View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Elsevier - Publisher Connector

Social Science & Medicine 75 (2012) 1097–1105

Contents lists available at SciVerse ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Cruel disease, cruel medicine: Self-treatment of cutaneous leishmaniasis with harmful chemical substances in Suriname

Sahienshadebie Ramdas*

Amsterdam Institute for Social Science Research, University of Amsterdam, Kloveniersburgwal 48, 1012 CX Amsterdam, The Netherlands

ARTICLE INFO

Article history:
Available online 26 May 2012

Keywords:
Suriname
Cutaneous leishmaniasis
Associative reasoning
Harmful chemicals
Self-medication
Health seeking behaviour
Self-treatment
South America

ABSTRACT

Why are potentially harmful, non-biomedical chemical substances, such as battery acid, chlorine, herbicides, and insecticides, used in the treatment of cutaneous leishmaniasis (CL)? What drives people to use these products as medicine? This article is about perceptions of CL, and the quest for a cure, in Suriname, South America. It highlights the associative style of reasoning behind health seeking and discusses the use of harmful chemical substances *as* medicines. Cutaneous leishmaniasis, a parasitic disease, affects 1 to 1.5 million people globally. It has a spectrum of clinical manifestations, but the most prominent and disfiguring elements are extensive dermatological ulceration and scar formation from lesions. The data upon which this article is based are derived from anthropological research carried out in different parts of Suriname between September 2009 and December 2010. Data was collected through mainly qualitative methods, including interviewing 205 CL patients using structured questionnaires at the Dermatological Service in the capital Paramaribo. Almost all people with CL said they tried self-treatment, varying from the use of ethno-botanical products to non-biomedical chemical solutions. This article presents and interprets the views and practices of CL patients who sought treatment using harsh chemicals. It argues that a confluence of contextual factors – environmental, occupational, infrastructural, geographical, socio-cultural, economic, socio-psychological – leads to the use of harmful chemical substances to treat CL sores. This study is the first in Suriname – and one of the few done globally – focusing on social and cultural aspects related to CL health seeking. It aims to encourage health policy makers and health professionals to carefully initiate, provide, and evaluate CL treatment and prevention programs.

© 2012 Elsevier Ltd. Open access under CC BY-NC-ND license.

Introduction

In case of illness, self-treatment is often the starting point in the therapeutic trajectory, and is in fact the most common form of all therapy. Van der Geest & Hardon, (1990: 199) have estimated that – depending on the definition applied – 50 to 90 percent of all therapeutic interventions can be labelled 'self-treatment.' They also emphasized that, especially in developing countries, self-treatment is extremely widespread, due to poor economic and infrastructural conditions and differing cultural cognitive contexts; moreover, self-treatment itself may cause grave health problems.

Numerous studies underline the complexity of health seeking and emphasize the importance of understanding medicine use in different cultural contexts (e.g. Etkin et al., 1994; Kleinman, 1980; Nichter & Nichter, 1996a; Van der Geest & Whyte, 1988; Whyte, Van der Geest, & Hardon, 2002). Medicines are material "things with social lives" (Whyte et al., 2002: 3), commodities, often "exchanged and used outside the control of Western professional medicine" (Van der Geest & Whyte, 1988: vii). Medicines are "understood – and used – according to local perceptions" (ibid: 175), which may be steered by seemingly whimsical associations and analogies. Understanding these meanings is crucial for successful illness prevention, health care, and health policy.

Despite this, the topic of self-treatment is widely overlooked. In his classic work *Patients and Healers in the Context of Culture*, Kleinman (1980: 51) pointed out that "the popular sector [where self-treatment takes place] has received far less attention than the usually more dramatic and exotic folk healing traditions." This article focuses on self-treatment – of cutaneous leishmaniasis (CL) in Suriname, South America – and demonstrates that it too can be dramatic.

The article presents research findings concerning self-treatment of CL by patients in Suriname with potentially harmful non-biomedical chemical products, such as chlorine, battery acid, lead,

* Tel.: +31 (0) 619797595.
E-mail addresses: rsphw@yahoo.co.in, S.Ramdas@uva.nl.

0277-9536 © 2012 Elsevier Ltd. Open access under CC BY-NC-ND license.
doi:10.1016/j.socscimed.2012.04.038

gasoline, insecticides, and herbicides. In particular, it examines CL patients' perceptions of the disease and the logic of using such harsh chemicals to treat it. The material composition of these chemicals and product purpose are quite different from medicines produced either by the pharmaceutical industry or indigenous 'traditional' practitioners. These chemicals are not even 'common drugs' sold in drugstores and their use in self-treatment is, due to their toxicity, worrisome to health professionals (Gomes & Westerhof, 2002; Weigel & Armijos, 2001; Weigel et al., 1994).

Despite their chemical composition and intended product uses, these substances are viewed in this article as 'medicines.' As Van der Geest & Whyte (1988: 3) point out, "medicines … are believed to contain in themselves a power to transform the human condition." Harsh non-biomedical chemicals are revealed through this research to be used in a similar spirit by CL patients in Suriname. Contextualization of the use of such 'medicines' elucidates the logic of these self-treatment choices in spite of their harmful effects. It is the confluence of multiple contextual factors that leads to the decision to use harmful chemical substances; associative reasoning, based on patients' perceptions of both illness and possible treatments, result in the identification of 'suitable' medication.

Cutaneous leishmaniasis

In the biomedical world, CL is viewed as "one of the most serious skin diseases in developing countries" (González, Pinart, Reveiz, & Alvar, 2008: 1). It has a spectrum of clinical manifestations, but the most prominent and disfiguring elements are the extensive ulceration and scar formation from lesions (Aronson et al., 2003). Fig. 1 shows ulcers on a patient's arms.

Cutaneous leishmaniasis affects between 1 and 1.5 million people globally. It can be caused by at least fourteen different species of parasite belonging to the subgenera *Vianna* and *Leishmania* (Chaves & Pascual, 2006), and is transmitted by two to 3 mm long female Phlebotomine sand flies. The disease is endemic in eighty-two countries spread across Southwest/Central Asia, the Middle East and Afghanistan, parts of Africa, as well as South and Central America. Despite its increasing incidence worldwide, CL remains a largely neglected disease (Reitinger et al., 2007: 581).

Though the first cases of CL in Suriname were reported a century ago (Flu, 1911), up to date incidence numbers are lacking. Epidemiological data is scattered, unstructured, and poorly collected and monitored. Van der Meide et al. (2008: 192) reported a mean annual incidence between 1979 and 1985 of 4.9 per 1000 inhabitants in the hinterland (inland rainforest areas, accounting for 80% of the country) and 0.66 per 1000 for the country as a whole. According to the Suriname Dermatological Service, currently some 300 new cases per year are registered (Hu, 2011: unpublished presentation). In Suriname, the sand fly vector is not exactly known (Wijers & Linger, 1966), neither has an animal reservoir been unambiguously identified (Burgos & Hudson, 1994; Rotureau, 2006), although according to Van der Meide et al. (2008: 192), the two-toed sloth, the anteater, and several species of marsupials and rodents are assumed reservoirs.

Fig. 1. CL ulcers on a patient's arms. Source: Collection Ramdas S., 2009, Dermatological Service, Paramaribo.

Treatment of cutaneous leishmaniasis

In general, CL lesions will heal spontaneously, though it can take months or even years, depending on the parasite species. To accelerate cure, and to prevent scarring, dissemination, or relapse, CL can be clinically treated, though its self-limiting character does complicate assessments of whether healing is "due to efficacy [of treatment] or spontaneous resolution" (Schneider, Seiger, & Mahon, 2008: 11). There are a number of drugs and therapies (Schneider et al., 2008), but the classic therapy for first-line treatment of CL is with Pentavalent Antimonials. This is effective in many cases, but the available drugs are toxic, expensive, and difficult to administer (Gasser et al., 1994), while side effects include nausea, vomiting, abdominal pain, diarrhoea, skin rashes, and headache (Frézard, Demicheli, & Ribeiro, 2009: 2318). Furthermore, there is emerging resistance to the commonly used drugs (Croft, Sundar, & Fairlamb, 2006: 114; Mitropoulos, 2008: 1) and a CL vaccine is currently still lacking (Mitropoulos, 2008: 1).

Medical doctors use the biomedical drug Pentamidine Isethionate to treat CL in Suriname. At the time of research (2009–2010) the standard biomedical treatment to cure CL involved a minimum of three intramuscular injections – in the buttocks or in some cases intra-lesional – each week, for a period of three weeks. The cost of the drug in Suriname is high, at about US$30 per ampule, and patients usually need three ampules to complete the treatment, thus amounting to a total cost of US$90. Depending on the severity of the lesions, sometimes even more drugs are required. Due to the high prices, stock shortages often occur in pharmacies, both in the capital city and in clinics in remote hinterland areas.

Multi-disciplinary program "Leishmaniasis in Suriname"

Suriname, located in the northern part of South America, comprises 163,820 km^2: 20% coastal area, 80% dense tropical rainforest (the so-called hinterland). The country is scarcely populated with 492,829 inhabitants. Hindustanis, descendants of British-Indian migrants, are the largest population group (27.4%), followed by Creoles (17.7%), Maroons (14.7%), Javanese (14.6%), people of mixed descent (12.5%), indigenous peoples (3.6%), and smaller groups of Chinese, Lebanese, Dutch, and other (2.9%) (Algemeen Bureau voor de Statistiek, 2005: 5; Heemskerk, Delvoye, & the Trio communities 2007: 27–28). Suriname consists of ten districts, eight in the coastal area and two in the hinterland; the two hinterland districts are Brokopondo and Sipaliwini. The main inhabitants of the hinterland are mostly Maroons and indigenous peoples. Though the indigenous peoples were the first inhabitants of Suriname, they are currently a small minority group. The Maroons, the third largest population group, are descendants of former African slaves who fled from the colonial plantations to the hinterland between the 17th and 19th centuries.

The environmental context in which Maroons and indigenous peoples live – deep in the Amazonian rainforest – makes them vulnerable to CL. The dense vegetation provides an excellent habitat for sand flies and possible animal reservoirs for the

Leishmania parasite. Other occupational and social groups visiting the hinterland, especially workers in the gold and lumber sector, but also those engaging in recreational activities (such as hunters, fishers, and campers), are similarly exposed to CL.

To combat the disease, national and international health and education institutes have set up a national program entitled "Leishmaniasis in Suriname." Through a multi-disciplinary approach, research is conducted to contribute towards better treatment, prevention, and control of the disease. Data are collected and analysed from three perspectives: clinical, biological, and anthropological. Using the latter approach, this study examined the social and cultural aspects of CL perceptions and treatment in Suriname within the wider socio-economic, cultural, occupational, and geographical contexts. Understanding these dimensions will hopefully improve the management of CL and facilitate better communication between patients, patient supporters, and health workers.

Methods

In the period between September 2009 and December 2010, fieldwork was carried out at the Dermatological Service in Paramaribo, the capital city of Suriname, and in five villages in the hinterland. All research sites were selected in close collaboration with national stakeholders. Suriname's Medical Ethical Commission, *Commissie Medisch Wetenschappelijk Onderzoek*, gave formal permission to carry out the research.

Mainly qualitative research methods were used. At the Dermatological Service a total of 205 CL patients were interviewed (183 males and 22 females), with their written or verbal consent, using structured questionnaires, which contained twenty open questions concerning a range of aspects related to living and working conditions, perceptions and explanations of CL, health seeking, self-treatment, stigma, illness severity, and prevention. Each interview lasted approximately 30 min, and in some cases 45 min to an hour. The answers were either written down on the form (by the researcher or assistants), or in some cases first audio-recorded and then transcribed.

In addition, the medical files of the 205 interviewed patients were studied to detect patterns of adherence, and interactions among CL patients and healthcare workers were observed with emphasis on forms of non-verbal and verbal communication. Interviews were carried out with three nurses and three medical doctors engaged in the process of treating patients with CL. The topics mostly concerned their experiences with CL patients, aspects of adherence, stigma, and logistical problems related to the provision of health care services. Finally, complementary interviews with five heads or representatives of non-governmental and public health institutions were carried out.

In the hinterland, after obtaining formal verbal approval from the village heads, a total of 285 people were approached through formal and informal – individual and group – conversations, thirty in-depth interviews, and eight focus group discussions. The informants consisted of ex-CL patients (selected from the CL patient list of the Medical Mission, – a private, non-profit, primary health care organization – that provides medical health care through fifty-seven village clinics in the hinterland), community members, local healers, and others living and working in the hinterland – especially gold diggers – who claimed to have treated themselves successfully with their own remedies. Flexibility was built into the topic list and the questionnaire, depending on emerging themes in the field, with the range of aspects covered relating to health seeking, stigma, prevention, and medical pluralism. Research in the hinterland included a small survey among forty-eight Brazilian gold diggers with specific questions concerning knowledge of biomedical treatment.

To process and analyse the large amount of data collected, computer software was used. After categorizing and labelling the answers to the 205 questionnaires with CL patients at the Dermatological Service, research assistants thematically entered all information into Excel spreadsheets; practical and useful for the data analysis. The questionnaire data were further coded and entered into a thematic framework within the software program Statistical Package for Social Science. All other interviews – including those conducted in the hinterland – were entered into the computer using Word. Thematic content analysis then helped to analyze the data and extract relevant relationships between research findings.

This article focuses on the self-treatment practices of CL patients who eventually sought biomedical treatment at the Dermatological Service, and relates the findings to qualitative observations and inquiries in different parts of the hinterland.

Results

Treating cutaneous leishmaniasis with non-biomedical chemicals

According to Etkin (1994: 26), "people are not passive recipients of medicine," they often "initiate symptom management prior to consulting an "official" healer or dispenser, and …continue doing so with or without the healer's approval (or knowledge)" (ibid). From the 205 CL patients at the Dermatological Service, 155 (76%) said they had attempted to self-medicate before coming to the clinic: 18 females (12%) and 137 males (88%). Within this group of 155 CL patients, 48 (31%) used potentially harmful chemical products. Only three women were part of this latter group: two were Maroon women living in the hinterland – one working as a bus ticket checker, the other as a petty farmer – and the third was a Brazilian working as a commercial sex worker in the gold fields. The remainder (94%) were men. Table 1 presents the socio-demographic and occupational characteristics of the forty-five male CL patients who resorted to harsh chemical treatments.

Table 1
Socio-demographic and occupational characteristics of male CL patients using harmful chemical substances ($n = 45$).

Characteristics	Number of patients	Percentage
Age (in years)		
≤19	1	2.2%
20–39	31	69%
40–59	12	26.7%
>59	1	2.2%
Cultural background		
Maroon	20	44.4%
Hindustani	11	24.4%
Other (Javanese, Creole, Brazilian, or mixed)	14	31.2%
Educational level		
No formal education	2	4.4%
Low[a]	37	82.3%
Intermediate[b]	6	13.3%
Profession		
Gold digger	13	29%
Machine operator	2	4.4%
Security guard (gold sector)	2	4.4%
Taxi and truck driver (goods and oil transport)	7	15.6%
Woodcutter/construction worker	7	15.6%
Prospector/technical worker	3	6.6%
Petty farmer	2	4.4%
No permanent job, or jobless	3	6.6%
Other	6	13.3%

[a] Primary school (unfinished or finished) or secondary school (unfinished).
[b] Secondary school (finished) or education between secondary and tertiary level.

The table shows that the majority of the forty-five male CL patients were low educated or with no formal education at all; most were Maroons and Hindustanis, and between twenty and fifty-nine years old. The men worked primarily in the gold, lumber, or construction sector. Occupational purposes were the major reason for the majority of men to visit the hinterland. Others did so for recreational purposes, such as hunting, fishing, or vacation with friends or family.

The non-biomedical chemicals that CL patients used comprised of six groups:

- *Personal hygiene, skincare, or beauty products*, such as Dettol soap, other soap types, skin cream, Vaseline, pomade, and make-up remover;
- *Household products*, such as candle wax, Dettol disinfectant, pine oil, and bleach;
- *Household insecticides and repellents*, such as Baygon sprays, mosquito repellents, and moth balls;
- *Chemical products* used in cars, clocks, flashlights, guns, and fuels, such as methylated spirit, lead, battery acid, small batteries, gunpowder, mixed and pure gasoline;
- *Herbicides*, such as Gramoxone;
- *Veterinary insecticides, in particular Smeerex*, known more generally in Suriname as *bom* (spray), or *dagubom* (dog spray).

Seven of these forty-eight CL patients (14.6%) had used only one chemical product; the remainder (85.4%) had used more than one, sometimes in combination with herbal medicine, house remedies, and/or biomedicine. Five patients (10%) used one or a combination of the personal hygiene products. The remaining forty-three (90%) used 'harsher' chemical products, as presented in (Table 2).

How toxic or harmful for human health?

By far the most frequently used chemical was a Brazilian product called Smeerex, a larvacide promoted for veterinary treatment and control of tissue infestation by fly larva on the open or infected wounds of animals, such as dogs, cows, and goats. Smeerex is made of chemical ingredients such as chlorfenvinphos and dichlorvos, which are discredited for human medical use, even banned or restricted in several countries (Agency for Toxic Substances and Disease Registry, 1997; Raeburn, 2006). These substances are reported to have harmful effects on the nervous system, while concerns also exist over acute and chronic toxicity (Raeburn, 2006: 26). Many of the other chemical substances that CL patients used are also noted to be hazardous, poisonous, and even lethal when inhaled or swallowed (Addo & Poon-King, 1986).

Gramoxone is a toxic liquid herbicide; skin contact with it may result in "irritation, blistering and potentially full thickness burns" (Health Assessment and Environmental Safety Department of Syngenta & the Medical Toxicology Unit, 2008: 5). Other chemical companies and community health institutes (Camden Electronics LTD, 2006: 1; Department of Community Health, 2004) warn against skin contact with bleach, chlorine, and battery acid because they can cause severe burns, blistering, or other permanent skin damage.

Table 2
Overview of 'harsh' chemical products used by CL patients.

Chemical product	Number of patients	Percentage
Smeerex	23	53.5%
Lead	5	11.7%
Battery acid	4	9.3%
Household insecticide or mosquito repellent	3	6.9%
Household disinfectant (pine oil) and vinegar	3	6.9%
Gasoline	2	4.7%
Bleach or chlorine	2	4.7%
Herbicide 'Gramoxone'	1	2.3%
Total CL patients	43	100%

CL patients also used lead and gasoline. Several studies emphasize the negative health effects of lead exposure, including lead poisoning (Bellinger & Bellinger, 2006; Markowitz & Rosner, 2000). Gasoline causes irritation or burning of the skin upon direct contact.

To 'kill' their sore, some CL patients used chemical products made for killing or avoiding flying and crawling insects. The WHO (1999: 19–20) stress the necessity to "avoid inhalation of [insecticide] spray mist or direct contact with skin and eyes." One CL patient, however, sprayed the insecticide Baygon directly onto the sore. Another patient crushed mothballs – containing pesticides – into a powder and applied it to the sore.

The findings on the use of potentially hazardous non-biomedical chemicals to treat CL correspond to some of the few studies conducted globally on traditional practices and treatment of CL. For example, from 1989 to 1991, Weigel et al. (1994) conducted a large-scale qualitative study in twenty-six agricultural villages in Ecuador. They noted use of chemicals like sulphur, battery acid, gasoline, kerosene, or creosote. Again in Ecuador, Weigel and Armijos (2001) found that people also used hot liquids, heavy metals, and cauterization.

Harmful biomedicine, harmful chemicals: 'similar,' different, effective?

When considering toxicity and side effects, the treatment of CL with biomedical drugs is itself not without 'harm,' as described above. The difference, however, between the available biomedical drugs for treatment of CL and the non-biomedical (household and industrial) chemicals used by CL patients is that the former have been tested in randomly controlled trials and found to be effective (Van der Meide et al., 2009); the non-biomedical chemicals have not. According to the CL patients in this research, the chemicals being used have reportedly been tried and 'tested' by family and friends, and have the reputation of being effective. These claims of efficacy, however, lack evidence that the sores being treated were actually caused by CL.

Presented above are the research findings specifically related to the use of non-biomedical chemicals and their potential health risks and damaging impact on human skin, especially open skin. Following is an analysis of why, despite these risks, patients choose to use this harsh 'medicine.'

Multiple contexts, understandable choices

Occupational 'pitfalls' and economic concerns

The data reveal different factors which contribute to the use of potentially harmful chemicals to treat CL. The first is the occupational context that creates conditions in which CL patients can easily resort to these readily available chemicals. As mentioned above, the majority of patients using chemicals were working in the gold or lumber sector. To undertake gold mining or wood processing activities, heavy equipment, machines, and all kinds of industrial supplies are required, thus workers are constantly surrounded by chemicals such as gasoline, kerosene, battery acid, and lead; as can be seen in (Fig. 2).

Most of the CL patients working as gold diggers or in the lumber sector used battery acid or lead to cure their sores. One patient, a truck driver transporting gasoline to the woods, used pure gasoline on his sore. By being surrounded by chemical products and working daily in a chemical environment, the health hazards of

Fig. 2. Freely available chemicals in a gold digger's camp. Source: Collection Ramdas, S., 2010, Boslanti, district Brokopondo.

Fig. 3. A gold digger's camp in the forest. Source: Collection Ramdas, S., 2010, Benzdorp, district Sipaliwini.

certain substances become normalized and minimized, and as some patients explained, certain chemicals even become first aid medicine.

The type of economic activity the patients were involved in was also often a stimulus to use available non-biomedical chemical products. Gold digging, for example, requires some six to eight men to work on one pit, and it takes about four to six weeks to finish the job. Each worker has his own task which he is expected to complete, since finding a replacement in the remote goldfields is very difficult; leaving also means no payment, regardless of the amount of work one has already done. It is therefore very difficult to leave the job. Additionally, most of the gold diggers and others working in the hinterland have no other source of income. With an average of about US$200-300 per month, or sometimes far less, earnings, according to CL patients, are usually "just enough" to cover monthly expenses. Having a CL sore may become a financial burden, especially if biomedical treatment must be sought in the city.

In the hinterland – unlike in the capital – medical treatment is free, provided by the Medical Mission (see above). However, health clinics often lack the necessary drugs and waiting periods can be long before medicines finally arrive. Therefore CL patients often need to go to Paramaribo for further treatment. In addition to the high expense of biomedical treatment, further costs include travel and living expenses in the capital, which may exceed one month's salary. One patient explained that, due to his financial debts, he could not afford biomedical treatment. It is therefore not surprising that many are tempted to use the cheaper or free 'medicines' at hand.

Geographical distance, infrastructural barriers, and a hostile environment

In addition and related to individuals' work and economic situation, a combination of other contexts – geographical, infrastructural, environmental, social – lead to patients using harmful chemical substances as medicine. Distances between the capital city and the interior, and between villages and goldfields in the hinterland, are usually very great (requiring travel of several hours or even days), and expensive, depending on the destination and transport method used (car, boat, all-terrain vehicles, or airplane). For this reason, CL patients are inclined to first attempt to treat themselves at their work location (see Fig. 3).

Whether living, working, or engaging in leisure activities in the hinterland, it means staying in the woods for sometimes undefined time periods, lasting days or months. Precisely because it is not easy to travel back to the capital, one must be prepared for all kinds of mishap, especially concerning health. Surrounded by the woods, one can easily be attacked by bees, snakes, mosquitoes, spiders, and other insects or animals. Household chemical products such as insecticides are therefore often taken along, as well as chemical items such as batteries for flashlights, which are important for moving about in the dark woods. For those working in the hinterland, there are also plenty of small shops in the villages and goldfields that are well stocked with various household insecticides and other necessities.

The geographical distance between the hinterland and the capital, and the 'hostile' natural environment, also stimulate use of the common 'medicinal kit,' which contains certain insecticides, especially Smeerex. Smeerex is easily found in both the capital – mainly in households that raise animals – and in the hinterland. Though meant for animal use, many are convinced of its healing qualities for humans and use it as a first line treatment. During fieldwork, people were observed using the spray on themselves or on children without hesitation.

Trust in the experiences of others

The social network of patients also plays an important role in providing information about non-biomedical chemical substances to cure CL. The majority of CL patients (both men and women) who had used chemical substances reported doing so on the advice of others in their environment; primarily colleagues, friends, family members, and others experienced with the use of such chemicals. According to the patients, their 'advisors' had either cured themselves with the chemicals or knew others who had tried them with positive results. Trust in their word motivated patients to try the same chemicals.

Fear of injections

Paradoxically, fear of the biomedical treatment is another (socio-psychological) aspect that contributes to the use of painful, harmful chemical substances. Indeed, many patients tried to cure their sores "in whatever way possible" to avoid the biomedical treatment. Insufficient information about the injections and the drug (Pentamidine Isethionate) used for treatment, side effects of the medication, and 'Wild West' stories about the painful effects of the injections, create great fear. Patients said that an injection causes one to "crawl over the floor," "vomit," "faint," "not be able to walk," "have the feeling of being electrified," "extreme pain in the buttock for a whole week," and various other serious side effects. Unlike in other communities where injections are desirable (Birungi, 1994; Whyte & Van der Geest, 1994), CL injections are unpopular in Suriname. Going to a clinic in the hinterland or to the Dermatological Service to take "painful injections" is therefore an option of last resort.

Masculinity and risk taking

Gendered ideologies of masculinity may also play a role in the decision to use harsh chemicals. The vast majority of the CL patients

using harsh chemicals in the study were men. Socio-behavioural studies on gender differences in risk taking show that men are more likely than women to take risks and become involved in dangerous activities (Hirschberger, Florian, Mikulincer, Goldenberg, & Pyszczynski, 2002; Wagner, 2001). Risk taking is seen as a characteristic of masculinity, as is physical strength, toughness, and courage (Krienert, 2003: 5). The men in this study correspond to this masculine image, considering the heavy, difficult, and dangerous work in which the majority were engaged in the hinterland; workers in the goldfields, deep in the jungle, are used to risk taking. As a Maroon gold digger explained:

> Gold digging is hard work, it means taking a lot of risk to leave your wife and children in the village for quite some time and you don't know what can happen to you in the woods. A snake can bite, bees can attack, or someone can kill you for a bit of gold; everything can happen. We take risks, a lot of risks, just to earn a bit of money. (Carlo, December, 2009: hinterland)

Among the study population, the aspect of 'courage' was seemingly inherently linked to being a man; and in additional the majority of the CL patients remarked that one must have a lot of courage to use certain painful chemicals.

Chemical use because of low education

Finally, the use of these chemicals might also be related to the level of education a person has received. As noted above, the majority of CL patients using harmful chemicals were low educated. In general, the overall educational situation in the hinterland, where about 49% of the CL patients in this research came from, is poor; children – both male and female – visit schools at a later age or not at all (Terborg, Ramdas, & Eiloof, 2006: 145). The majority of the study participants were men; according to national statistics for Suriname, in 2004 45% of the male population (aged fifteen and above) in Brokopondo district (Algemeen Bureau voor de Statistiek, 2006: 141) and 39% of the male population in Sipaliwini district (ibid: 221) had received only primary education. Correlated to these low educational levels is limited awareness of the health hazards of chemicals, which may also contribute to the normalization by CL patients of harmful chemicals as first aid medicine.

Disease perceptions and suitable medications

Thus far, the multiple contexts maintaining and supporting an environment in which CL patients resort to potentially harmful non-biomedical chemical substances in their quest for a cure for CL have been outlined. Related to these contexts, another important reason why such substances are used is the way in which CL patients perceive the disease.

Associative reasoning

Aetiological ideas and analogies in associative logic (Mathews, 1982) are often used in health seeking to find appropriate treatment. Such heuristics in treatment seeking are widely reported in medical anthropological studies (Evans-Pritchard, 1937; Mathews, 1982; Nichter & Nichter, 1996b; Nichter & Vuckovic, 1994; Van der Geest & Meulenbroek, 1993; Van der Geest & Whyte, 1989). In associations, mental connections between one thing and another become the basis upon which people use – or experiment with – certain medication.

In Suriname, CL is commonly referred to in Sranan (the *lingua franca*) as *Bussi-Yassi*, or *Bos-Yaws* in Dutch (the national formal language). Both terms, *Bussi*/*Bos*, mean "bush" or "forest." The exact biomedical cause of CL is not known by the CL patients, but the terms suggest that CL is "something caused by nature," a belief confirmed by most CL patients in the study who cited insects such as flies, bacteria on a leaf or tree, juices or skin of certain lianas, dark dirty water, or certain trees as causing the disease.

Locating the cause of CL in nature, patients employ treatments believed to counter-attack the natural agents causing the illness. Pista, a 21-year-old Maroon man, used the extremely toxic herbicide Gramoxone to cure his sore, though first he had tried undiluted bleach. He could not say exactly why, but explained that if there were bacteria on the sore, they should be removed in order for it to heal.When bleach did not help, he used Gramoxone:

> We always have Gramoxone at home, for the grass, but also against mosquitoes. When I saw it, I thought, Gramoxone kills everything. My sore was caused by *Bussi-Yassi*; *bussi* means the bush, something of nature. And then I thought, if this [the sore] was caused by something of nature, something that kills everything in nature would probably also kill my sore. (Pista, January, 2010: Dermatological Service)

Pista's decision to use this poisonous chemical came from his association of the origin of the sore as "something from nature" and Gramoxone as a "killer of nature." Other patients used mothballs and the insecticide Baygon because, again, associations were made between killing the "bacteria," "worms," and "insects" of the sore by using something that kills such things. When CL sores were associated with dirt in the domestic sphere, products were used because of their disinfecting power, such as pine oil, methylated spirits, Dettol, or bleach.

In analogical thinking, treatments for certain (unknown) illnesses are chosen because of resemblances or similarities with *known* conditions (Mathews, 1982). In this study, CL sores were compared with sores on animals, so treatments successful for animals were used to treat human sores. Patients using Smeerex said that seeing the spray work on animals made them try the product on themselves. Marseo explained, "I thought it [the CL sore] would heal. Because if that thing [Smeerex] could cure a cow, it could probably also cure me" (Marseo, January, 2010: Dermatological Service).

Sequences of treatments (see Etkin, Ross, & Muazzamu, 1990; Mathews, 1982; Young & Garro, 1982) were furthermore noted among the CL patients where, in order to achieve a cure, different products were used, sometimes in a particular order and sometimes haphazardly. When Gramoxone failed to cure his sore, Pista used antibiotic ointment, and when that did not help, he tried Smeerex, before finally visiting the Dermatological Service. Another patient used Smeerex first, then bleach, then lead. This method of sequential self-treatment evokes questions about the limits to health seeking attempts. How 'far' will patients go in their attempts to self-treat their sore? What makes them use one after another harmful chemical, experience excruciating pain, and yet still be willing to experiment with further harsh remedies? The answer to these questions lies in CL patients' associative perceptions of the illness.

Cruel disease, cruel medicine

Perceptions of CL are tied to the symptoms and the process of the disease, and CL has a bad reputation. Patients call it "difficult," "evil," "cruel," "horrible," "stubborn," "dangerous," "uncontrollable," "filthy," and "expensive." CL is believed to be difficult and stubborn primarily because it takes a long time to cure:

> You can use so many things, leaves, herbs, oils, whatever, but it just won't go away. Sometimes it stays for six to nine months on your skin. It's a *tangayesi siki* [stubborn disease]. It keeps on growing and growing. That's why you try out something cruel that maybe will kill the sore. (Ronald, March, 2010: Dermatological Service)

In particular it is seen as cruel and uncontrollable because it keeps on growing, spreading, "eating away the meat." One patient

commented, "If it wants, it can spread all over your body, you'll feel the nodules, then you see a sore breaking open at that point. It's just horrifying" (Sico, February, 2010: Dermatological Service).

It is viewed as dangerous because it poses severe health threats, such as losing a finger, hand, arm, or leg. Should the sore not heal, almost all patients expressed fear of amputation. To counter-attack the sore, curative methods and treatments are identified that are harsh, i.e. equally "horrible" and "cruel." An old Maroon lady in a hinterland village explained:

> We, Ndjuka people, have a saying: *hogii siki, abi hogii desi* [cruel diseases need cruel cures]. That's what old people say. If you have some terrible disease, you have to treat it with equally terrible medicine. You hear the boys [gold diggers] use all kinds of things, sometimes very dangerous things, but *Bussi-Yassi* is the kind of disease that asks for it. Oh no... it is a horrible disease! (Mammi, October, 2009: hinterland)

The belief that "cruel diseases need cruel cures" plays a decisive role in the decision by CL patients to use potentially harmful chemical substances. Studies examining the meaning of medication (e.g. Etkin, 1994; Nichter & Nichter, 1996b; Van der Geest & Whyte, 1989) point at metaphoric and metonymic associations between non-medical phenomena and the qualities of medicinal material. Van der Geest and Meulenbroek (1993), in a study in Burkina Faso, point to the importance of such associations in naming and explaining illnesses and applying medicine; natural phenomena or domestic tools are linked to symptoms of illness because of similarity (metaphor) or contingency (metonym).

In this study, the adage "like produces like" or "like counteracts like" (cf. Van der Geest & Meulenbroek, 1993: 286) seems applicable: the appearance and aggressive development of CL sores stimulates use of harsh chemical products that work equally aggressively on the skin. Aggressiveness, both of the condition and the cure, is the metaphorical link that inspires the choice of medication: strong corrosive materials, strong penetrating odours, chemicals with the capability to kill anything such as bacteria, insects, and other dirt. One CL patient commented:

> That's why we use these kinds of products. You should try to kill the sore, if not with herbs, then with other things like battery acid. Those things are powerful, heavy. It will burn through everything and kill the sore. (Kajo, January, 2010: Dermatological Service).

The same reasons why non-biomedical chemicals are advised against – the capacity to burn the skin – become the reasons for using them.

Interestingly, the converse was also sometimes found, as patients would avoid contact with sharp and aggressive objects and beings. The piranha fish, for example, was not eaten by Trio Indigenous people when suffering from a CL sore because of the aggressive behaviour of the fish. Similar to how the piranha aggressively devours everything between its sharp teeth, eating the piranha is believed to aggravate the fast and aggressive development of a CL sore. Some Brazilian gold diggers with CL avoided eating chicken, explaining that a chicken has sharp nails which it uses to scratch the soil for food. Linking this metaphorically to CL, they judged that eating chicken would worsen the sore and cause more pain.

Contradictory findings

Belief in the efficacy of harmful chemicals is one of the reasons why they are used in the quest to cure CL. Despite this belief, however, none of the forty-eight CL patients in this study using chemical treatments actually found a cure. Mostly patients experienced excruciating pain, but reported that "nothing helped." Pista shared his experiences:

> I just used one drop of it [Gramoxone], one drop on the sore and with some cotton I rubbed it in the sore. It hurt a lot, a lot! But I left it, and later added one more drop. But it started hurting me too much. In the evening I tried to clear the thick green substance on top of the sore with a piece of cotton drenched in 70% alcohol, but it hurt me extra. It was burning, biting, pulling, and I just couldn't get rid of the pain. I then put my hand in the freezer, and kept it there for a few minutes. And then the sore started feeling a bit colder. Then I sat down watched the television a bit and again, as it started hurting extra again, I put my hand in the freezer. I did so some two to three times. (Pista, January, 2010: Dermatological Service)

Some patients who used household chemicals – disinfectants in particular – mentioned that the products helped against the smell of the sore, but not against its growth. One man who used melted clock batteries reported that the sore had dried on the surface, but remained moist inside. These disappointing experiences did not hold back patients from using chemicals, but they did finally lead them to seek treatment at the Dermatological Service.

Interestingly, in contrast to the finding that CL is portrayed and experienced as horrible and difficult to cure, it is nevertheless not viewed as a priority disease. In listing priority diseases or health conditions in the hinterland, patients mentioned primarily snake bites, malaria, and HIV/AIDS. CL usually came in fourth or fifth place, or even further down the list. One CL patient remarked, "*Bussi-Yassi* is not really an illness, it is just a sore. That's it, nothing more" (Franco, February, 2010: Dermatological Service). Furthermore, unlike in other countries, CL is hardly seen as a stigmatizing condition. These paradoxical perceptions regarding the gravity of CL fall outside the scope of this article, but will be discussed in a future publication.

Conclusion

CL patients in Suriname use potentially harmful non-biomedical substances such as chlorine, battery acid, lead, gasoline, insecticides, and herbicides to treat their sores. This article has addressed the multiple factors that lead to and support this practice, and has contextualized this harmful form of health seeking, including how specific conditions contribute to the choice for specific chemicals.

Geographical factors, such as poor infrastructure, long distances between the capital and hinterland, and a potentially dangerous physical environment, also shape people's health perceptions. Economic factors and the presence of chemicals in the work environment create conditions in which CL patients pragmatically resort to these chemicals for self-medication, which form a vital – and accessible – part of first aid medication. These conditions, and possibly the low education of CL patients, contribute to an underestimation of the health hazards related to use of chemicals. Furthermore, CL patients simply do not know the cause of the disease; though they believe that knowledge about disease causation is important, finding a solution has a higher priority. Treatment decisions are also influenced by socio-cultural factors such as recommendations for chemical treatments from people within patients' social networks, notions of masculinity, and fear of regular biomedical treatment. Biomedical treatment is thus an option of last resort.

Within the constellation of their everyday lives and work in the hinterland, CL patients have their own constructed notions about the illness and choose their medication in associative ways. CL is viewed and experienced as a nasty, time and money consuming, and hard to cure disease. The adage that "cruel

diseases need cruel cures" and associative reasoning lead to the use of harmful chemical substances. The contradiction, however, between belief in these harmful 'medicines' and their apparent inefficacy is striking. CL patients did not hesitate to use harsh chemicals, despite the risks and dubious therapeutic success. Aggressiveness, both of the condition and the cure, is the crucial metaphorical link.

This research on the therapeutic use of potentially harmful chemical products remains an understudied area within medical anthropology. The study aims to create awareness about the different contextual dimensions – environment, infrastructure, work, gender, education, and fear of biomedical treatment – that are necessary to understand such a 'therapeutic' practice, and which require further exploration. The contextual dimensions addressed in this article depend also on macro-level – global, political, historical, economic, and social – forces, which have not been addressed in this paper, but which add weight to the complexity of health seeking practices.

The study invites further multi-disciplinary discussion and research. Health policy makers need to be aware of, and act upon, structural problems to discourage harmful self-treatment practices. In collaboration with health practitioners, and local 'traditional,' regional, and international health organizations, they should explore possibilities for less painful, yet effective, cheaper, and more accessible treatment of CL.

Public health authorities – primarily concerned with improving conditions for health seeking – should begin public health education on the biomedical cause of CL, the disease course, and prevention. But that alone is not enough. Drawing on the findings of this study, public health authorities should initiate *open* and *non-judgemental* dialogue and discussion between health professionals and CL patients and communities in the hinterland on topics concerning CL treatment; in particular, on the biomedical treatment process, benefits and side effects of the treatment, and the health hazards of self-treatment with harsh non-biomedical chemicals. By creating a platform of mutual respect and understanding, communication barriers between health practitioners and the target population may be significantly lowered. This would be beneficial for the discouragement of harmful self-treatment practices and early case registration (which would make self-treatment with harmful chemicals unnecessary).

As a final note, it is important to acknowledge that changing (harmful) health seeking behaviours is often a long process. Becoming aware of the multiple contexts that lead to use of harmful 'medicine' is therefore crucial for successful development, implementation, and evaluation of future CL treatment and prevention programs.

Acknowledgements

This article is the outcome of a multidisciplinary research programme "Leishmaniasis in Suriname," funded by the WOTRO Science for Global Development, which is a division of the Netherlands Organization for Scientific Research (NWO). I am grateful to the "Leishmaniasis in Suriname" research team, in particular Dr. Henk Schallig, Prof. Dr. Ria Reis, and Prof. Dr. Sjaak Van der Geest, for support and comments on earlier versions of this article. Thanks also to the Ministry of Health and all stakeholders in Suriname supporting this study, in particular the Dermatological Service and its personnel, the Medical Mission and all health workers, Amazone Conservation Team, and the Bureau for Public Health. Many thanks to my research assistants for their hard work during fieldwork and data processing. Thanks to Susan Stocker and Zoe Goldstein for their editorial comments. Special thanks to all respondents at the Dermatological Service and the people in various communities in the hinterland – all chiefs and their assistants – who supported and participated in the research.

References

Addo, E., & Poon-King, T. (1986). Leukocyte suppression in treatment of 72 patients with paraquat poisoning. *Lancet, 1*(8490), 1117–1120.

Agency for Toxic Substances and Disease Registry (ATSDR). (1997). *Toxicological profile for chlorfenvinphos*. Atlanta, GA: United States Department of Health and Human Services, Public Health Service.

Algemeen Bureau voor de Statistiek. (2005). *Zevende Algemene Volks-en Woningtelling in Suriname. Landelijke resultaten*. Paramaribo: Algemeen Bureau voor de Statistiek.

Algemeen Bureau voor de Statistiek. (2006). *Zevende Algemene Volks-en Woningtelling in Suriname. Districtsresultaten, Vol. 5*. Paramaribo: Algemeen Bureau voor de Statistiek.

Aronson, N., Coleman, R., Coyne, P., Rowton, E., et al. (2003). Cutaneous leishmaniasis in U.S. military personnel – Soutwest/Central Asia, 2002–2003. *Morbidity Mortality Weekly Report, 24*(52), 1009–1012.

Bellinger, D. C., & Bellinger, A. M. (2006). Childhood lead poisoning: the torturous path from science to policy. *Journal of Clinical Investigation, 116*(4), 853–857.

Birungi, H. (1994). Injections as household utilitiesi Injection practices in Bugosa, Eastern Uganda. In N. L. Etkin, & M. L. Tan (Eds.), *Medicines: Meanings and contexts* (pp. 17–32). Amsterdam/Quezon City: Medical Anthropology Unit/Health Action Information Network.

Burgos, A. M., & Hudson, J. E. (1994). Annoted list of the phlebotominae (Diptera) of Surinam. *Memorias do Instituto Oswaldo Cruz, 89*(2), 171–178.

Camden Electronics LTD. (2006). *Requirements-hazards and disposal of batteries*. Hertfordshire: Camden Electronics LTD.

Chaves, L. F., & Pascual, M. (2006). Climate cycles and forecasts of cutaneaous leishmaniasis, a nonstationary vector-borne disease. *Plos Medicine, 3*(8), e295.

Croft, S. L., Sundar, S., & Fairlamb, A. H. (2006). Drug resistance in leishmaniasis. *Clinical Microbiology Reviews, 19*(1), 111–126.

Department of Community Health. (2004). *Chlorine public fact sheet*. Michigan: Department of Community Health.

Etkin, N. L. (1994). The negotiation of 'side' effects in Hausa (Northern Nigeria) therapeutics. In N. L. Etkin, & M. L. Tan (Eds.), *Medicines: Meanings and contexts* (pp. 17–32). Amsterdam/Quezon City: Medical Anthropology Unit/Health Action Information Network.

Etkin, N. L., Ross, P. J., & Muazzamu, I. (1990). The indigenization of pharmaceuticals: therapeutic transitions in rural Hausaland. *Social Science & Medicine, 30*, 919–928.

Etkin, N. L., & Tan, M. L. (Eds.). (1994). *Medicines: Meanings and contexts*. Amsterdam/Quezon City: Medical Anthropology Unit/Health Action Information Network.

Evans-Pritchard, E. E. (1937). *Witchcraft, oracles and magic among the Azande*. Oxford: At the Clarendon Press.

Flu, P. C. (1911). Die Aetiologie der in Surinam vorkommende sogenannten "Boschyaws" einer der aleppobeule Analogen. *Centralblatt fiir Bakteriologie, Parasitenkunde und Infectionskrankheiten Orig, 60*, 624–637.

Frézard, F., Demicheli, C., & Ribeiro, R. R. (2009). Pentavalent antimonials: new perspectives for old drugs. *Molecules, 14*(7), 2317–2336.

Gasser, R. A., Jr., Magill, A. J., Oster, C. N., Franke, E. D., et al. (1994). Pancreatitis induced by pentavalent antimonial agents during treatment of leishmaniasis. *Clinical Infectious Disease, 18*(1), 83–90.

Gomes, P. D., & Westerhof, W. (2002). Het gebruik van chemische bleekmiddelen onder Indiase vrouwen in Banglore. *Medische Antropologie, 14*(2), 353–374.

González, U., Pinart, M., Reveiz, L., & Alvar, J. (2008). Interventions for old world cutaneous leishmaniasis (Review). *The Cochrane Library, 4*, CD005067.

Health Assessment and Environmental Safety Department of Syngenta & the Medical Toxicology Unit. (2008). *Paraquat poisoning: A practical guide to diagnosis, first aid and hospital treatment*. London: Guy's & St. Thomas' Hospital NHS Trust.

Heemskerk, M., Delvoye, K., & the Trio communities. (2007). *Trio baseline study*. Paramaribo: Amazon Conservation Team Suriname.

Hirschberger, G., Florian, V., Mikulincer, M., Goldenberg, J. L., & Pyszczynski, T. (2002). Gender differences in the willingness to engage in risky behavior: a terror management perspective. *Death Studies, 26*, 117–142.

Kleinman, A. (1980). *Patients and healers in the context of culture*. Berkeley: University of California Press.

Krienert, J. L. (2003). Masculinity and crime: a quantitative exploration of Mescherschmidt's hypothesis. *The Electronic Journal of Sociology, 7*(2), 1–30.

Markowitz, G., & Rosner, D. (2000). 'Cater to the children': the role of the lead industry in a public health tragedy, 1900–1955. *American Journal of Public Health, 90*(1), 36–46.

Mathews, H. F. (1982). Illness classification and treatment choice. *Reviews in Anthropology, 9*(2), 171–186.

Mitropoulos, P. (2008). New world cutaneous leishmaniasis: updated review of current and future diagnosis and treatment. *Dermatology Online Journal, 14*(7), 1.

Nichter, M., & Nichter, M. (1996a). *Anthropology and international health: Asian case studies*. Amsterdam: Gordon & Breach.

Nichter, M., & Nichter, M. (1996b). Cultural notions of fertility in South Asia and their impact on Sri Lankan family planning practices. In M. Nichter, & M. Nichter (Eds.), *Anthropology and international health: Asian case studies* (pp. 3–33). Amsterdam: Gordon & Breach.

Nichter, M., & Vuckovic, N. (1994). Agenda for an anthropology of pharmaceutical practice. *Social Science & Medicine, 39*(11), 1509–1525.

Raeburn, P. (2006). Slow-acting: after 25 years, the EPA still won't ban a risky pesticide. *Scientific American, 295*(2), 26.

Reitinger, R., Dujardin, J. C., Louzir, H., Pirmez, C., et al. (2007). Cutaneous leishmaniasis. *Lancet Infectious Diseases, 7*(9), 581–596.

Rotureau, B. (2006). Ecology of the Leishmania species in the Guianan ecoregion complex. *The American Journal of Tropical Medicine and Hygiene, 74*(1), 81–96.

Schneider, J., Seiger, R., & Mahon, M. (2008). Leishmaniasis – case report with current diagnostic and treatment strategies. *Journal of the American Osteopathic College of Dermatology, 11*(1), 11–16.

Terborg, J., Ramdas, S., & Eiloof, D. (2006). *ICPD + 10 report: 10 years program of Action of the International Conference on Population and Development (ICPD) in Suriname 1994–2004*. Paramaribo: Stichting Prohealth.

Van der Geest, S., & Hardon, A. (1990). Self medication in developing countries. *Journal of Social & Administrative Pharmacy, 7*(4), 199–204.

Van der Geest, S., & Meulenbroek, A. (1993). Metaphors, metonyms and homeopathy: terms of illness and therapy among Mossi people in Burkina Faso. *Curare, 16*(3/4), 285–290.

Van der Geest, S., & Whyte, S. R. (Eds.). (1988). *The context of medicines in developing countries. Studies in pharmacological anthropology*. Dordrecht: Kluwer Academic Publishers.

Van der Geest, S., & Whyte, S. R. (1989). The charm of medicines: metaphors and metonyms. *Medical Anthropology Quarterly, 3*(4), 345–367.

Van der Meide, W. F., Jensema, A. J., Akrum, R. A. E., Sabajo, L. O. A., Lai, A., Fat, R. F. M., et al. (2008). Epidemiology of cutaneous leishmaniasis in Suriname: a study performed in 2006. *American Journal of Tropical Medicine & Hygiene, 79*(2), 192–197.

Van der Meide, W. F., Sabajo, L. O. A., Jensema, A. J., Peekel, J. P., Faber, R. W., et al. (2009). Evaluation of treatment with pentamidine for cutaneous leishmaniasis in Suriname. *International Journal of Dermatology, 48*(1), 52–58.

Wagner, M. K. (2001). Behavioral characteristics related to substance abuse and risk-taking, sensation- seeking, anxiety sensitivity and self-reinforcement. *Addictive Behaviors, 26*(1), 115–120.

Weigel, M. M., & Armijos, R. X. (2001). The traditional and conventional medical treatment of Cutaneous Leishmaniasis in rural Ecuador. *Review Panam Salud/Pan American Journal of Public Health, 10*(6), 395–404.

Weigel, M. M., Armijos, R. X., Racines, R. J., Zurita, C., et al. (1994). Cutaneous leishmaniasis in subtropical Ecuador: popular perceptions, knowledge and treatment. *Bulletin of PAHO, 28*(2), 142–155.

Whyte, S. R., Van der Geest, S., & Hardon, A. (2002). *Social lives of medicines*. Cambridge: Cambridge University Press.

Whyte, S. R., & Van der Geest, S. (1994). Injections: issues and methods for anthropological research. In N. L. Etkin, & M. L. Tan (Eds.), *Medicines: Meanings and contexts* (pp. 17–32). Amsterdam/Quezon City: Medical Anthropology Unit/Health Action Information Network.

Wijers, D. J. B., & Linger, R. (1966). Man-biting sandflies in Suriname (Dutch Guiana): *Phlebotomus anduzei* as a possible vector of *Leismania brasiliensis*. *Annals of Tropical Medicine & Parasitology, 60*, 501–508.

World Health Organization. (1999). *Safe and effective use of household insecticide products. Guide for the production of educational and training materials*. Washington: World Health Organization.

Young, J. C., & Garro, L. C. (1982). Variation in the choice of treatment in two Mexican communities. *Social Science & Medicine, 16*(16), 1453–1465.

Web references

http://www.vetboi.com.br/produto/1204101/Mata-Bicheira-Fort-Dodge-Spray500ML, last entered 17-04-2012.

http://toxtown.nlm.nih.gov/text_version/about.php, last entered 10-11-2011.

http://en.wikipedia.org/wiki/chlorfenvinphos, last entered 10-11-2011.

http://npic.orst.edu/factsheets/naphgen.pdf, last entered 10-11-2011.

http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=931&tid=193 last entered 10-12-2011.

http://www.scientificamerican.com/article.cfm?id=slow-acting last entered 10-11-2011.

http://www.syngenta.com/global/corporate/en/pqmedguide/Pages/exposure.aspx last entered 10-11-2011.

http://www.mi.gov/documents/Chlorine_factsheet_82357_7.pdf last entered 10-11-2011.

http://www.camdenelec.com/pdf/M.D.S.pdf last entered 10-11-2011.

http://www.medischezending.sr/website/zorggebied.asp?menuid=67, last entered 31-10-2011.