Interpretation of a microbe: Historicizing anthrax in Bangladesh

by

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DECLARATION

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Abstract

This discursive essay considers the role of interpretation in the modern public health laboratory through the lens of biopolitics, and analyses with a case study of anthrax in Bangladesh, the consequent social effects incurred by the global health *in*-security dispositif. The laboratory blazes a trail between the unknown chaotic world of disease with a sensorially perceptible, structured and ordered world. The findings of the laboratory became part of a narrative structure where healers interpret a coherent set of symbols through emplotment that involves the roles of performance and social action in healing enactments. The laboratory is shown to be an inscription device that transform bodily specimens into text that are symbolically represented and imbued with contextual interpretation. Public health laboratories have traditionally been seen as spaces where disinterested scientific inquiry yield objective facts for the protection of the population against infectious diseases. As such, the laboratory has continued to occupy a sacred position, its knowledge generating *work* – the social effects of science - escaping analysis. The historical development of the public health laboratory is traced from its inception, making visible it's efficiency as a tool for the political administration and policing of life that has culminated in the post 9/11 phantasm of global health *in*-security. I show how discourses and the *in*-security dispositif shape the things of which they speak, reflecting a Northern fear and anxiety projected onto everyday life of the South, resulting in what can be described as an epidemiology of affect.

A case study of anthrax in Bangladesh is used to illustrate the influence of particular power/knowledge relationships effected through the globalized health security agenda and how Northern fears and anxieties contaminate local conceptions and beliefs. Could the emerging infectious disease and health *in*-security dispositif reveal the affective spectrum of the North's attraction to the exotic South and simultaneous repulsion by it, reminiscent of the eroticized narrative of New World imperialism? Has the biology of everyday life in the South become interpreted in the North in the symbol of the black woman?

Opsomming

Hierdie diskursiewe opstel beskou die rol van interpretasie in die moderne openbare gesondheidslaboratorium deur die lens van biopolitiek, en ontleed met 'n gevallestudie van miltsiekte in Bangladesh, die gevolglike sosiale effekte wat deur die globale gesondheid *in*-sekuriteit dispositif veroorsaak word. Die laboratorium slaan 'n spoor tussen die onbekende chaotiese wêreld van siekte met 'n sensories waarneembare, gestruktureerde en geordende wêreld. Die bevindinge van die laboratorium het deel geword van 'n narratiewe struktuur waar genesers 'n samehangende stel simbole interpreteer deur inwerkingstelling wat die rolle van opvoering en sosiale aksie in genesingsvervaardigings behels. Daar word getoon dat die laboratorium 'n inskripsietoestel is wat liggaamsmonsters omskep in teks wat simbolies voorgestel en deurspek is met kontekstuele interpretasie. Openbare gesondheidslaboratoriums is tradisioneel gesien as ruimtes waar belangelose wetenskaplike ondersoeke objektiewe feite oplewer vir die beskerming van die bevolking teen aansteeklike siektes. As sodanig het die laboratorium voortgegaan om 'n heilige posisie te beklee, en sy kennisgenererende werk – die sosiale effekte van wetenskap – analise ontsnap. Die historiese ontwikkeling van die openbare gesondheidslaboratorium word vanaf sy ontstaan nagespoor, wat die doeltreffendheid daarvan sigbaar maak as 'n instrument vir die politieke administrasie en polisiëring van die lewe wat uitgeloop het op die post 9/11 fantasme van globale gesondheid *in*-sekuriteit. Ek wys hoe diskoerse en die *in*-sekuriteit dispositif die dinge vorm waarvan hulle praat, wat 'n Noordelike vrees en angs weerspieël wat op die alledaagse lewe van die Suide geprojekteer word, wat lei tot wat beskryf kan word as 'n epidemiologie van affekte.

'n Gevallestudie van miltsiekte in Bangladesh word gebruik om die invloed van bepaalde mag/kennisverhoudings wat deur die geglobaliseerde gesondheidsekuriteitsagenda bewerkstellig word, te illustreer en hoe Noordelike vrese en angs plaaslike opvattings en oortuigings besoedel. Kan die ontluikende aansteeklike siekte en gesondheid *in*-sekuriteit dispositif die affektiewe spektrum van die Noorde se aantrekkingskrag na die eksotiese Suide en gelyktydige afstoot daardeur openbaar, wat herinner aan die erotiseerde narratief van Nuwe Wêreld imperialisme? Het die biologie van die alledaagse lewe in die Suide in die Noorde geïnterpreteer in die simbool van die swart vrou?

Contents

Chapter 1: The interpretation of a scientific discipline

> *"Bioterror is the dream dreamed by postmodern society in the throes of a self-determined state of war, and "anthrax" its wish fulfilment"* (Sarasin, 2006).

This discursive essay considers the role of interpretation in the modern public health laboratory through the lens of biopolitics, and the consequent social effects incurred by the global health *in*-security dispositif. A case study of anthrax in Bangladesh is used to illustrate the influence of particular power/knowledge relationships effected through the globalized health security agenda and how Northern fears and anxieties contaminate local conceptions and beliefs.

To assign meaning is to animate whatever one comes across, to re-shape and change it (Jäger & Maier, 2016). If one is to understand how the work of the public health laboratory has affected society one has to reimagine and reconstruct its performative aspects (Pickstone & Worboys, 2011). Science, a descendent of the art of tracking wild animals, and healing, is imbued with ritual beliefs and practices (Liebenberg, 2013). To approach the inner structure of ritual requires an understanding of the basic building-blocks of ritual, the symbols (Turner, 1977). The symbols in rituals signify a "blaze" such as to "blaze a trail" by slashing a mark on a tree, to represent an element, connecting the unknown to the known territory (Turner, 1977). The symbol of the blaze links the structured and ordered against the unstructured and chaotic - symbols make intelligible what is mysterious, and also dangerous (Turner, 1977).

The classification of disease is the first therapeutic act (Kleinman, 1973). However, the internal events taking place in the patient is not directly accessible to a physician, they are observed through the physician's technological extensions such as the laboratory (Staiano, 1981). Clinical microbiology is the scientific service that specialize in the detection, identification and antibiotic susceptibility testing of human pathogens. When these scientific activities are performed in the hospital or community healthcare service context it is referred to as clinical microbiology (Thomson et al., 2010). When applied by health authorities in the context of population- or community health surveillance of infectious diseases and outbreak response it is considered a public health laboratory.

The laboratory blazes a trail between the unknown chaotic world of disease with a sensorially perceptible, structured and ordered world. Antony van Leeuwenhoek was the first to describe the "animalcules" in 1674 - 1676 and, together with Robert Hooke (1635 - 1703), Marcello Malpighi (1628 - 1694) and others, rendered the first blaze to the microscopic world, just as Galileo's telescope to the vast astronomy (Berger, 1999). The quarry at the end of the path of the microscope was first "captured and domesticated" in the 1880s by the early bacteriologists Robert Koch in Germany and Louis Pasteur in France, rendering bacteria in pure culture on

solid medium as colonies visible to the unaided eye. These developments facilitated the emergence of the aetiological conception of diseases - the idea that a specific microorganism is the necessary and sufficient cause of disease (Rosenberg, 2002). This blaze, symbolically represented by the public health laboratory, was used to track a path from the dangerous unknowns of diseases associated with water, milk and food, and the epidemic diseases cholera, plague, tuberculosis, and pertussis at the end of the 19th century. The laboratory rendered the aetiologies visible, enabling physicians to link microorganisms, symptoms and lesions systematically (Rosenberg, 2002). The findings of the laboratory became part of a narrative structure where healers interpret a coherent set of symbols through emplotment that involves the roles of performance and social action in healing enactments (Hatala & Waldram, 2017).

Public health laboratories are often seen as spaces where disinterested scientific inquiry yield objective facts for the protection of the population against infectious diseases. Although politics and ideology are acknowledged elements of government public health services, the public health laboratory, as a scientific laboratory, continues to occupy a sacred position, its knowledge generating *work* – "the social effects of science" - escaping analysis (Ben-David & Sullivan, 1975). Although recognizing that all scientific paradigms are ultimately founded upon subjective worldviews, a more useful starting point for public health laboratories is the recognition that the laboratory is an "inscription device" that transforms material objects and human bodily samples into signs and symbols represented as text on a laboratory report (Latour & Woolgar, 2013). For this sign to point to a certain state which is conducive to public health action it must be individually interpreted, linked semantically with a referent or assigned to categories known as diseases or syndromes. As such, a sign stands for something else, it is an object or an idea that must be *interpreted* in order to have meaning (Staiano, 1981). In the professional practice of public health laboratory sciences the interpretation of test results is the act of making meaning of the laboratory report for the purpose of medical diagnosis, prognosis, and treatment - "above all, the clinical microbiology laboratory, whenever appropriate, should provide an interpretation of laboratory results" (Washington, 1996). Interpretation is made through the process of semiosis that forges the triad of the object (the thing that the sign actually refers), the representamen (the sign vehicle or the 'object' which signifies), and the interpretant (the response which the presence of the representamen provokes) (Staiano, 1981). Professional clinical- and public health microbiology competence for interpretation requires specialized knowledge obtained during advanced training, and recognized through professional certifications and other appellations (Thomson et al., 2010). Yet a broader context of interpretation exist, neglected in the technical literature of the discipline itself, which must be located beyond the clinical interaction, recognizing that the laboratory is only one point of view, it is an entity that cannot be separated from its situatedness in society (Edsall, 1950). In Science and Technology Studies (STS) it is recognized that the 'work' of the laboratory interacts with, and is co-constructed in relation to other social actors and practices (Timmermans & Berg, 1997). In fact, seminal thinking by Pierre Bourdieu recognized the field of science as social field with a distribution of power and monopolies, struggles and strategies, interest, and profits (Bourdieu, 1975). Robert Kohler further recognized that it is in laboratories where cultural boundaries, between the realms of nature and of religion and politics, are rendered visible (Kohler, 2008).

Chapter 2: Biopolitical securitization of health

Biopolitics is the political rationality for the administration of life and populations as its subject in order to "ensure, sustain and multiply life and to put this life in order"; and biopower represents the modes by which biopolitics acts in society to govern, and subject peoples to government power (Foucault, 2013). Achile Mbembe links biopower to the concept of a state of exception and a state of siege where in such instances, power continuously refers and appeals to exception, emergency, and a fictionalized notion of the enemy, and labours to produce that same exception, emergency, and fictionalized enemy (Mbembe, 2013). Such a fictionalized emplotment of bacteria was presented in the early years of bacteriology by Rudolph Virchow as "foreign bodies" in 1885: "[bacteria] are independent beings, infinitely small, but prolific, with racial features, living in diverse milieus, coming from outside, penetrating the organism like the Sudanese, ravaging it through invasion and conquest, without regard for kinship or alliance (Sarasin, 2006). The work of public health laboratories in the early twentieth century were further subjected to emplotment for the foreign bodies narrative. Through improved laboratory methods germs in the sewage, water and air, were tracked to specific individuals, now labelled "germ carriers" (Leavitt, 1992; Wilson, 1948a). Such labelled individuals became an important focus for a bacteriologically oriented public health illustrating how a new taxonomy was deployed in the fight against disease (Leavitt, 1992). In subsequent decades public health laboratories became useful to colonial commercial interests and in the development of 'the Tropics' (Wilson, 1948a). The Pasteur Institute in Paris, established in 1887, appearing disconnected from politics, participated in the global spread of French colonization (Davidovitch & Zalashik, 2010). Davidovitch argues that the medical science applied to public health had a special place in a Zionist scheme - not only in its important role of protecting the health of newcomers to a hostile epidemiological environment, but also an important carrier of ideals of social progress, equality and justice (Davidovitch & Zalashik, 2010). Wars fought in foreign theatres became a strategic reason for expansion of laboratory networks beyond national borders, to "meet the demands of the moment" (Ash, 1947; Murray, 1963; Wilson, 1948b). The instrumental efficiency of the laboratory as a tool for biopolitics can be recognized soon after the expansions of laboratories in the wake of World War Two: As Wilson noted in 1948 "the Council now possesses in the permanent services an excellent instrument for gaining, by controlled inquiries on groups of the child and adult population knowledge that it believes cannot be obtained in any other way…[the laboratory] provided a useful tool for the discriminating application of the quarantine regulations" (Wilson, 1948a).

The World Health Organization (WHO) facilitated the development of regional and international networks of public health reference laboratories, established under programs designed before 1967 for the surveillance of epidemic prone diseases as part of "pre-eradication" efforts, including cholera, plague, polio, and yellow fever etc. In the 1970s however, laboratory systems became promoted at national, intermediate and peripheral levels within countries as part of campaigns focussed on developing basic health infrastructure and to promote appropriate diagnostic services for humanitarian ideals (World Health Organization, 2008). Since then, global health development programs, including global health laboratory capacity development programs, have

evolved from a discourse focussed on humanitarian efforts in the 20th century to a discourse of securitization. The instrumental biopower of the global public health laboratory development movement became manifest in the wake of president Clinton's declaration of AIDS as a national security threat to the USA and the USA anthrax letters mailed post 9/11 – prioritizing capabilities to detect, prevent and defeat the consequences of nuclear, biological or chemical materials and weapons used by terrorists against the USA (McLeish, 2017). On a global scale the principle of national sovereignty became subordinate to the collective interests for global disease surveillance, formulated in the 2005 revision of the International Health Regulations, an outgrowth of the G8 Global Health Security Initiative (McLeish, 2017). This trajectory is not new, however, and traces back to "the right of invasion and conquest" that European powers were really after in their "frenetic scramble for Africa" (Sarasin, 2006)

Laboratories are powerful because they resemble, and are useful to, the most powerful and ubiquitous institutions of modern society: the nation-state, the middle class, and the capitalist economy (Kohler, 2008). As such, "the power of modern laboratories lies neither in some essential internal feature nor in their social symbolism, but solely in the knowledge that laboratories project into the world" (Bruno Latour in (Kohler, 2008). However, "projection" into the world is made by individual humans and in their collectives, not by laboratory facilities and equipment. Projections are psychological facts that can be observed in everyday life of every human being – in our ideas about others and situations we are often liable to make misjudgements that we later have to correct when we acquire better insight, such as with paranoias (von Franz, 1985). When subjected to psychoanalysis, what is projected is in actual fact a real characteristic of the person in whom the projection originates, of which he is himself unaware (von Franz, 1985). In reflecting on the phantasm of Anthrax in the USA, Philip Sarasin asks "Is it possible that we hanker after the pleasure of infection, the desire to play with foreign bodies that was and is simultaneously more fantastic and more real, even more 'realistic', than any fear of bioterror? Could infection be the central metaphor of globalization, and bioterror the corresponding game?" (Sarasin, 2006). To the psychologist, the question of the origin of the morbid complex of ideas becomes unavoidable, but this question falls outside the scope of this essay (von Franz, 1985).

Chapter 3: Dispositif

In 1977 Michele Foucault introduced the concept of the "dispositif" as a means to gain insight into the practices of power and knowledge in modern societies (de Graaf & Zwierlein, 2013). In everyday French, the word "dispositif" is used to describe a system set up for a specific purpose (Caborn, 2007). In *L'archéologie du savoir* Foucault explains that discourses are to be treated as practices which systematically form the objects of which they speak (Foucault, 1989: 74 cited in Wodak & Meyer, 2001). As such, the discursive relationships determine the package of relations which the discourse must induce in order to be able to speak of the objects, to treat them, to give them names, to analyse, to classify and explain them (Wodak & Meyer, 2001). The power characteristic in the Foucauldian power/knowledge complex is embedded in the network of relationships between different points strategically linked, that stratifies between those who are at the disposal of others who determine the strategy employed to meet a need (Caborn, 2007).

Discourse is the institutionalized way of talking and acting that regulates and reinforces action and thereby exerts power (Jäger & Maier, 2016). The approach to discourse analysis is based on the work of Jürgen Link on Foucauldian theory, as extended by Maier to analyse discourse, to uncover the linguistic and iconographic means by which discourses and non-linguistically performed action and material objects work, and to analyse how discourse legitimize and secure hegemony in bourgeois-capitalist modern society (Jäger & Maier, 2016). In contrast to natural sciences that view material reality as an objective given, "discourse and dispositive analysis examine how reality is brought into being by human beings assigning meaning" (Jäger & Maier, 2016). The linguistically and non-linguistically performed practices and materializations are connected by a power/knowledge complex wherein actors find meaning that helps them interpret reality in ways previously interpreted by others (Jäger & Maier, 2016). Elements of a dispositif are connected not just by a certain kind of knowledge, but also a common purpose they serve, namely the purpose of dealing with an urgent need. This urgent need is a major inner bond that holds a dispositif together. For Foucault the dispositive is a formation which has as it's major function at a given historical moment that of responding to an urgent need [urgence]. The dispositive thus has a dominant strategic function (Foucault 1980b: 195 cited in (Jäger & Maier, 2016).

What might then be revealed through a dispositive analysis is how a disease category is a historically situated artifacts with a membership to a certain grouping that originates from the abstract sphere but is also a product of a particular community of practice and of the social world (Vanderslott, 2020). Given the significant expansion of global health laboratory development programs, financed by Northern governments, their agencies and development organizations, a dispositif analysis of the resulting power/knowledge complex formations may offer a valuable perspective on current interpretations of natural phenomena. A critical analysis of the potential for the laboratory to be rendered, unselfconsciously, at the disposal of broader societal power/knowledge relations of 'in-security' and 'foreign bodies', and how the laboratory might contribute to meaning making in society. It is a necessary exercise since it is only when a disease entity is controversial or socially stigmatized that awareness is directed toward the classificatory system at work (Bowker and Star 1999,

cited in Vanderslott, 2020). To assign meaning is to animate whatever one comes across, to re-shape and change it (Jäger & Maier, 2016). By subjecting the 'work' of global health security laboratory capacity development to critical analysis the possibility emerges for objects to become nondescript as established discourses are withdrawn from the reality that were used to be built on them – those parts of reality become meaningless, and a return to a blank slate is possible (Jäger & Maier, 2016).

Chapter 4: Case Study of Anthrax in Bangladesh

The disease known as anthrax is not just an illness associated with the occurrence of the bacterium *Bacillus anthracis* in humans and livestock. People and organizations attribute meaning to the phenomenon, and it is incorporated into medical, public health administrative, political, and other bureaucratic decision-making-processes and procedures. Anthrax in Bangladesh provides a useful case study on how laboratory capacity development, if framed within the context of global health security, may be at the disposal of power/knowledge relationships that influence the meaning, or render a strategic interpretation of disease, locally and in a globalized context. Through an "archaeology of knowledge" we can relate the phenomenon of anthrax in Bangladesh today through the discourses and dispositif that have constituted its historical appearance (Foucault, 2002: 54 cited in Jäger & Maier, 2016).

4.1 Natural history of *Bacillus anthracis*

Viewed under the microscope the bacterium *Bacillus anthracis* is a rod shaped microorganism, it naturally occurs in soil and has a world-wide distribution. When environmental conditions are unfavourable *B. anthracis* forms spores – seed-like structures that can withstand heat, desiccation, irradiation etc. Spores 'germinate' into vegetative forms when conditions are favourable for growth, such as conditions found in animal tissues. When spores are introduced into an animal they may germinate and grow, producing toxins that result in the disease known as anthrax. In the event of death, the vegetative forms in tissue sporulate when exposed to the outside environment and become redistributed in the soil, maintaining the cycle of sporulation, inoculation, growth, death and sporulation (Turnbull, 1998).

Grazing animals, such as cattle, antelope, goats and sheep may become infected while grazing, typically thought to be caused when spores are traumatically implanted into tissues of the mouth or gastrointestinal tract while feeding, or when feeding in areas with unusually high number of spores. Not all grazing animals are equally susceptible to infection. Cattle are more susceptible than water buffalo, goats more than sheep etc. It would appear that the more susceptible species are more often prone to flock outbreaks, whereas only sporadic individual cases are reported in the less susceptible species. The condition of the animal may also play an important role in the development of disease. Carnivores can become infected when feeding on prey that have died from anthrax (WHO, 2008). The disease in animals typically present as a gastrointestinal disease with septicaemia (bloodstream infection) resulting in fever, septic shock, haemorrhage, and death in a relatively short period of time (hours to a few days). Animals that are exposed, and those whom recover from mild disease develop robust long lasting protective immunity.

Humans become infected through exposure to animals that have died from anthrax, typically from the slaughtering process, causing cutaneous anthrax, and less frequently from eating undercooked meat that leads

to gastrointestinal anthrax. Cutaneous anthrax accounts for >95% of anthrax cases globally and is characterized by the development of a small pruritic painless papule at the inoculation site within one week. After another 2 - 3 days the papule develops into a vesicle that can be 1 - 2 cm in diameter. The vesicle ruptures to form a shallow ulcer with a dark brown eschar at its base. As the ulcer matures it becomes characteristically black and is the source of the name anthrax, which derives from the Greek word *anthrakis*, meaning coal (Turnbull, 2008). In uncomplicated cases the lesion heals over a period of 1 - 3 weeks without leaving a scar. Most cases are associated with low grade fever, malaise and associated headache. In severe cases multiple lesions may develop with extensive oedema that may involve the entire extremity, with pain and signs of toxaemia. At the beginning of the 20th century untreated cutaneous disease carried a fatality rate of 10%, while treated cutaneous disease has rarely been fatal. Repeated infections are milder and evidence suggest robust long lasting immunity (Turnbull, 2008). Gastrointestinal anthrax is reported to occur in 1% of anthrax cases globally, although it carries a 40% mortality if left untreated. Naturally occurring inhalation anthrax is extraordinarily rare, cases are primarily associated with industrial processing of hides or exposure to weaponized spores. A review of 82 reported cases of inhalation anthrax from 1900 to 2005 showed a 92% mortality rate (Martin & Friedlander, 2010).

4.2 Anthrax in Bangladesh

At the inception of the British Colonial Civil Veterinary Department at Bengal in 1892 the imperial administration observed that what it considers to be anthrax in animals was known in the region as "Loodianah disease" (Mohan & Ali, 1948). Later descriptions from the region records the disease in animals as "*torka*", denoting the 'suddenness of death' (Khaleque et al., 1961). The first reports of what is now considered human cutaneous anthrax was recorded by Khaleque in 1961, then East Pakistan, as "*dana-gha*" ("*dana*" meaning pimple, vesicle, papule or pustule, and "*gha*" an ulcer) (Khaleque et al., 1961).

The normative collective affect[1] occasioned by "Anthrax" in the United States of America (USA) is not universal. Blumer suggests that "peasants of Europe and Asia accepted anthrax as natural and inevitable…others saw it as a problem, but inevitable" (Blumer, 1969). A new, perhaps Northern, interpretation of "Anthrax" emerged out of the cold war era's focus on biological weapons; as Turnbull notes "in the developed parts of the world where it is now seen rarely, anthrax has developed something of a 'doomsday bug' status in the mind of the public, and the name frequently engenders unnecessary fear…this anxiety results from the association of anthrax with the topic of biological warfare" (Turnbull, 1998). One of the criteria for assigning a pathogenic microorganisms to the United States Centers for Disease Control and Prevention (CDC) Category A list[2] is that it might cause public panic and social disruption, however the very fact that some infectious diseases are so listed in the USA seems to confirm their fearsomeness (Enemark, 2017). Fearsome

[1] In this context "collective affect" has to do with senses and sensibilities of the collective unconscious and the body writ large (Skoggard & Waterston, 2015).

[2] A list of bioterror agents https://emergency.cdc.gov/agent/agentlist-category.asp

diseases in one country might be considered endemic, natural or inevitable in another (Enemark, 2017). "Cultural liberty, the right of each people to choose and create its own culture…also means that each culture has the right to understand the world through its own ways of knowing" (Haverkort & Reijntjes, 2010).

Vieira *et al.*, writing to promote the Global Health Security Agenda and the US CDC, makes the unsupported assertion that the motivation for endemic countries to prevent, detect, and respond to anthrax is "because of their desire to meet requirements under the International Health Regulations 2005 and Global Health Security Agenda (GHSA)" (Vieira et al., 2017). To meet this desire, the CDC has developed a "start-to-finish" approach that "can be applied in any anthrax-endemic country and can be modified to address specific gaps" (Vieira et al., 2017). The CDC's "start-to-finish" framework is said to advance global health security and biosecurity in endemic countries (Vieira et al., 2017). However, the securitization of public health is a contested project that may, in many regions be in conflict with national and local conceptions of public health as a humanitarian program (Aldis, 2008). Further, the performance of health security may be at risk of being a security threat itself (Wenham, 2019). Biosecurity practices aimed at responding to a natural disease outbreak framed as a matter of national security in an atmosphere of dread, might result in transgression of normal rules that are unjust and unproductive for public health (Enemark, 2017). Reflecting on the discourses of "panic" and "emerging infections" that are incorporated in the mass media and academic narratives in Bangladesh from 2009 (discussed later) reveals an essential element that is absent from the "start-to-finish" framework - the mitigation of potential "panic" and "havoc" that may be created as a result of pursuing Pasteur's proverb[3] "seek the microbe" when it is couched in the terms of *in*-security.

4.3 Anthrax in context

4.3.1 Primarily a livestock disease

The livestock population of Bangladesh is approximately 52.8 million, consisting of 23.2 million cattle, 1.4 million buffaloes, 25.1 million goats, and 3.1 million sheep; the majority of livestock are reared by smallholders in integrated agricultural farming systems (Mondal & Yamage, 2014). A retrospective nation-wide survey of upazila[4] veterinary hospital records from 2010 through 2012 yielded 300,333 cases of Foot-and-Mouth Disease (FMD), 247,783 of Peste de Petit Ruminants disease (PPR), 14,085 dog bite/rabies, 13,436 of Hemorrhagic Septicemia (HS), and 5,937 clinically suspected cases of anthrax (Mondal & Yamage, 2014). The occurrence of anthrax in livestock has been well documented in this region from the time of the inception of the Civil Veterinary Service of Bengal 1892 (Mohan & Ali, 1948). Up to 1948, anthrax accounted on average for 2.6% of bovine deaths due to contagious diseases, ranging from 0.2% to 16.8% annually (Mohan & Ali, 1948). From 2010 to 2012 cattle accounted for approximately 84% of livestock anthrax cases in Bangladesh, followed by goats (10%), buffaloes (5%) and sheep (0.8%) (Mondal & Yamage, 2014).

[3] Cited in Blumer (Blumer, 1969)

[4] Upazila is a Bangladesh administrative sub-unit of a district.

The annual number of reported anthrax in cattle have varied greatly from year-to-year; for example, from 40 cases during the 1898-1899 season, to 804 cases in 1899 – 1900, and 17 cases in 1902-1903 (Mohan & Ali, 1948). Reports from 1958-1959 show annual anthrax cases ranging from 400 to 900 (Khaleque et al., 1961). From 1980 – 1984 Samad reported 62 cases in the Pabna Milk Shed District, and estimated an annual incidence of 2.1% in Pabna, a high-cattle density district (Samad & Hoque, 1986). More recently Fasanella notes that the Department of Livestock Services (DLS) registered 437 animal cases in 2008, 449 in 2009 and 104 cases from July to September in 2010 (Fasanella et al., 2013). Passive national surveillance of animal disease data from the upazila level shows 2,174 cases of anthrax in 2010 (prevalence of 0.14%), 1,688 in 2011 (0.09%), and 2,095 in 2012 (0.17%). During the same years the prevalence of HS varied from 0.18% - 0.38%; rabies 0.19 - 0.58%; FMD 2.81% - 12.91%; and PPR 11.27 - 24.01% (Mondal & Yamage, 2014). However, it should be noted that "some over-reporting of disease data (e.g. anthrax) may have occurred from some upazilas depending on the level of enthusiasm of the responsible livestock authority, which is not unexpected in a disease endemic country" (Mondal & Yamage, 2014). Alluding to the mortality rate of anthrax, Mondal and Yamage notes "some underreporting (e.g., anthrax deaths) may have occurred due to a lack of awareness of farmers" (Mondal & Yamage, 2014).

Although cases are reported throughout the year, a monsoon-associated annual summer peak has been well established. The peak months, however, have shifted from May and June in the first half of the 20th century to July and August in the first decade of 21st century (Khaleque et al., 1961; Mohan & Ali, 1948; Mondal & Yamage, 2014).

Large scale outbreaks have been recorded. The most extensive outbreak on record was the 1918 - 1919 outbreak, resulting in a loss of 3,500 cattle; in these years anthrax was responsible for 16.8% of all cattle deaths from contagious diseases (Mohan & Ali, 1948). Analysis of 1,000 outbreaks between 1937 – 1946 showed the number of cattle deaths per outbreak averaged 8 (Mohan & Ali, 1948). Khaleque reports 80 - 105 annual outbreaks in East Pakistan, with each outbreak limited to 1 or 2 animals (Khaleque et al., 1961). The demarcation of each outbreak in livestock is however influenced by administrative boundaries, and may not represent biological reality (Mohan & Ali, 1948). Mortality in infected cattle up to 1948 varied between 40% - 100%, typically 75 - 90% (Mohan & Ali, 1948); in 1958 - 1959 mortality ranged between 60 - 70% (Khaleque et al., 1961); and between 1980 - 1984 average mortality was 69% (Samad & Hoque, 1986). More recently, the retrospective nation-wide study of clinical records from 2010 through 2012, kept at upazila veterinary hospitals, suggest an annual case fatality rate from 9.31% to 19.92% (Mondal & Yamage, 2014).

4.3.2 Human Disease

As early as 1936, before the availability of penicillin, an outbreak of anthrax in "beef-eating communities" is reported to have caused 66 human cases linked directly to animal slaughter, hides and flesh. The majority of cases presented with localized cutaneious lesions and recovered completely in a few weeks to months; however, septicaemia resulted in 8 fatal cases (Mohan & Ali, 1948). Khaleque in 1961 considered human

anthrax to be uncommon since more than half a million raw hides are processed annually in Dhaka with only 4 anthrax cases reported from hospitals of Dhaka and suburbs in the preceding 13 years (Khaleque et al., 1961). In 1997 the Institute for Epidemiology, Disease Control and Research (IEDCR) is reported to have detected cutaneous anthrax in 19 out of 624 tannery workers in Dhaka city (Ahmed et al., 2010). A single case report of gastrointestinal anthrax in a Bangalee student at Dhaka was published in 1977, and suggests an imported case from Bangladesh to the USA (Nalin et al., 1977). In the Pabna Milk Shed areas Samad reported 27 cases of cutaneous anthrax from 1980 to 1984; none of the 27 cases of "malignant pustules" were associated with pain or fever, and all were cured with penicillin within 14 days without complications (Samad & Hoque, 1986).

The attribution by Mohan and Ali, of anthrax to "beef-eating communities", suggests an early example of othering, or 'foreignness' in the narrative emplotment of the disease in Bangladesh. However, there is no evidence that anthrax is discussed in the context of dread or an 'emerging' disease. The disease, in animals and in humans, is known to be endemic with regular patterns of seasonality, and large outbreaks in animals being well documented prior to 1986.

A clear discursive event took place in 2009 during which, and subsequently, the tone of reports of anthrax in Bangladesh changed. In 2009 after a message was received by a veterinarian at the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR'B). It is reported that a relative from a village in Pabna alerted a staff member at ICCDR'B of many people with skin lesions after slaughtering a moribund cow. This reportedly led to an investigation by a multidisciplinary team from ICCDR'B, IEDCR, DLS, with human samples sent to the CDC in Atlanta for laboratory investigations. This investigation identified two outbreaks. One month later a similar report from Sirajganj was investigated, which in turn revealed a third outbreak. From the three outbreaks 40 sick animals were identified, of which 35 (88%) died. The first outbreak investigation reported 35 people with skin lesions, the second investigation reported 15 people, and the third investigation yielded 5 people (ICCDR, 2009). It was noted that all cases were treated with ciprofloxacin by the physician from the upazila health complex (ICCDR, 2009). Of note, community residents reported that many cattle have been dying of "*tarka*" for many years prior to the multidisciplinary team investigation (ICCDR, 2009). The following year in December 2010, the ICCDR'B noted that there continued to be intermittent reports of anthrax by health workers and newspapers. A multidisciplinary team from IEDCR, DLS, and ICCDR'B was sent to investigate 7 outbreaks over 11 villages in August 2010, with 65 animal cases identified (60% died). The team interviewed 176 suspected cases of cutaneous anthrax and 26 suspected cases of gastro-intestinal anthrax. There was no known case of hospitalization or death due to these outbreaks. The CDC isolated *B. anthracis* of the same genotype from ocular fluid of a dead goat and a vesicular swab of a human case; the CDC collaboration is reported to be the first confirmation of human cutaneous anthrax in Bangladesh since 1986 (ICCDR, 2010; Vieira et al., 2017). Immediately after the first multidisciplinary investigative team's fieldwork the number of unconfirmed cases of cutaneous anthrax reports continued to increase to 607 across 12 districts by the end of August 2010, however, these may have been "caused by increased awareness because of unprecedented media coverage" (Chakraborty et al., 2012). The Government issued a "red alert" on 5

September 2010, and by 18 September distributed 700,000 doses of animal vaccine, placed veterinary doctors and other staff from DLS at checkpoints around the country and in cattle markets to search for infected animals, prevent their slaughter, and prevent sale of infected meat. The "red alert" ended on 7 October 2010, following several days without reports of new cases (Kunal, 2010). From the start of the 2009 outbreak in August until 2011 only two human deaths had been reported (ICCDR, 2011).

4.4 Epidemiology of affect[5]

A review of the outbreaks reported from August 2009 through 2011 the ICCDR'B found that 13/25 (52%) outbreaks were first reported by newspapers, 8/25 (32%) by health officials, 3 (12%) through personal communications, and 1 (4%) by the outbreak investigation team (ICCDR, 2011). The effect of newspaper reports is recounted by Chakraborty "after a newspaper report of another outbreak of cutaneous anthrax in Sirajganj in August 2010, health workers and newspapers reported a series of outbreaks and sporadic cases of cutaneous anthrax from different parts of the country" (Chakraborty et al., 2012). The effect of the reports of outbreaks from August through September 2010 "created fear among the general population, which reduced meat consumption…and had a major negative impact on livestock industry of the country" (Chakraborty et al., 2012). Ashan suggests "the government of Bangladesh had to declare "red alert" for three months (August to October 2010) in order to keep the beef market against possible distortion and to provide safeguard to those farmers (Ahsan, 2012). Similarly, Siddiqui notes of the April to September 2011 outbreaks "meat sales drastically declined due to a lack of consumer confidence and anthrax created mass havoc with significant economic losses related to cattle farming", and "although there were no known case fatalities, people panicked and mass immunization of livestock was demanded by concerned sections" (Siddiqui et al., 2012).

Peer reviewed academic journal publications of anthrax in Bangladesh points to a 2009 discursive event that led to a change in narrative from an endemic disease, tarka, to that of "panic" and "emerging infectious diseases", Anthrax. Ashan notes of anthrax after 2009 "the disease has occurred repeatedly exerting panic to farmers; the outbreaks speculate that it is no longer sporadic rather than enzootic in Bangladesh" (Ahsan, 2012). Ahmed notes "anthrax has emerged as a zoonotic disease in Bangladesh during 2009 - 2010" (Ahmed et al., 2010), and "anthrax is now an emerged zoonotic disease of Bangladesh and its enzootic also for long time" (Ahsan, 2012). This new interpretation of a disease for which there is solid scientific evidence of endemicity and periodic outbreaks from the turn of the 19th century to the 1980s, demands explanation.

Securitization anxiety of the 'Other' emerges within the academic discourse of anthrax in Bangladesh. This is exemplified by Mondal and Yamage, although finding no correlation, hypothesize there to be a difference in disease occurrence between the Indian/Myanmar border areas when compared to "non-border" areas (Mondal & Yamage, 2014). This discourse point to anxieties about the boundaries, or grey zones, separating us from

[5] The concept of the "epidemiology of affect" is developed by Dumes to understand patterns of illness behaviour (Dumes, 2020).

the Other, or self from non-self. Similarly, Rume *et al*. reveal anxieties about contaminated cattle feed from China, reifying concerns of contagion from foreign bodies (Rume et al., 2016).

4.5 Anthrax transmission

4.5.1 Maintenance of anthrax in the environment

Soil in Bangladesh consistently yield *B. anthracis,* and is the most likely source of enzootic transmission in the country (Ahsan, 2012; Fasanella et al., 2013; Galante et al., 2021; Rume et al., 2016). Grass and water hyacinth has been suggested as a source, however only grass, and grass silage feed samples, have yielded *B. anthracis* (Biswas et al., 2012; Galante et al., 2021). Bone meal, also used in cattle oil cakes, have been suspected (Fasanella et al., 2013; Galante et al., 2021). However, a study that included bone meal did not confirm this suspicion (Rume et al., 2020). *B. anthracis* has been detected in one water sample (Galante et al., 2021).

Mohan and Ali in 1946 noted a main cause of widespread epizootics relates to carcass disposal (Mohan & Ali, 1948). Today, carcasses continue to be disposed of in flood or river water, abandoned outside the farm compound; only a few report the shallow burying of carcasses (Ahsan, 2012; Fasanella et al., 2013; Haque et al., 2017; ICCDR, 2011; Islam et al., 2013). It should be noted that abandoned carcasses have an economic value to *muchi*, who make a living selling hides and bones of abandoned carcasses (Fasanella et al., 2013; Islam et al., 2020).

4.5.2 Transmission of anthrax from livestock to humans

Since at least 1936 it was well known that slaughtering of infected animals and handling of their hides and flesh cause human anthrax infections in Bangladesh (Mohan & Ali, 1948). Tannery workers in Dhaka were known to be at risk by 1961 (Khaleque et al., 1961). From 1986 the consumption of meat from diseased animals during outbreaks was noted by Samad as a concern for human anthrax (Samad & Hoque, 1986). It is a common practice for rural villagers to consume diseases animals "if their disease doesn't seem too bad, then we even slaughter and eat them" (Roess et al., 2013). All the post-2009 multidisciplinary team outbreak investigations in Bangladesh confirmed these modes of transmission. Perhaps in the belief that anthrax transmission to humans can be prevented through wholesale national behavior modification, all the post-2009 research studies that included an anthropological component provided further detailed information on community 'risk practices', revealing that sick animals are slaughtered before death to mitigate economic loss as Muslim custom prohibits consumption of dead animals (Chakraborty et al., 2012; ICCDR, 2010; Islam et al., 2013). However, Fasanella noted "a few owners did not slaughter their sick animals because they believed that slaughtering sick, pregnant or under-age animals is forbidden by their Muslim religion" (Fasanella et al., 2013). Perhaps it would be insightful to understand why in some Muslim communities the slaughtering of sick animals is permitted, while in others it is prohibited. This may provide an opportunity to engage with religious leaders as a means to render an interpretation that would prevent zoonotic transmission.

4.6 Vaccination

The lack of prompt diagnosis and control of outbreaks, combined with inadequate carcass disposal methods and poor vaccination program effectiveness, have been emphasized since 1948 as impediments to anthrax prevention (Mohan & Ali, 1948). The live spore vaccine, produced by the Livestock Research Institute (LRI) in Dhaka, is prepared using the non-encapsulated attenuated Sterne F-24 strain of *B. anthracis* from Australia (Dipti et al., 2013). The LRI produced vaccine has been shown to elicit a maximum measurable IgG response by 30 days post vaccination, with detectable levels up to 180 days (Dipti et al., 2013; Zohora, 2011). Revaccination every 6 – 12 months is recommended as immunity is short-lived. Adequate vaccination requires sufficient stock and an effective vaccination administration process. Current annual vaccine production of 3.8 million doses is a small fraction of the 23 million cattle, 1 million buffalo, 21 million goats, and 3 million sheep (Chakraborty et al., 2012). With limited infrastructure and manpower, the DLS distributes anthrax vaccines at a subsidized rate of 50 Taka per 100 doses (Chakraborty et al., 2012). During the 2009 and 2010 outbreaks in Pabna and Sirajganj, Islam reported that only 46,000 vaccines were distributed in a region with 800,000 cattle, where only 9 government livestock officers have a mandate to distribute and administer vaccines (Islam et al., 2013). It has however, been speculated that the abrupt decline in number of anthrax cases in Sirajganj from 111 in 2010, to zero in 2011 and 2012, may well have been the result of government's vaccination response (Mondal & Yamage, 2014). The formal veterinary infrastructure and manpower relied on for vaccine distribution and administration is seen as the primary constraint, together with low demand from farmers results in poor vaccine coverage (Sarker et al., 2020). Haque suggest improving coordination between veterinary services and NGOs in Lalitnagar area to increase vaccination coverage (Haque et al., 2017). The web-based Livestock Disease Information System (LDIS) may enable tracking field cases on a daily basis and aid veterinary outreach (Mondal & Yamage, 2014).

The proposal to increase vaccine coverage by increasing domestic production or importation and increasing demand by raising awareness is common (Chakraborty et al., 2012). However, the recurring assertion that vaccination is the key has only recently been called into question by Fasanella, noting that there is a need for cheaper, faster, and more cost-effective approaches than vaccination "which to date has had limited success in preventing livestock anthrax in Bangladesh" (Fasanella et al., 2013). Given that there has been scant new knowledge generated about anthrax in Bangladesh since 1948, it is perhaps timely to recall Mohan and Ali who, after the largest and most extensive analysis of anthrax in the region to date, reasoned that large scale annual vaccinations were inadvisable on economic grounds, as anthrax contributes a small fraction of livestock disease, as well as on technical grounds given the sporadic occurrence in villages (Mohan & Ali, 1948).

In endemic regions evidence suggest that humans develop effective T-cell immunity from natural cutaneous anthrax infection, despite antibiotic therapy; where the majority of cutaneous anthrax cases are nonlethal and self-limiting, and re-infection is reportedly not seen (Ingram et al., 2010, 2015). Serological studies from the 2009 - 2010 investigation by the CDC in Bangladesh suggest that the self-limited, localized cutaneous lesions induce effective toxin neutralizing antibody (Boyer et al., 2011).

4.7 Antibiotics

From the literature reviewed, Samad in 1986 was the first and last to report on antibiotic therapy for anthrax in animals in Bangladesh, reporting that animals found clinically sick were treated with Crystapen manufactured by Glaxo Bangladesh Ltd. (Samad & Hoque, 1986). The absence of discourses around antibiotic therapy for anthrax in Bangladesh must be noted with interest since penicillins and tetracyclines are useful for treating any sick or febrile animal, as well as any suspect incubating cases (Bengis & Frean, 2014). The power of discourse delineates that which is said, but also inhibits what is not sayable (Jäger & Maier, 2016). Could the absence of an antibiotic discourse for Bangladesh be related to the growing anxiety in the North of the emergence of antibiotic resistant bacteria from countries in the South where their use is considered excessive and irrational (Dixon & Chandler, 2019)?

Effective antimicrobial therapy is an important consideration for human cutaneous anthrax as well as treatment of diseased animals. It is well documented that village doctors in Bangladesh provide allopathic medicines for both humans and animals, and often the same antibiotics when symptoms are similar. However, the most commonly used antimicrobial drugs and dosage sold by village doctors may not be effective for treating anthrax in humans and animals (Roess et al., 2013). It should stand to reason therefore that with the ease of access to antimicrobial therapy more research is needed in Bangladesh on treatment options that could limit the occurrence of anthrax in livestock, especially during outbreaks.

4.8 Indigenous solutions

4.8.1 The Village Doctor

Rahman suggest that the lack of a feed-back system between medical and veterinary practices results in One Health diseases being underdiagnosed and under-reported in Bangladesh. He also suggests that the lack of awareness about diseases transmitted between animals and humans is the result of poor communication between veterinarians and physicians (Rahman et al., 2020). The suggestion that improving communication between veterinary and medical/public health structures will lead to changes in disease management has an important limitation; there is in fact no locus of application where this ‘coming together’ is enacted in practice. Veterinarians have a sufficient knowledge of zoonotic human diseases, and physicians have sufficient knowledge of zoonotic animal diseases for them to fulfill their roles within their scopes of practice. These formal scopes of practice are boundaried such that increasing awareness between disciplines will not result in changes of practice.

Does the Bangladesh Village Doctor (VD) offer the potentiality of One Health[6] in practice, a node that could connect two networks? In the Sylhet district of rural Bangladesh "formal sector veterinarians" are rarely sought for assistance, perhaps only for vaccinations. Rather, the VD is preferred and typically cares for humans and their animals in the communities, where medicines are also a commonly shared commodity (Roess et al., 2013). In Bangladesh the "*gram dakter*" (village doctor, VD) is by far the largest group of healthcare providers. This group is made up of semi-qualified or unqualified allopathic practitioners, drug vendors and practitioners of non-allopathic or mixed systems of medicine. Because VDs are usually close by and provide inexpensive services, they are the most commonly used care providers in rural areas, especially among the poor. Village doctors offer advice that is in line with the cultural beliefs of their patients and, at the same time, provide drugs used in "modern medicine" (Salim et al., 2006). Also known as "*pallichikitshaks*" from a brief training program sponsored by Bangladesh in the 1980s, VDs are particularly respected and play an important role in referral to health facilities (Parkhurst & Rahman, 2007). In Chakaria, VDs obtain training certificates in veterinary programs through DLS, but call for training on more diseases, recalling a case of a woman with skin lesions "but since he was not aware of the treatment required, he was not able to help her" (Wahed et al., 2009). Connecting VDs to the formal medical system through mHealth trails have shown promise. The VDs in Chakaria are seen as a possible conduit between the community and a qualified doctor (Khan et al., 2015). This could be extended to formal veterinary systems, thus creating recognition of a One Health node that is in actual fact routine practice in Bangladesh. The possibility to improve prescribing practices of VD in rural Bangladesh has been documented (Rasu et al., 2014; Salim et al., 2006). The potentially important role of pharmaceutical representatives should be recognized as they provide information to VDs on animal and human antimicrobial selection and administration (Roess et al., 2013). The recruitment of VDs to contribute to surveillance has been initiated in China where VDs are being integrated into rural China's surveillance systems to improve detection of epidemics (Rasu et al., 2014).

Political challenges may well be anticipated when considering VDs as an avenue to explore. Mahmood cautions "the executive members of the Bangladesh Medical Association oppose the idea on patient safety grounds, whereas the Bangladesh Nurses Association is in support with proper training and regulatory mechanisms in place (Mahmood et al., 2010). However, it is boundary-crossing that lies at the heart of One Health.

[6] "One Health is a collaborative, multisectoral, and trans-disciplinary approach - working at local, regional, national, and global levels - to achieve optimal health and well-being outcomes recognizing the interconnections between people, animals, plants and their shared environment" – One Health Commission available at https://www.onehealthcommission.org/en/why_one_health/what_is_one_health/

4.8.2 Religious leaders

The observation by Roess *et al*. that rural villagers of Sylhet recall past interaction with a trained veterinarian on the occasion of a vaccination campaign in front of the Mosque supports the potential importance of religious leaders in interpreting disease control programs for the community (Roess et al., 2013). When a community interprets an illness as "*asmani bala*" (hard time sent by Allah) (Parveen et al., 2016), is there a role for the Muslim *mullabee shahebs* (religious leader) *bawndokawra* (shutting/closing off rites), demarcating with *shada hawr* the closing off of areas affected to prevent slaughter of sick animals during a state of *bawndo*? Is there a role for the Mogh *thakur* to demarcate with *ra-khow ra*? (Nalin & Haque, 1977).

More research is needed to better understand the connection between disease cause and severity and treatment choices to inform health interventions (Camp & Camp, 2012). The importance of culturally credible, locally interpreted disease control messaging has been recognized in Bangladesh during the 2004 and 2010 Nipah virus outbreaks. A counterproductive strategy was used where the local health authority used loudspeakers and household visits to tell residents that drinking raw date palm sap could cause illness and announced that people should stop drinking it (Parveen et al., 2016).

4.9 Discussion

On investigating the issue of anthrax in Bangladesh one finds a body of literature that yields remarkably consistent descriptions of the presence and nature of the disease from the late 19th century up to the present. There is sufficient evidence to confirm that anthrax is endemic in Bangladesh and is maintained as an enzootic disease among livestock that causes sporadic outbreaks. Anthrax however represents a relatively small fraction of livestock disease in general. Sporadic cases of cutaneous lesions in people directly involved with slaughtering and working with hides is a regular occurrence. Human cases present as self-limited cutaneous lesions that resolve spontaneously, or with the aid of locally available antimicrobial therapy. Rarely gastrointestinal disease is associated with cutaneous disease. Only two cases of human anthrax deaths have been reported over the 80 years of literature included in this review. Natural inoculation may provide long lasting immunity that protects a community from disaster and requires further investigation.

A distinct discursive event occurred in 2009 that has resulted in significant economic harm and initiated a multitude of research studies presenting a picture of an emerging infectious disease and panic. Most of the subsequent research has confirmed what was already known of anthrax in Bangladesh. Although well intentioned, acontextual start-to-finish programs implemented might result in unintended consequences.

All Bangladeshi customs, behaviors and practices surrounding the slaughtering of diseased livestock and handling of carcasses are being interpreted as 'contravening international best practice', although at the same time it is recognized that incineration, 6-feet deep burial and other forms of 'international best practice' is not possible in Bangladesh. Instead of recognizing from the evidence that what is considered "international best practice" turns out not to be *international* best practice, but merely convenient Northern practice, the narrative

condemns Bangladesh to the impossible task of implementing a Northern practice that has been shown to be impossible.

The unrelenting call for more vaccines, despite a long history without success, is worth noting. Despite evidence for an immunological benefit to a population from natural exposure, the on-going narrative is focused on a presumed need for more vaccinations, which interestingly renders the animal population dependent on biannual vaccinations, never allowing a herd to develop resistance. This directly then also subjects the human population to eternal dependency on animal vaccination to prevent human infections. Is any form of 'natural' inoculation/infection so taboo that the North cannot bare it, rather preferring eternal subjugation to vaccine manufacturing and 'artificial' inoculation? Is it indeed the capitalist preference to sell vaccines, rather than allow a loss of production due to convalescence and lifelong immunity? The absence of an animal antibiotic option, due to the fear of antibiotic resistant infections to the North, shapes Anthrax as much as the overzealous promotion of vaccines, allowing Anthrax to be a thing only framed within a strict ideology that permits only specific solutions that could only protect Northern interests.

The multiplicity of beliefs about diseases in societies necessitates mediation, through interpretation, between the scientific and the real. The approach to speak directly to rural farmers through a purely scientific discourse with the expectation of changes in community practices, tradition and customs is problematic, not only for its lack of effectiveness, but also its potential for epistemic violence. In all of the studies reviewed on anthrax in Bangladesh there is a noticeable silence on the role of the religious leaders or traditional healers. When considering public health intervention at the level of what can be eaten, when, and how; beliefs about disease, carcass disposal and death; surely help is needed from those who can interpret respectfully. Bangladesh provides an opportunity for the advancement of a One Health approach by leveraging the existing village doctor system and the rich diversity of religious leaders.

Historicizing anthrax in Bangladesh and the events leading up to the Government's Red Alert it is noteworthy to recognize that a contrived 'multidisciplinary team' may have been the creator of a narrative of outbreak and emergency in communities who reflected back to the investigators, quite matter of fact "that many cattle have been dying of *tarka* for many years" prior the sudden arrival of the delegation. What is also important to recognize is the small fraction of media reported cases (>600) that were even considered suspected cases (26) of cutaneous cases upon investigation, and an even smaller fraction (not provided) with confirmatory findings. What is of possible concern is the creation of fear and panic by a multidisciplinary team of investigators who bring a peculiarly Northern interpretation of Anthrax to communities that had an existing understanding of, and a long history living with and dealing with "tarka" that was not couched in conceptions of global health insecurity. I suggest that this multidisciplinary anthrax investigation may present an instance of a global health *in*-security dispositif that transforms tarka into Anthrax, a peculiar post-cold war Western conception of a disease, elevated through sheer dominance over interpretation of natural phenomena and the consequent knowledge production.

An insightful analysis of an unrelated illness phenomena, that of the recent epidemic of chronic Lyme Disease (CLD) in the USA, might shed light on the social construction of fear and anxiety surrounding infectious diseases so prominently featured in the Northern psyche. Abigail Dumes considers CLD, a contested illness without an identified organic pathological cause, as an example of local realities shaped by the American aesthetic of nature encompassing an affective spectrum resulting from attraction to, and simultaneous repulsion from nature (Dumes, 2020). Dumes thus argues that CLD can be better understood through an "epidemiology of affect", that is, as I understand it, a pattern of illness (unwellness) *behavior* emerging from the tension between attraction and repulsion to the degree of the experience of being afflicted by some *thing* (Robberts, 2021). According to Dumes, the American attraction to nature, enabled by socioeconomic privilege, is simultaneously affected by a perception of an increasingly toxic environment existing only because of the possibility of ultimate detoxifications. Dumes argues that these enactments of CLD practices are concurrent with a change in conceptions of quarantine from an underlying assumption that the environment supports health to one where the environment is illness-inducing necessitating isolating the body. Such practices she argues are characterized by affective social relations that makes CLD meaningfully understood through an "epidemiology of affect" (Dumes, 2020).

Could the emerging infectious disease and health *in*-security dispositif similarly reveal the affective spectrum of the North's attraction to the exotic South and simultaneous repulsion by it, reminiscent of the eroticized narrative of New World imperialism? Has the biology of everyday life in the South become interpreted in the North in the symbol of the black woman?

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