were not highly visible (or audible). As a result, I illustrate how people cared for their worms in order to prevent them from becoming excessive and therefore a sickness. I suggest that care for worms allowed worms to remain silently within the human body without causing phenomenological signs of sickness. As with worms, in discussions around HIV, people described how they had to satisfy and feed their virus in order for the virus to be content and healthy. While a hungry or an awake virus caused a sick human body, a healthy and content virus translated into a healthy human body.

From these examples, I suggest that the boundaries of the human body are constantly being defined and redefined through relationships with other species. This means that the health of one species cannot be separated and detached from another. A virus cannot be abstracted from and cared for outside of the human body or livestock conceptualised as external to and segregated from the family. Through reconceptualising health as more than human, I argue that human health cannot be privileged, detached, or conceptualised as separate from the lives and health of other non-human species.

Relationships between species can co-create healthy bodies and yet they can concurrently influence disease emergence, control, diagnosis, and treatment. In line with the multispecies health argument outlined above, I illustrate what anthropologists and scholars from science and technology studies (STS) can offer to those working within health fields, such as public health and veterinary medicine. Using ethnographic methods, this thesis switches focus from understanding the social conditions that drive disease outbreaks towards examining the enactments of diseases across different species bodies. In doing so, I ask; how are signs and symptoms of sickness enacted by different people across different species bodies and what does this mean for disease control, diagnosis, and treatment?

From the evidence in this thesis, I argue that those working in health fields should not make assumptions about the prevalence of zoonotic diseases based on the body of one species. Furthermore, I suggest that those working in health fields should avoid proposing solutions to zoonotic diseases that are based on single and therefore partial enactments of pathogens. To make this argument, I use literature produced by scholars in STS, who have explored the myriad of ways in which diseases and bodies are enacted in practice (Law & Lien 2012; Lien 2015; Mol 2002; Woolgar & Lezaun 2013). This literature documents how actors bring objects into being as opposed to them having an inherent meaning or form. I contend that diseases are not stable, static, or quantifiable across different species bodies and instead document the ways in which enactments of diseases are embedded in particular ways of doing and ways of seeing (Foucault 1973; Law 2010). Through the example of the neglected zoonotic parasite, *Taenia solium* taeniasis/cysticercosis (TSTC), I show how in Uganda, veterinarians enacted TSTC as a parasite, a pathogen that was stable across both pig and human bodies. This was despite the fact that there was limited epidemiological evidence indicating that TSTC was a public health issue in Uganda. Veterinarians' enactments of TSTC as a pathogen, prompted the development of veterinary interventions that would prevent its spread, as well as funding for novel technologies such as a rapid diagnostic kit for porcine cysticercosis. In this thesis, I illustrate how veterinarians assigned ontological attributes to TSTC as a pathogen, despite the fact that TSTC (as enacted by veterinarians) was not being enacted in the same way by any other person along the Ugandan pig supply chain or by medical professionals in hospitals and clinics.

In making this argument, I illustrate anthropology's contribution to those working within veterinary medicine – as well as other health fields such as public health. I argue that ethnographic methods, anthropological theory, and scholarship from STS, generate new ways of conceptualising zoonotic diseases. In light of this, I argue that the work of anthropologists is central to zoonotic disease control, with anthropological research potentially able to prevent those working in health fields from designing novel technologies or basing health interventions on singular and therefore partial enactments of zoonotic diseases.

In light of the above, I recommend that anthropologists should advance the following three topics. These recommendations are interlinked and generate a framework that contributes to anthropological theory, anthropology in practice, and One Health policy formation.

1. Multispecies health: I argue that anthropologists should open up new ways of thinking about disease and sickness across different species bodies. I suggest that there is a need for anthropologists to challenge the anthropocentrism in accounts of human health and to recognise that human health is often constituted through relationships with other species. I suggest that instead of problematising multispecies relationships, anthropological accounts should document interactions between species and the ways these relationships reconceptualise ideas about care, wellbeing, sickness, and health.

2. An anthropology of veterinary medicine: this thesis provides an insight into veterinary anthropology – an area that anthropologists have recently highlighted as underdeveloped (Brown & Nading 2019). I propose that veterinary anthropology – as an emerging sub-field of medical anthropology – raises important questions around veterinary care and veterinary practices. Unlike medical doctors, veterinarians care for many different species and as a result, veterinary anthropology opens up new ways of understanding multispecies relationships and the ways in which humans live their lives with non-human species. I argue that scholars of veterinary anthropology should cross disciplinary boundaries, contributing to research that addresses current challenges to the health of both humans and animals. This includes topics such as newly emerging infectious diseases and the rise of antimicrobial resistance.

3. An anthropology of One Health: The One Health framework is often discussed by policymakers and those working within health fields as a response to pandemics, particularly Avian Influenza. This means that funding is skewed towards certain types of diseases and certain types of bodies (Bardosh 2016; Galaz et al. 2016). I suggest, in response, that anthropological enquiries

should consider current attempts to provide a coordinated response to neglected zoonotic diseases without pandemic potential. I recommend a move towards an ‘Everyday One Health’ and a recognition of the ways in which many neglected zoonotic diseases raise a very different set of concerns than diseases that present a major global risk. In accordance, I suggest that accounts of an ‘Everyday One Health’ examine the possibilities of integrated responses to the surveillance, control, and treatment of non-pandemic neglected zoonotic diseases.

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