

# **Exploring Disease in Africa:**

**Smallpox**  
**Sleeping Sickness**  
**AIDS**

*A curriculum for advanced high school and college students*

**African Studies Center**  
Boston University  
Email: [africa@bu.edu](mailto:africa@bu.edu)

Copyright © 2010 by Melissa Graboyes  
[melissagraboyes@yahoo.com](mailto:melissagraboyes@yahoo.com)

## **Table of Contents**

Political Map of Africa

Curriculum Introduction

    Main Themes

    How to use this curriculum

    Why Africa

    Why these diseases

Disease in Africa

    Changes in the Land, Changes in Disease

    New People, New Diseases

Introductory Activities

    Richard Burton

    David Livingstone

## **Smallpox**

    Boylston and Boston

    Africans and Inoculation

    Jenner and Vaccination

    Transmission, Symptoms, Death Tolls

    Eradication: Theory and techniques

    Eradication: Ethical Questions

    Discussion Questions

    Activity Ideas

    Additional Materials

        Last case of Smallpox

        Smallpox photograph

## **Sleeping Sickness**

    An Ancient and Modern Disease

    The Two Diseases

        Symptoms

        Treatment

    The Cycle of Transmission

        The Vector (Tsetse Fly)

        The Parasite (Trypanosome)

        The Reservoirs (Wild Animals, Cattle)

        The Host (Humans)

    Precolonial African Methods

Colonization and Increasing Sleeping Sickness

Colonial methods of control

Modern methods of control

Discussion Questions

Activity Ideas

Additional Materials

Map of Sleeping Sickness Epidemics in E. Africa

Trypanosomiasis cycle 1, 2

Methods of Sleeping Sickness Control

## **AIDS**

AIDS Today

The Worst Epidemic?

Disease Ecology,

Prevention and Transmission

African Action Against AIDS

Generic Drugs & South Africa

Availability and Regional Differences

Health and Human Rights

Ethics of Scarcity

Discussion Questions

Activity Ideas

## **Appendix 1**

Stanley George Browne Excerpt

Geography and Disease

Geographic Map of Africa

Vocabulary List

Additional Resources (annotated)

Author Biography

Boston University African Studies Outreach Center

## **Appendix 2**

David Livingstone Excerpt PDF

## **Appendix 3**

Richard Burton Excerpt PDF

## **Appendix 4**

Zanzibar Eradication PDF

Political Map of Africa



## **CURRICULUM INTRODUCTION**

I've written this curriculum for teachers who are interested in Africa, want to teach about Africa, and have a gnawing feeling that what they're reading in the newspapers, hearing on the radio, and watching on TV isn't the whole story, or the only story. Whether your specific interest is in disease, development, ecology, history, human rights, or medical ethics, I believe that this curriculum should provide a useful starting point. The following materials should help students think critically and intelligently about disease in Africa.

This curriculum aims to do a few things, mostly to correct biases that are prevalent in much of what we hear about Africa. Biases that imply that Africa is a disease-ridden continent, that help for these diseases only came with the arrival of outsiders, that disease on the continent continues to a problem that only foreign aid and western ideas can fix. I try to counter some of these ideas by focusing on the only disease that has been globally eradicated (smallpox); an ancient disease that lingers on today (sleeping sickness); and a disease that has only emerged in the lifetime of your students (AIDS). A curriculum focused on three diseases is obviously not comprehensive. Conscious decisions were made about what to include, and teachers should be aware of the themes I've chosen to stress.

One of the things I've emphasized is the role of the environment. I try to show students how diseases are dependent on their environments, and that there is an often complex relationship between geography, climate, flora, fauna and disease. Additionally, the modules on sleeping sickness and AIDS show how we must think about the environment with humans in it—a place that is constantly being shaped and changed through human activity. These materials will show how actions such as the introduction of crops and animals and the building of roads and houses have created new niches for some diseases while pushing out others.

I've also tried to examine disease while keeping in mind current debates about human rights and medical ethics. Real life events occurring on the continent present case studies for students to wrestle with difficult questions such as whether there is a “right” to health; if paternalistic behavior is ever justified; and how to allocate scarce yet lifesaving therapies. I do not advocate a specific position on any of these questions, I merely provide students with the materials needed to come to their own decisions. In the sections on smallpox and AIDS, what students will hopefully discover is that many of the questions about human rights are surrounded by other, stickier, questions of medical ethics—questions that get at ideas of justice and equity. As the curriculum explains, a true ethical dilemma has multiple persuasive solutions, making it an excellent starting point for discussion and debate.

Throughout these pages, my thinking is undergirded by the idea of “African agency,” which is the belief that Africans were always active participants in events, not just passive subjects or observers. In practical terms, this simply means I have a bias toward reporting heavily on African ideas, techniques and practices. It also means that in each of the disease modules, students will be presented with information about how Africans controlled diseases prior to Western colonization and how they continue to do so today. An exploration of these practices will draw students into fifteenth century West African kingdoms where smallpox epidemics were contained, and across the continent and into the present where South African citizens have demanded new rights about access to life saving drugs.

I hope you find this curriculum useful as you expose your students to new ways of thinking about disease in Africa.

## **MAIN THEMES**

Briefly stated, the main themes of this curriculum are:

- The physical environment profoundly shapes disease. The environment is more than just the natural environment. People modify the land and waterscapes in innumerable ways: by building houses, cutting down trees, building roads, grazing livestock, planting crops for agriculture, and introducing new plants and animals. All of these changes create new disease environments.
- Africans had indigenous methods to control disease. From across the continent, there were a variety of different responses to different diseases. Some were pragmatic and evidenced a deep understanding of disease even before modern science had explained the intricacies of diseases such as sleeping sickness and smallpox.
- Diseases respect no boundaries. Although this curriculum focuses on Africa, there are global connections when it comes to the spread, prevention, treatment, management and eradication of disease. In order to understand diseases worldwide today, we must understand diseases in Africa historically.
- Diseases exist in the realm of human rights. We cannot discuss diseases in a moral vacuum, and must consider them within the current realm of human rights. Inquiries into disease raise questions about global inequities, the allocation of scarce resources and if there is a “right” to health or life saving treatments.

## **HOW TO USE THIS CURRICULUM**

This curriculum is made up of three separate modules, focusing on smallpox, sleeping sickness and AIDS. The materials have been designed so that the modules can be used individually as stand alone lessons, or all together to explore similarities and differences among and between the diseases. Each module contains a narrative introduction to the disease, which students can read or used by the teacher as lecture notes. Additionally, each module includes a list of discussion question and activity ideas and primary source documents and images. Prior to the disease modules, there is a master vocabulary list and two activity ideas to introduce students to thinking about diseases and their treatments in Africa.

Each module highlights a different concept. Short synopses are provided below:

- For smallpox, students will be exposed to ancient African practices to control smallpox that predated Western forms of vaccination, and how that practice helped stop an epidemic in eighteenth-century Boston. This module also explores the successful eradication of smallpox and asks some difficult ethical questions about the paternalism of public health campaigns and the rights (autonomy) of individual people to choose not to participate.
- For sleeping sickness, particular attention is paid to African techniques for controlling disease by thoughtfully managing the environment. This section also demonstrates the integral role of the environment and the complex relationship that exists between vector-borne diseases and their environments.

- For AIDS, the curriculum presents materials about not only the toll of the epidemic, but also how Africans are responding. Additionally, this module presents the most information about current debates on human rights and medical ethics, highlighting questions of whether there is a right to life saving treatment, and how to distribute scarce life-saving resources.

### **WHY AFRICA?**

Maybe the question should be asked, “Why *not* Africa?” How much is known about this vast continent, and how much is taught in the high school curriculum? In short, it seems there is *too* much misinformation about Africa, and too little emphasis in the high school curricula. It's important for young adults to have an understanding of this massive, diverse, continent.

### **WHY THESE DISEASES?**

The first disease is smallpox, which is the oldest of the diseases presented, and also the only one to be eradicated. Important because: ancient disease; only one eliminated via the methods of modern medicine and public health working together; eradicated with a vaccine developed only in the 1950s; that vaccine given to people only with the organized efforts of global public health efforts (World Health Organization, etc). Also important because a truly devastating disease, horrifying and almost always fatal. Also interesting case study because despite the West's late creation of a vaccine, Africans had methods of variolation in order to prevent against smallpox dating back hundreds if not thousands of years. Through smallpox we'll be able to explore African indigenous knowledge about disease, the transfer of African medical knowledge to the West (rather than the other way around), and how an infectious disease can be eradicated.

The second disease presented is sleeping sickness. This disease is often overlooked in current discussions about disease in Africa, yet it has been around for centuries and continues to be endemic in parts of the continent, and occasionally epidemics flare up. Sleeping sickness can be fatal, severely decreases quality of life and there is still no method for prevention. Although a pharmaceutical treatment has been available for more than half a century, it is still not widely available in the places where people need it.

Sleeping sickness is the most obvious example of a disease that is profoundly rooted in, and affected by, the environment. It is the most complicated of the diseases presented in terms of the required physical conditions, and the complex interactions between vector, host, reservoir and victim. It is here also where we will find more examples of Africans thoughtfully managing the physical landscape in order to minimize exposure to the disease.

The final disease presented is the most notorious, and the most intimately linked with Africa: AIDS. It is an obvious choice for a curriculum such as this one. Almost everyone knows about AIDS, and has heard about the devastating toll the epidemic has had in Africa. This disease, however, also presents some interesting contrasts to the other two. AIDS is not transmitted by a vector, and is not as intimately linked to the environment as sleeping sickness. But, we will show how the AIDS epidemic took on a particular shape due to humans' impact on the environment (location of roads, patterns of urbanization and rural-urban contact, presence of labor migration).

This epidemic has often been portrayed as one requiring foreign solutions. The curriculum challenges this idea by illustrating some of the mechanisms Africans have used to cope with the fallout of the epidemic: home based care for the sick being just one example. The epidemic is not just a case of foreign solutions, but also very pragmatic responses on the ground. Finally, we will explore the dark reality that because of cost and politics, drugs to treat AIDS patients are not widely available in Africa. This raises important questions about human rights that students will be forced to address while grappling with what human rights mean.

## **DISEASE IN AFRICA**

### *Changes in the Land, Changes in Disease*

As a continent full of diverse landscapes and ecosystems, Africa has always had disease. But, Africa did not always have the *same* diseases they have now, and they did not suffer from them in the same way. All diseases are rooted in their environment, but some are more sensitive to environmental changes than others. One of the biggest shifts during the past millennium is that people's relationship to the land has changed.

Until 5000 BC, Africa's population was composed primarily of small nomadic groups engaged in hunting and gathering. These small groups of people traveled from place to place, hunting and collecting wild grains. They moved to a new location when the seasons changed or when a place no longer provided food.

Although it goes against many people's expectations, the disease burden was actually quite low for these nomadic people. They did not have many things: permanent homes, reliable food supplies, iron tools or agricultural knowledge. But they also did not have many diseases common in Africa today. For instance, waterborne diseases such as dysentery and cholera were virtually unknown since groups would move before fouling their water supply. Their lack of contact with livestock also protected them against diseases such as smallpox or measles.

Answers as to why people stopped being nomadic and turned to settled agriculture are hard to prove definitively. What we do know is that when groups began to settle down to grow their own crops, it ushered in a new era. With the blessings of no longer being dependent on what they could find, they also had to endure the hardships that came with new diseases. As groups settled down to domesticate animals and grow crops, Africans intentionally and unintentionally changed the land. And with changes in the land came changes in the disease environment.

## **ANIMALS AND NEW DISEASES**

The domestication of animals was a major step in creating settled agricultural societies. Domestication meant far more contact between humans and cattle, chickens and goats, which made people increasingly susceptible to animal diseases. Viruses that formerly only affected these animals were given multiple opportunities to mutate and transition from being purely animal diseases into human ones. The process of a disease mutating and jumping species is a two part process that almost always begins with a new, higher level of contact between animals and humans. In the first phase, an animal disease mutates to infect a human that is in contact with a sick animal. In this case, an animal is sick, and a human becomes sick through contact with the infected animal. To use the recent scare about bird flu as an

example, the first phase was when sick birds infected the farmers and handlers who were around them. To reference one of the diseases we'll study in this curriculum, cowpox jumped from sick cattle to the hands of the milkmaids who were in constant contact with them.

A second transition is needed for the disease to become truly dangerous to humans. The virus must mutate again so that it becomes a disease that can not only infect humans, but which can be transmitted and spread from human to human. Once this transition has occurred, the disease no longer needs the sick animal. A person can become sick with the disease just by being in contact with a sick person. To return to the example of bird flu, this is luckily a transition that has not yet occurred. It's this jump that public health officials are especially worried about, since it means that bird flu is no longer dependent on sick birds, only on sick humans. Regarding sleeping sickness, part of what made it such a dangerous disease was that it successfully made this jump and was easily transmitted from one infected person to another.

### **AGRICULTURE AND DISEASE ENVIRONMENT**

Another way that the disease environment was changed was through the practice of agriculture. In order to grow crops, the land had to be cleared and formerly wild grains cultivated in a single area. The changes in the land and the flora meant that new disease environments were created: places for vectors to breed, and places for people to come in contact with those vectors (Vector: See the vocabulary list in the appendix). One way to explore the changes that occurred due to the cultivation of new crops is by looking at one plant. In parts of Uganda, banana trees from Asia were introduced with great success. The trees were planted near homesteads and villages and provided an easily maintained and steady source of food. But in order for the trees to be planted, other plants had to be removed. As the trees grew up, the perfect conditions for tsetse flies (which transmit sleeping sickness) were created. For centuries now, southern Uganda has remained a site of reoccurring sleeping sickness epidemics, which have killed hundreds of thousands, if not millions, of people.

Before we denounce the introduction of banana trees, we have to consider what kind of environment the trees replaced. In the case of southern Uganda, the places where the banana trees were planted used to be an ideal habitat for anopheles mosquitoes—the vectors for malaria. When the trees were introduced and began to grow, the new tsetse environment destroyed the formerly mosquito (and malaria) friendly conditions. Thus the Baganda people suffered more exposure to tsetse flies, but less malaria. It would be hard to argue that this change was either bad or good; it is more honest to claim that this was more a case of environmental change. As we explore the history of disease in Africa, it is important to remember that humans can have both positive and negative impacts on the land, but more often than not, there are mixed results.

### **HOW EPIDEMICS HAPPEN**

Settled agriculture creates denser settlements of people compared to nomadic hunter-gather groups. Larger numbers of people gathered in one place means there is a higher likelihood of epidemic and endemic diseases. With small groups of people, it becomes impossible to have epidemics of disease since these diseases require a sufficient number of uninfected or non-immune people to infect. The way many infectious disease epidemics work is that they enter a new location where there is a large number of uninfected people who have no immunity. The disease sweeps in with an infected foreigner or a

local who has become infected while traveling. People quickly become infected and one of two things happen. Either the person dies or the person becomes immune. After the disease has burned through the human hosts, it will need to retreat to an animal reservoir (allowing it to become endemic) or it will disappear until a sizable number of non-immune people again exists.

### **ADVANTAGES OF AGRICULTURE**

But there are also some advantages to living in settled agricultural villages, despite the fact that it exposed people to new diseases. In particular, there is greater food security which helps prevent malnutrition and undernutrition. There are also advantages gained technologically from sharing knowledge. It was only with the advent of settled agriculture that villages and cities developed, and with those densities of people came much of what we associate with “culture” was able to develop.

### **NEW PEOPLE, NEW DISEASES**

Africa is often considered part of the “old world” consisting of Europe and Asia, but this is only partially true. For millennia the continent had many of the diseases that were in Europe: plague, leprosy, syphilis. But just because these diseases existed on the continent doesn't necessarily mean they emerged there independently. It's unclear whether these diseases were spread from Europe to Africa via contact, or if they arose independently in each place. What we do know is that on many parts of the continent, Africans shared enough diseases with Europe to have a degree of resistance. There were very few “virgin soil” epidemics that resulted in huge losses of life.

One of the ways epidemics began, however, was through the re-introduction of diseases by travelers or traders from other parts of the world. Both the eastern and western coasts of Africa received many visitors, meaning that there were many potential chances for infection.

### **ATLANTIC EXCHANGES**

On the West Coast of Africa, there was regular and sustained contact with Europeans from the 1500s onward for the purpose of trade. There was also regular contact with the East Coast of Latin America, and indirectly with the southern United States and Caribbean due to the slave and triangular trade. West Africa was intimately connected to the rest of the Atlantic Ocean world through the slave trade. They exported much more than just people, though. Aspects of West and Central African language, religion and cultural practices could be found on the Eastern coast of Latin America, the Caribbean and in the American colonies in the south. All of this contact meant that in addition to people and ideas, parasites and whole new diseases could be introduced into trading centers. It didn't mean that such biological exchanges were sure to happen, but it did raise many new possibilities.

As just one example of this trans-continental trade in diseases, the African continent was on the receiving end in the 1890s. A boat arriving from Brazil into a west African port brought along not only supplies to trade, but also a very hardy flea. The flea, also referred to as a jigger, was to quickly make its way across the width of the African continent. The flea was not deadly, but it did qualify as a big nuisance. The pregnant flea, which normally resides in dirt or sand, will burrow into the feet of a person walking on top of it. Once establishing itself under the skin, the flea bites into a capillary and begins sucking the person's blood. In the next one to two weeks, the flea releases approximately a hundred eggs that will pass out of the person's foot onto the ground. Inside the body, the flea will

continue to suck, growing up to a centimeter in size. The site can become ulcerous and infected, in addition to being quite painful. This new immigrant to the continent moved fast, and had reached the East African coast within three years. One of the things that the remarkably fast spread of the jigger shows is how well connected West Africa was to its interior since it required people moving across the continent to bring the sand flies with them.

### INDIAN OCEAN EXCHANGES

On the East African coast, there was also a long history of contact with other lands facing the Indian Ocean lands. For centuries, the east coast of Africa had been a destination for traders and travelers from the Middle East, Oman and India. The yearly monsoon winds provided the perfect means for travel since they blew half the year toward Africa and half the year toward India. The nature of this contact differed a bit from that in West Africa, however. On the Eastern coast, new products, people and diseases introduced into the coastal ports and entrepôts moved into the interior more rarely and slowly because of less developed trade networks. This did not stop diseases such as tuberculosis, plague and cholera from being re-introduced into the port areas, where they could cause havoc. And, as the networks into the interior improved in the mid-1800s (created to move slaves and ivory to the coast) diseases more quickly moved into formerly isolated and protected regions..



*The Indian Ocean world, connecting Eastern and Southern Africa to Asia and the Middle East.*

The history of European contact in Africa differs dramatically from that in North and South America. The Americas were considered part of the “new world” where many of the diseases rampant in Europe did not exist. Smallpox and tuberculosis were new diseases to the native Americans, great numbers of whom people died, since they possessed no acquired immunity. In Africa, the tables were turned to some extent. European explorers were unable to penetrate the interior part of the continent—or much beyond coastal areas—for centuries due to the rich disease environment. Europeans possessed no immunity to, or protection for, malaria which was found across huge parts of the continent. Sleeping sickness was also rife, in addition to a number of “fevers” that would routinely kill whole exploration teams. Some scholars have argued that the late colonization of Africa compared to the Americas is due to a degree of protection the continent had because of its unique and deadly disease environment.

## INTRODUCTORY ACTIVITIES

In order to introduce your students to thinking about disease and medicine in Africa, it may be useful to spend time allowing them to read one or two primary sources that challenge some preconceived notions. There are two documents included in the appendix of this curriculum that have passages that will challenge students' ideas about what constitutes medicine in Africa, how useful African knowledge is, and the flaws that can be inherent in a folk understanding of disease.

### **Richard Burton, *First Footsteps in East Africa or an Exploration of Harar*, (London: Longman, Brown, Green, and Longmans) 1856.**

Richard Burton was an adventurer, explorer, spoke more than a dozen languages, and was reputedly the first foreigner to sneak into Mecca. This book was published in 1856 and records his travels around the horn of Africa. In general, Burton is an extensive and thorough chronicler of places. He was a bit of an eccentric for his time since he valued local knowledge, and was possibly less racist than his peers. In his many books, including this one, readers will find quite thoughtful descriptions of local practices and ideas. The following excerpts focus on Burton recounting conversations he had with Somalis about their customs for treating different diseases.

Pg: 180-182

We're reading Burton's footnote to his regular commentary. It has to do with the treatment for a variety of different maladies, including smallpox, chickenpox, dysentery, hemorrhoids and consumption, and the use of leeches. Interestingly, toward the end of the passage Burton records how Somalis argue that their indigenous therapies are more effective than British medicine.

Things to notice/discuss:

- Connections between food/diet and healing are not so different than ideas we have about these things today. (Chicken soup, orange juice)
- Use of leeches then and now (just because old and foreign doesn't mean they're ineffective; leeches are being re-introduced into medical practice today)
- Somali's argue their treatment was more effective than the British. Believable?

Pg: 232-233

This passage discusses the use of oil and butter as a skin protector and illustrates that just because some folk practices are true, not all are.

Things to notice/discuss:

- Use of butter to protect skin, similar to use of shea butter today
- Just because one part of a practice is true (butter as a skin protection), doesn't mean all are true (neutralizes malaria)

### **General Questions:**

- Why did the Somalis have the practices Burton described? How did they learn them?
- Do you have to understand "science" to know a medicine or practice is effective?
- Today, how do we explain chicken soup, orange juice or a particular diet to restore health?
- Should we be wary of dismissing "traditional" or "folk" remedies since there is a tendency for many remedies to return?

**David Livingstone and Charles Livingstone, *Narrative of an Expedition to the Zambesi and its Tributaries; and of the Discovery of the Lakes Shirwa and Nyassa, 1858-1864*, (New York: Harper & Brothers Publishers) 1866.**

The two authors consisted of David (the recipient of the famous line, “Dr. Livingstone, I presume”) and his brother, Charles. What were they doing there? Explain his mixed feelings about local medical practice because of his role as a missionary. Intent on bringing the three “Cs” to Africa: Christianity, civilization and commerce—all through colonization. These excerpts are taken from their absolutely huge book (600+ pages) of very detailed commentary. The included passages show examples of Europeans recognizing African competence regarding agriculture, and a questioning of what “medicine” in Africa is all about. Dr. Livingstone's passages are also a good opportunity to talk about how there can be biases in primary sources, and the importance of being critical readers.

Pg. 57-58; 313; 446-447—What is an African “doctor” and African “medicine”?

- Europeans describing the African “medical profession”: crocodile, elephant, rain doctor. Interesting example of European/African interaction and change since there is now a “gun doctor”.
- Different types of medicine including “child medicine” and the “medicine of fatness”.
- Should we explain these things just in terms of semantics, or does this imply a fundamental difference in how Africans understanding disease and medicine?

Pg. 250-251; 447; 510—Sleeping sickness, African treatment and ideas about

- Paragraph long description of an African technique for preventing, treating tsetse-bitten cattle
- Local knowledge about tsetse
- What did Livingstone understand about the role of the environment and disease ecology? Who do you think understood more about sleeping sickness at this time, why?

Pg. 524-525—Recognizing African knowledge

- Recognition that Africans did possess some skills
- Does this passage fit with the excerpts of other parts of the book?

**General Questions:**

- How does Livingstone characterize local medicine?
- What do you think he thinks of native practitioners and why?
- If you were using this account to try to write an “honest” assessment of local medical practices, would you use this account—would anything worry you? Do you trust the Livingstone’s assessment?

**Exploring Disease in Africa:**  
**Smallpox**  
**Sleeping Sickness**  
**AIDS**

*A curriculum for advanced high school and college students*

**African Studies Center**  
Boston University  
Email: [africa@bu.edu](mailto:africa@bu.edu)

Copyright © 2010 by Melissa Graboyes  
[melissagraboyes@yahoo.com](mailto:melissagraboyes@yahoo.com)

## **SMALLPOX: THE DISEASE THAT DIED AFRICAN PRACTICES AND THE CHALLENGES OF ERADICATION**

### **BOYLSTON AND BOSTON**

In 1721, a deadly epidemic of smallpox broke out in Boston. All around the city, people were dying painful deaths, covered all over their bodies with oozing, pus-filled sores. The disease was terrifying not just for the astonishing number of people it killed, but also because it was so misunderstood. During this period of time, science existed alongside superstition, and medicine next to magic. People were not clear about how the disease was transmitted, and because of that, virtually nothing could be done to prevent it. Smallpox was an equal opportunity killer.

While the epidemic was worsening and people becoming increasingly desperate, Dr. Zabdiel Boylston learned of a process of inoculation used by slaves in the Boston area. In general, a handful of different slaves described a practice of taking the liquid from a smallpox lesion, and putting it into a cut made on a healthy person. The healthy person would get sick with a mild form of smallpox, but would recover shortly. The slaves attested to the fact that the practice of inoculation seemed to provide lifetime immunity to smallpox, and that very few people died undergoing the procedure.

Based on that information gleaned from the Boston-area slaves Boylston decided to begin inoculating people. His actions created a huge controversy and he defended his decision, stating:

I don't know why 'tis more unlawful to learn of Africans, how to help against the Poison of the Small Pox than it is to learn of our Indians, how to help against the Poison of a Rattle Snake.

Dr. Boylston continued to inoculate people to great criticism. Only when the epidemic had subsided could his technique be compared to the standard care at the time (doing nothing). At the end, he showed that of the 300 people he inoculated, only 6 died. At worst, the death rate for those undergoing his procedure—or really, the slaves' procedure—was only 2%. Among the general population in Boston, the death rate was 14%.

### **AFRICANS AND INOCULATION**

Smallpox is an ancient disease and was present in Africa, Asia and Europe since 400 BC. It is unclear whether smallpox was indigenous to Africa or was introduced early on. By 600 AD, smallpox was widespread in North Africa, and probably moved into West Africa by virtue of the caravan trade that crossed the Sahara desert. In addition to the disease arriving from across the desert, it was also introduced and reintroduced on the coast by foreign ships.

By 1700, there is record of West African people using the practice of inoculation. If the practice had been adopted, it likely came from visitors or travelers who had crossed the Sahara desert from the Middle East. If it emerged independently in West Africa, it's hard to establish when it began since we are reliant on documents written by foreign travelers and traders—many of whom never left the coast. An African account was collected in the twentieth century, although it describes the woman's own inoculation around 1892. She reported that:

they used to scratch your arm until the blood came, then they got the fluid from someone

who had the smallpox and rubbed it in. It all swelled up and you covered it until it healed. Some children used to die...

Although it was the practices of Africans that informed Dr. Boylston's actions in Boston, Africans were not the only group to use inoculation. The practice had a long history in Asia and the Middle East, and reports from the 1700s describe it being used widely to contain smallpox outbreaks in Constantinople. It is unclear whether the practice of inoculation arose spontaneously in multiple sites, or if the knowledge had been passed around the globe.

Ironically, despite these techniques being used outside of Europe with great success, the practice did not catch on quickly. There was little understanding of why inoculation worked, just a body of very persuasive evidence. It was not until the experiments by Edward Jenner half a century later that more light was shed on the practice of inoculation and how to prevent smallpox.

### **JENNER AND VACCINATION**

In 1796, Edward Jenner conducted an experiment that would change the way the West dealt with smallpox, and that would set the stage for eradication attempts nearly two hundred years later. In that year, he made the observation that milkmaids in England were never stricken with smallpox. Rather, they suffered from “cowpox” lesions all over their hands and arms due to their constant contact with the cows they milked. Jenner guessed that the women's exposure to cowpox granted some degree of immunity to the related smallpox disease. (In fact, smallpox is the human form of cowpox, and the disease mutated once cattle were domesticated and there was greater contact between humans and cows.)

In order to test his hypothesis he conducted a very useful experiment, but one that would never be allowed to occur today. He inoculated an eight-year-old boy with fluid from a cowpox lesion on the arm of one of the milkmaids. The boy developed a cowpox lesion, and after a few days it healed. This was the first part of the experiment, but then Jenner had to challenge the boy's immunity, and this is the part that would be deemed quite unethical today. Jenner exposed the boy to smallpox victims—essentially *trying* to infect the boy with smallpox. When the boy remained free of smallpox Jenner knew that his hypothesis had been correct and that it was possible to prevent against smallpox.

From Jenner's experiments came the practice of “vaccination.” The term was originally derived from the Latin word for cow, “vacca”. Thus, the practice of injecting someone with cowpox in order to provide immunity to smallpox was referred to as vaccination. Only later did the term take on its more general meaning of receiving an injection to prevent against disease.

### **TRANSMISSION, SYMPTOMS, DEATH TOLLS**

Smallpox is an acute contagious disease caused by variola virus, a member of the orthopoxvirus family, and is related to cowpox and monkeypox. It is transmitted from person to person by infected air droplets spread in face-to-face contact with an infected person. The disease can also be transmitted by contaminated clothes and bedding, though the risk of infection from this source is much lower. There is no animal reservoir and insects play no role in transmission.

The incubation period of smallpox is usually about two weeks. During this period, there are no outward symptoms and the person cannot infect others. The incubation period is followed by the sudden onset of flu-like symptoms including fever, malaise, headache, severe back pain and, less often, abdominal pain and vomiting. Two to three days later, the temperature falls and the patient feels better. Over the next few days, the characteristic rash appears on the face, hands, forearms and abdomen. Lesions also develop in the mucous membranes of the nose and mouth, and ulcerate very soon after their formation, releasing large amounts of virus into the mouth and throat. Lesions progress from macules to papules to vesicles to pustules. About two weeks after the onset of symptoms, if the patient is still alive, the pustules form scabs which leave behind scars.

The possibility of infection is greatest after face-to-face contact with a patient after fever has begun and during the first week of rash. It is then that the virus is released via the respiratory tract and the patient's coughing spreads infected droplets into the air. Although patients remain infectious until the last scabs fall off, the large amounts of virus shed from the skin are not highly infectious. Exposure to patients in the late stages of the disease is much less likely to produce infection.

There is no effective treatment for smallpox. For those who were exposed, a vaccine could be administered within 4 days of exposure to the virus. Sometimes this would grant immunity, prevent infection or lessen the severity of the disease. Otherwise, 30% of those infected by smallpox died.

In the early 1950s – 150 years after the introduction of vaccination – an estimated 50 million cases of smallpox occurred in the world each year, a figure which fell to around 10–15 million by 1967 because of vaccination. Historically, there were major epidemics of smallpox throughout Africa. Along the West African coast, there were epidemics from the 1680s through the nineteenth century. In South Africa, there were smallpox epidemics introduced by foreign ships in 1713, 1755, 1767. On the East Coast, the Portuguese recorded an epidemic in 1589, but it moved into the interior slowly since the trade networks were not as extensive as on the West Coast. Globally, the disease killed between 300 and 500 million in the twentieth century alone.

### **ERADICATION: THEORY AND TECHNIQUES**

There are at least two different strategies for managing disease: control or eradication. Since a version of Jenner's vaccine came into widespread use, smallpox had been managed globally by administering the vaccine to people. But no matter how good a vaccine is, it can never be 100% effective. Vaccines suffer from a few minor problems and one major problem. The minor problems are that there is always a slim chance that a vaccine is ineffective, or that it won't properly work on a person. In a small number of cases, the vaccine will also cause serious side effects and even death. But these aren't the real shortcomings of vaccination.

More importantly, a vaccine's efficacy is limited by where it is actually used. A vaccine cannot help someone if it doesn't reach that person. In rural parts of Africa and Asia, people were not being vaccinated and were continuing to suffer from a fatal—yet preventable—disease. People were beginning to see the limits of only controlling smallpox. Control meant that while it was virtually eliminated from industrialized nations, but continued to plague poorer countries. In 1967, the "ancient scourge" still threatened 60% of the world's population, killed every fourth victim and scarred or

blinded most survivors and eluded any form of treatment. This reality made many ethically uncomfortable and by the late 1950s there was talk of another type of management for smallpox: eradication.

Despite appearing to be quite clear, eradication is a public health term that is actually quite hazy. When the World Health Organization first began discussing smallpox eradication in 1958, then eradication only meant the elimination of the disease within specific nations. By 1967, the term described the elimination of smallpox globally. This was a huge jump in scale. With the backing of the United Nations and the WHO, smallpox became the second disease to be targeted for worldwide eradication. (Malaria was the first disease; and while it was successfully eliminated from the Southern United States and parts of Europe and Latin America, attempts failed in Asia and Africa.)

The blueprint to accomplish global smallpox eradication was to eradicate the disease country by country using the techniques of vaccination and isolation. The plan for eradication called for 100% vaccination. This meant that thousands of public health workers were sent out into millions of villages and cities to go door to door, vaccinating every single person.

This plan of 100% vaccination sounded great to public health workers, but there were two areas where problems arose. The first came when public health workers encountered someone who refused to be vaccinated. The reasons as to why someone would refuse were many. Some people refused on religious grounds, others were doubtful as to the efficacy of the vaccine or felt threatened by foreigners pushing medicine. Regardless of the reasons, there were many people who refused to be vaccinated. In these cases, the WHO plan relied on forcing those individuals to be immunized against their will.

The second scenario that threw a wrench into the public health machine was when workers discovered someone who was infected with smallpox. There was no effective treatment for smallpox so anyone who had the disease had to be isolated to prevent the spread of the disease to other persons. Complete isolation was the only way to be sure that the disease wouldn't spread to others and foil eradication attempts. Isolation in a special ward in a hospital was ideal, but in many rural areas there were no hospitals, and no special wards. In this case, isolation was best done at home. As you may have guessed by now, many patients were less than enthusiastic about the idea of being isolated, especially forced isolation. People were so distraught by this, in fact, that smallpox patients hid from workers and tried to avoid being discovered.

Ultimately, the WHO strategies of mass vaccination and isolation were effective at eliminating the disease from the globe. In 1980 the WHO announced the total eradication of smallpox. Some have argued that the eradication of smallpox was the biggest public health accomplishment in history, remarkable both for its logistical difficulty and the outcome.

### **ERADICATION: ETHICAL QUESTIONS**

The tactics used to eradicate smallpox are worth considering from an ethical perspective, rather than just a pragmatic one. The campaign was based on the notion of 100% vaccination in locations where the disease was still present. It was also dependent on finding every case of smallpox so the individual

could be isolated. Each of these practices raises serious ethical questions about the rights of individuals to choose what happens to their own bodies versus the rights of public health workers to go against an individual's wishes and do what they believe is best both for the individual and larger society. In this section, we'll evaluate the practice of forced vaccination.

As was mentioned in the prior section, public health workers occasionally ran into people who refused to be vaccinated. Sometimes these people made sophisticated arguments about why they wanted to opt out, and other times they were just obstinate. From an ethical perspective, we could say that these people—regardless of whether they had a good reason or not—were exercising their autonomy. It is their choice as an individual to decide what will and will not be done to their body. The ethical principle of autonomy is also sometimes referred to as the right to self-determination. In the United States, we recognize respect for autonomy as one three key ethical principles guiding medical practice. (The other two principles are “non-maleficence and beneficence” and “distributive justice.”) In practice the major way medical researchers and doctors respect autonomy is by always asking for informed consent. The process of informed consent is meant to share information with the patient so she can decide what she would like to be done.

In medical and public health situations, when a health worker knowingly disrespects someone else's autonomy, one of two things are afoot. On one hand, the health worker is just knowingly and egregiously breaking the law. On the other hand, the person may defend herself by claiming that she is in fact acting in the person's best interest. In this case, the person is said to be acting paternalistically. Paternalistic behavior is grounded in the belief that there are times when someone may not act in his best interest, and that an outside person can do a better job of deciding what is best. An obvious example of paternalism is when your parents forced you to go to the dentist, get a shot, or eat your vegetables when you were little. Although as a ten year old you probably objected to all of these things, your parents acted in your best interest, ruled against you and made you go to the dentist and the doctor and to finish your peas. This type of paternalistic behavior is tolerated when a parent is acting in the best interest of the child.



*The WHO card used in the eradication campaign*

The concept of paternalism becomes murky when we have adults acting on behalf of other adults. For the smallpox eradication campaign, global health workers would determine that although a competent adult might state their opposition to being vaccinated, it was actually better for that person to be forcibly vaccinated. This type of paternalistic behavior was justified by claiming that it was better for the individual to be vaccinated. The logic was that smallpox was a terrible disease and that the vaccine was safe and effective, and it would protect this adult from future infection really a question of individual rights to autonomy vs community interest in good health. Better frame e.g. stopping at red lights benefits community over individuals.

You may or may not agree with the health worker's justification on paternalistic grounds. An alternative justification is based on the concept of utilitarianism. Briefly, a utilitarian is in support of actions that will bring the greatest good to the greatest number of people, even if that means that the

rights of an individual are infringed upon. In this case, one person's forced vaccination would bring great benefit to that person's family and whole community, now protected from smallpox. However, a supporter of rule-based ethics would argue that it is always wrong to disrespect someone's autonomy since there are certain ethical rules and principles that must always be adhered to. If respect for persons through respect for autonomy is a fundamental ethical principle, any action that conflicts with this principle must be wrong.

### **Discussion Questions**

- What techniques did Africans use to treat smallpox? How do you think they learned those things?
- Discuss the differences between controlling a disease and eradicating a disease. Although eradication may always be desired, can mere control also be successful or desirable?
- Is eradication only possible when there is no vector involved, and the disease is only tangentially linked to the environment? [easier to discuss when compared to sleeping sickness]

### **Activity Ideas**

- Consider the practices used during the smallpox eradication campaign. Outline the different ethical arguments to be made in support of, and against, the practice of forced isolation. What is your conclusion about the health workers' actions?

After you've discussed the practice of forced isolation related to smallpox, reconsider your argument in light of a recent story about an American infected with tuberculosis. This man knew he was infected with tuberculosis yet chose to travel to Europe and visit multiple countries before returning to the United States. Ethically, he was expressing his autonomy in choosing to be out in society. But as soon as he arrived back to the United States he was legally forced to be isolated and treated. Do you think this was fair? Are there ever situations when individual rights ought to be ignored if it means society, as a whole will benefit? Does the fact that tuberculosis is a contagious disease that can quickly spread amongst the public make a difference? Can you identify the ethical principle behind your argument?

**Additional Materials**



*The last victim of smallpox*



*A particularly bad case of smallpox*

# **Exploring Disease in Africa:**

**AIDS**  
**Sleeping Sickness**  
**Smallpox**

*A curriculum for advanced high school and college students*

**African Studies Center**  
Boston University  
Email: [africa@bu.edu](mailto:africa@bu.edu)

Copyright © 2010 by Melissa Graboyes  
[melissagraboyes@yahoo.com](mailto:melissagraboyes@yahoo.com)

## SLEEPING SICKNESS: ANCIENT SCOURGE, MODERN PROBLEM ECOLOGY AND AFRICAN KNOWLEDGE

### AN ANCIENT AND MODERN DISEASE

Possibly the earliest record of death due to sleeping sickness came in 1373 when a traveler noted that the Sultan of Mali suffered from lethargy, “a disease that frequently befalls the inhabitants.” European slave traders were aware of the disease and would check for swollen lymph glands in the neck—an early symptom of sleeping sickness. Unfortunately, sleeping sickness was not just an ancient disease, it continues today. The World Health Organization (WHO) estimates that 50-60 million Africans live in areas where sleeping sickness might infect them. There are different hypotheses about why sleeping sickness remains a scourge today: the sophistication of the parasite, the tolerance of the parasite to drug treatment, the socioeconomic status of most Africans, and the complex ecological nature of the disease. In this section, we'll explore the disease of sleeping sickness, which continues to plague the rural and poor across large parts of Africa.

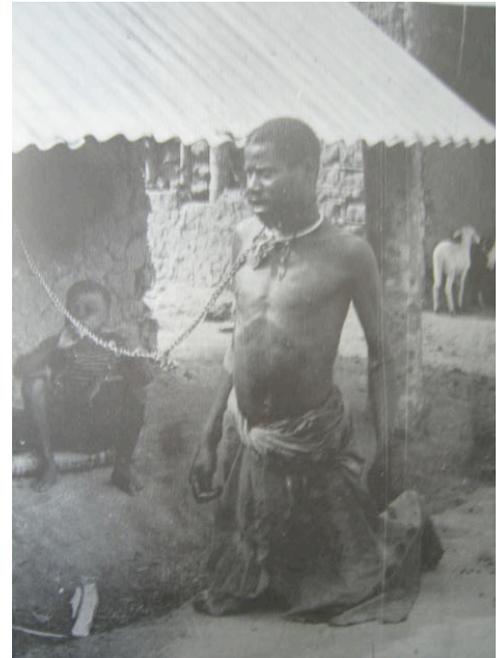
### THE TWO DISEASES

The term “sleeping sickness” is used to refer to two distinct forms of human trypanosomiasis. In this curriculum, we will be focused more on *Trypanosoma brucei rhodesiense*, which is the form that occurs across parts of Eastern and Southern Africa. *TB rhodesiense* is transmitted by tsetse flies that live in woodland regions. It is particularly acute; typically killing infected individuals in a matter of weeks. These traits are in contrast to the other forms of sleeping sickness that affect parts of Central and Western Africa. That form of sleeping sickness (*TB gambiense*) is spread by tsetse flies that reside near water sources, and resembles more of a chronic disorder. People infected with *TB gambiense* have been known to live for years after first being bitten by an infected tsetse fly, although the ultimate outcome of both forms of sleeping sickness is death. The table below shows the major differences.

	<i>Trypanosoma brucei rhodesiense</i>	<i>Trypanosoma brucei gambiense</i>
Type	Acute	Chronic
Region	Eastern and Southern Africa	Western and Central Africa
Incubation Period	5-7 days	Weeks, months, or years
Spread by	Savanna tsetse fly	Riverine tsetse fly
Spread at	Savanna woodlands	Lowland rainforests; gallery forests along waterways
Reservoirs	Wild and domestic animals	Wild and domestic animals
Transmission linked to	Occupation: Searching for wood, hunting, fishing, honey gathering, cattle keeping	Location: Water sources when fishing, bathing, collecting water
More often affects	Men and boys	Women and children
Time until death	6-18 weeks	2-3 years

**SYMPTOMS.** There are two stages to the disease, an early stage and an advanced stage. In the early phase, the symptoms are quite nondescript and include swollen lymph glands, aching muscles and joints and headaches. For the acute form of sleeping sickness in East Africa (rhodesiense), the first phase may only last a few days or weeks, and cannot be accurately diagnosed by sight. For the chronic form of the disease in West Africa, a person may live for years with low levels of parasites in the blood and without the symptoms progressing.

Once the advanced stage sets in, a variety of complications begin. Patients sometimes develop anemia in addition to heart or kidney problems. The central nervous system is eventually affected. Victims often suffer extreme mood swings and are sometimes violent or show signs of mental breakdown. Those who are infected are sometimes such a danger that they are chained to poles or houses as the picture to the right shows. It is at this stage that people eventually become lethargic and fall into comas that give this disease its name. Left untreated, sleeping sickness always results in death.



*A sleeping sickness victim in the Belgian Congo. Taken from Maryinez Lyons, The Colonial Disease.*

**TREATMENT.** Since the 1920s there have been drugs to treat sleeping sickness. The problem with the earliest drugs and those that have come since is both their limited efficacy and many painful side effects. The first treatment used was atoxyl, an arsenic based drug that was toxic for 38% of the patients who received it. More worrisome was one of the side effects: it caused blindness in nearly 30% of those who were treated. Treatments have been improved upon since the 1920s, and while the cures of today do not cause blindness, they do cause other uncomfortable side effects.

The biggest problem however, was, and continues to be, access to the drugs. The access is limited on both sides of the equation: from those who supply the drug (pharmaceutical companies) and those who demand the drug (rural, poor Africans). On the supply side, the drug therapies available today to cure sleeping sickness are expensive. A course of treatment costs approximately \$1,000. On the demand side are hundreds of thousands of Africans who are in need of the drug, but have no way to pay for it. From the perspective of the drug company, there is little incentive to provide the drug in these regions, since there are very few people or organizations willing to purchase it. (There is also little incentive to develop new treatments since the drugs will only be used and purchased in poor areas.) In response to public criticism of such conditions, some pharmaceutical companies have agreed to donate drugs. This is only a temporary solution since infections will continue and the donations will eventually run out.

Unfortunately there are problems in addition to just procuring the actual drugs. Most sleeping sickness cases occur in rural areas, where there are few hospitals and health clinics. The drug treatment requires technically and medically competent staff, something that is often in short supply in rural areas.

Finally, the drugs themselves are also coming under attack. Due to a resurgence of sleeping sickness since the 1960s, cases of drug resistance are beginning to appear.

As will be explained in the following section that describes the cycle of transmission, one of the difficulties of drug treatment is that treatment for the disease does nothing to prevent re-infection. And, since the infection often occurs in the midst of routine, necessary, activities (such as hunting, grazing cattle, gathering wood), people are liable to become re-infected even after being cured. The next section will show that despite a century of research on this disease, and attempts to both eradicate and control it, this disease has persevered and may even have grown worse.

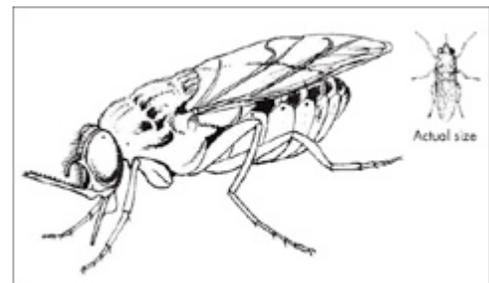
### CYCLE OF TRANSMISSION

The concept of disease ecology is particularly helpful when trying to untangle a complicated disease like sleeping sickness. If we take an ecological approach to evaluating sleeping sickness it means that we have to pay attention not just to the parasite, or the victim, or even to the tsetse fly that transmits the parasite. Rather, in order to understand the way the disease functions we have to look at the complex web of factors that interact and allow sleeping sickness to thrive. In practical terms, it requires that we are conscience of the geography, climate, rainfall patterns, flora, fauna, human settlement and working patterns, in addition to tsetse fly behavior, man-fly contact, and man-animal contact. The ecological approach to studying disease grew during the 1900s as colonial researchers tried to focus on only one aspect, only to discover that they were unable to control, or even understand the disease without looking at all the necessary components.

What are those necessary components? Sleeping sickness involves at least five different actors: tsetse fly, trypanosomes, wildlife, livestock, and humans. These are only the active participants needed to transmit the disease. The environment also plays a significant role since each of these actors must have a livable environment. In order to understand the cycle of transmission better, each of the five actors involved in spreading the disease will be explained.

**VECTOR—tsetse fly.** A vector is the living thing that transmits a disease from one living thing to another.

The tsetse fly is the insect that transmits sleeping sickness, and is much disdained for its role in spreading this deadly disease. But to see the tsetse as being a malevolent character would be wrong. The tsetse fly is only trying to fulfill basic living needs: to eat, to rest, to reproduce.



The problem is that while fulfilling these basic requirements the fly first becomes the unwitting receptacle for a deadly parasite, and second, becomes the vehicle to move the parasite around. It could be useful to think of the tsetse fly as a kind of hop on-hop off rural bus. In East Africa, it trolls up and down the savanna woodlands, stopping when it gets hungry and food is nearby. When the fly stops to suck the animal or human blood it needs to live, it also picks up the parasites that reside in the blood. Those parasites are the tsetse bus passengers. Once those parasites enter into the tsetse fly, a variety of

things can happen. Some of the parasites die off because they can't survive inside the fly's body. Some of the parasites—like the trypanosome— thrive inside the fly's gut and begin reproducing.

When the tsetse fly bus makes another stop to feed, some of the parasites can hop off. If the tsetse fly is feeding on an animal, the parasite hops off and infects the blood of a cow or wild animal without causing any ill effects. (This infected animal can now be thought of as a reservoir for the disease.) The fly may instead feed on a human, though. And if that fly sucks blood from a human, the trypanosome parasite will hop off into the human blood. Once the parasite has entered into the human blood stream, infection with sleeping sickness has occurred.

The last important thing to remember about the tsetse fly is that once infected with the sleeping sickness parasite, it remains infected for the rest of its life, which typically spans one to six months. So although the fly does operate as a bus where the parasite can hop on and then hop off, it never truly disappears. This means that once infected, every time the tsetse fly bites it can spread the parasite into another human or animal.

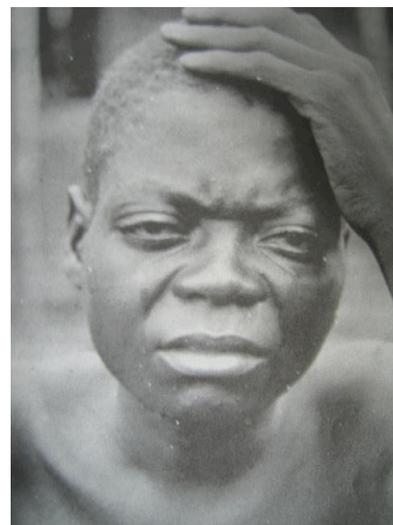
*PARASITE*—trypanosome.

Sleeping sickness is caused by a protozoan parasite, called a trypanosome. The parasite is complex enough to have foiled all attempts to create a vaccine to prevent against sleeping sickness. The parasite can reside without causing any ill effects in the blood of wild ungulates (hoofed mammals such as antelope and wild pigs) and domestic cattle. It is transmitted from animal reservoirs to human hosts by tsetse flies. Inside the tsetse fly, the parasite is able to survive and reproduce, infecting the fly for the duration of its life. In humans, the parasite quickly begins to reproduce and in the advanced stage of the disease, it attacks the central nervous system.

*RESERVOIR*—wild animals, cattle. A reservoir refers to the animal where a vector-borne disease is maintained. A reservoir is not negatively harmed by being infected with the disease, and it is a place where the disease can be maintained over long periods of time.

One of the things that make sleeping sickness so difficult to eradicate is that the disease has multiple reservoirs. The parasite is able to reside in two distinct populations: wild animals and domesticated animals. Wild animals are abundant and a regular source of the tsetse fly's blood meals. These wild animals are potent reservoirs for sleeping sickness since they are so abundant, share so much of the tsetse fly's habitat, and have long life spans. People would come in infrequent contact with these animals except when venturing into the forest areas to collect wood or hunt.

The other common reservoir for sleeping sickness is cattle. Being a domesticated animal, humans are in regular and sustained contact with them. Cows are typically brought in to rest near a village at night, and herders are around them during the day, regularly moving them from



*A victim of sleeping sickness, in the advanced phases. Taken from Maryinez Lyons, The Colonial Disease.*

place to place. Cows are usually grazed away from villages since adequate grass is needed, which often brings herders to the edges of the forest or “bush” (land unmanaged by humans).

In terms of transmission, one of the most important questions is how much contact there is between reservoirs and flies; flies and humans; and reservoirs, flies and humans in the same place. As should be apparent by now, sleeping sickness can only be spread when: a tsetse fly bites an infected animal; the fly becomes a carrier of the sleeping sickness parasite; and the infected fly then bites a human.

*HOST*—humans. A host refers to the person or animal where a vector-borne disease is living. A host is typically negatively affected by being infected.

Unfortunately for humans, they are the hosts for sleeping sickness, and in this case, host is just another word for victim. A person is at risk for sleeping sickness when two conditions are met. First, the person has to be bitten by a tsetse fly. This means that the person has ventured outside of the village into a savanna forest area to do something like graze cattle or gather wood. The bite of the tsetse fly isn't enough to cause infection, though. The second condition is that the fly must be infected with the trypanosome parasite. The fly is more likely to be infected if there is a large reservoir of infected cattle or wild animals. Alternately, if there is an epidemic going on and there is a large number of infected humans for tsetse flies to bite, the humans can also serve as a short-term reservoir for the disease.

### **PRECOLONIAL AFRICAN METHODS**

Prior to colonization beginning around 1900, many different groups of Africans had developed methods meant to minimize or prevent disease. In the case of a complicated disease like sleeping sickness, the transmission cycle was not fully understood. But incomplete knowledge about the disease didn't prevent very pragmatic techniques from emerging. Below are some of the strategies used in Africa in the pre-colonial period.

One of the first things that could be done to avoid infection with sleeping sickness was to carefully locate villages and farms to minimize contact between man and the tsetse fly. Going back to at least the 1860s, Africans in the Eastern and Southern parts of the continent had determined that the fly was responsible for causing infection. They also realized that by avoiding the locations where the fly lived was one of the simplest ways to prevent the disease. The only problem with this method was that not all man-fly contact could be prevented. The East African form of sleeping sickness is spread by tsetse flies living in woodland areas. Humans had to enter the forests occasionally to hunt, fish and herd cattle, which exposed some of the population to the bite of the tsetse fly.

Once a village had been established, if residents were being plagued by sleeping sickness they would utilize another practice: bush burning. In addition to realizing tsetse flies spread the disease, Africans had also observed that the fly resided in wooded areas. They correctly surmised that if they burned all the brush near the village, the tsetse flies would be forced to move further afield. The other advantage to this practice was that it was good for farming since it cleared new land for agricultural fields and the ash from the burned trees and bushes served as fertilizer.

Another technique that was sometimes used was the killing of animals such as wild pigs. While no one

could, or would, have called these animals “reservoirs” in the eighteenth and nineteenth century, people had already grasped that wild animals played a role in the transmission of the disease. So, when cases of sleeping sickness increased, animals would be culled, reducing the overall reservoir for the disease.

If all of these techniques failed to bring an end to an epidemic or to lessen the strain of endemic sleeping sickness, there were a few more extreme tactics available. One brutal method was to physically segregate or isolate all sleeping sickness victims. By banishing those infected people into the bush, far away from the village, the other citizens were minimizing the human “reservoirs” in their midst. If a village continued to be terrorized by disease, another dramatic step was to abandon the site and look for a new location. In this case, villagers would begin their search again for a place where good agricultural land and water was available without the assault of the tsetse fly.

Despite the assorted techniques used by Africans to control sleeping sickness, almost all of this was overlooked or ignored by Europeans. After committing themselves to eradication attempts starting after the 1900 epidemics, colonial scientists nearly always missed the successful strategies already being employed. John Ford, who worked as an entomologist for the British colonial government in East Africa wrote that his scientist colleagues, “almost entirely overlooked the very considerable achievements of the indigenous people in overcoming the obstacle of trypanosomiasis to tame and exploit the natural ecosystem of tropical Africa by cultural and physiological adjustment both in themselves and [in] their domestic animals.” While there were some notable exceptions to this blindness (some articles from the 1920s praised the practice of bush burning), the techniques pushed by the colonial governments were not typically those used historically.

### **COLONIZATION AND INCREASING SLEEPING SICKNESS**

One of the sad ironies of colonization of Africa was that counter to colonial claims that they were going to rid the continent of disease, colonial intrusion actually increased the prevalence of sleeping sickness. In general, we can think about the start of the colonial period, around the turn of the century, as a time of intense biological, social and economic upheaval. Ford considers colonization to be an “ecological disaster” and refers to “the biological catastrophe of the colonial impact”.

The start of the colonial era coincided with terrible epidemics of sleeping sickness in Eastern Africa. In the British Protectorate of Uganda, between 200,000-300,000 people died over a ten year period. In the Belgian controlled Congo, nearly half a million people perished. As people continued to die, colonial governments were spurred to action. New colonial policies and laws were created, meant to lessen the incidence of sleeping sickness. Unfortunately many of these practices were misguided and did more to exacerbate the situation than alleviate it.

Based on our understanding of how sleeping sickness is spread, there is at least one explanation for why the disease increased around the turn of the century. Colonization brought with it warfare and social disruption. It also happened to coincide with a number of ecological catastrophes such as years of drought, plagues of locusts and the resulting famines. Because of these events, people were abandoning farms and sometimes whole villages. As people moved away, the forests regrew. With the forest came wildlife reservoirs and tsetse flies. The implied relationship here is that it was the presence of humans, clearing land and controlling the onslaught of the forest, that impeded the spread of

sleeping sickness. When humans leave a place, the environment needed to spread the disease begins to grow back and can even take over land that was formerly free of sleeping sickness.

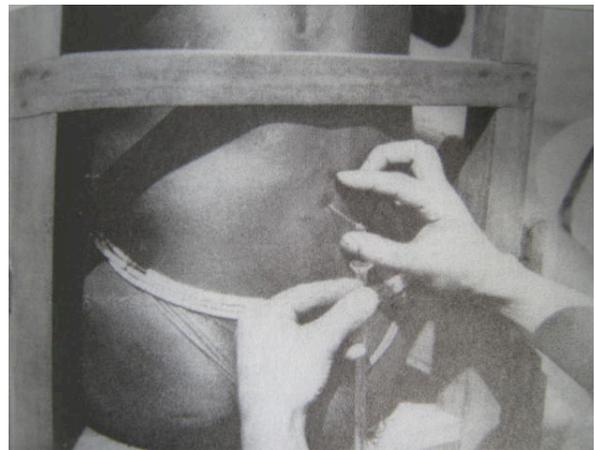
### **COLONIAL METHODS OF CONTROL**

As the colonial government committed to the control of sleeping sickness, and hoped to be able to eradicate it entirely, they used a variety of strategies. There were different approaches taken by the colonial powers.

The British in East Africa tended toward environmental solutions. Their goal was to eradicate the tsetse fly, so there would no longer be a vector to transmit the disease. In order to kill the flies, they advocated bush burning (to destroy habitat) and also spraying with insecticides. Unfortunately neither of these strategies were effective, and the goal has remained elusive. Although the complete eradication of a disease vector would stop all transmission, this is a concept that has not worked out well in reality. (The only exception to this rule has been in unique closed environments, such as islands. More information is provided about this in activity #2.)

Another strategy that the British used was to resettle whole villages out of tsetse fly zones. These massive movements often came in the midst of disease outbreaks, and decisions would be made without local input. Entire villages were forced to pack up and move to an uninfected area. Although this was a strategy also used precolonially, it was a last-ditch strategy. The manner in which this occurred during the colonial period fostered much ill will.

The Belgian and French colonial government tended toward medical solutions that tried to eliminate the human hosts for the disease. In the Belgian Congo, medical missionaries and colonial doctors worked together to identify and treat those infected. This required hugely invasive tactics since many Africans tried to avoid being identified and sent to government hospitals where they would be treated with only partially-effective therapies. It also involved physically invasive practices in order to diagnose the disease. The standard method was to perform a lumbar puncture, a painful procedure where a needle is introduced into the spinal cord. A bit of lymph fluid is extracted, which then can be analyzed to see if the typanosome parasite is present. A picture of this procedure being performed is shown at the right. (More information is provided about this in activity # 3.)



*A Belgian doctor performs a lumbar puncture on a patient suspected of having sleeping sickness. Taken*

### **MODERN METHODS OF CONTROL**

Since the end of the colonial era in the 1960s, sleeping sickness has remained a major problem. In general, there are a few different ways people have thought about control. The goals of various

campaigns have been to reduce the number of flies; reduce contact between flies and humans; and treat infected people to eliminate human hosts. To date, none of these strategies have proved successful, but it is the idea of reducing the fly population that has generated the most interest.

Potentially one of the most promising strategies, fly eradication attempts have not been very successful. Tsetse flies are remarkable in their ability to reproduce and repopulate areas. As an example, one type of tsetse fly was eradicated from the area around Lake Victoria (in East Africa) between 1954 and 1957. Despite complete eradication of the fly in 1957, tsetse flies had returned and repopulated the area by 1967.

Another technique used in the 1950s-1970s and again today is the spraying of pesticides to kill the flies. During the 1950s, when there was a campaign to eradicate malaria, the pesticide DDT was sprayed across wide swaths of Africa. The poison killed not only mosquitoes, but also the tsetse fly. DDT was eventually banned because of other negative side effects it caused in the environment. Since then, naturally derived insecticides (pyrethroids) have been used. Finally, “trap and target” is another strategy that was being used in Zimbabwe. Tsetse traps were set up on the edges of regions where the flies lived in order to stop their spread into populated areas and decrease the overall population. While initial results showed some success, one difficulty with this method is that it required a great deal of manpower to set up and maintain. Thus, despite being quite effective this practice has not caught on and is not widespread.

### **Discussion Questions**

- If you were trying to control a sleeping sickness epidemic occurring today, what techniques would you advocate? Is there any additional information you would need before deciding on the best approach?
- Sleeping sickness today is a curable disease, yet many people still die each year. Effective drugs have been found, yet they are not available in many regions of Africa. Do you think there's anything that can be done about this?
- There is an inherent tension between public health and medicine. Explain that tension and explore it in the case of sleeping sickness. What policies are good for the community, and which are good for the individual? Are they mutually exclusive?

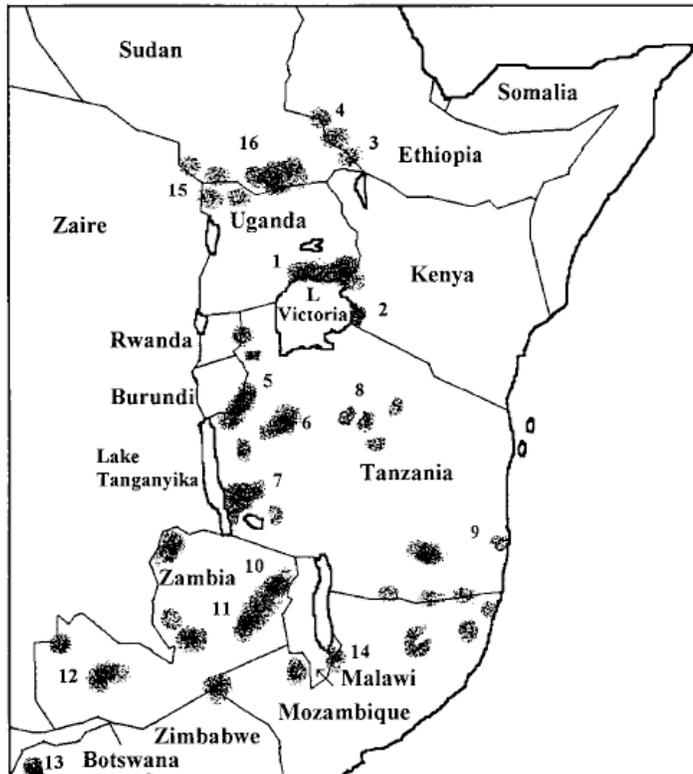
## Activities

1. John Ford was an entomologist who worked for the British colonial government in East Africa for many years. While there, he participated in much of the research about sleeping sickness. Eventually, in the 1970s, he wrote a book about sleeping sickness and colonial policies, and came to some surprising conclusions about the efficacy of colonial interventions. Discuss the following quote:

“It seemed that my efforts and those of my colleagues were, perhaps, very misdirected. We were feebly scratching the surface of events that we hardly knew existed, and if we achieved anything at all, it was often to exacerbate the ills of the societies we imagined ourselves to be helping. Unfortunately, with very few exceptions, it was psychologically impossible for men and women concerned in imperial expansion in Africa to believe that their own actions were more often than not responsible for the manifold disasters in which they found themselves caught up.”
2. Read the PDF document included in the appendix about the eradication of tsetse flies on the island of Zanzibar. Discuss the pros and cons of taking such an approach. Also, try to determine if this is a strategy that could work in other parts of the continent. Finally, is there anything that is worrisome about this approach, or that you'd like to know more about?
3. Read the information about the medical missionary Stanley George Browne that is included in the appendix. He was stationed in the Belgian Congo and participated in sleeping sickness control measures in the 1930s-1950s. After you've read the introduction and the excerpts from his own writings consider the following questions:
  - Does anything stand out about the methods the Belgian government used to control sleeping sickness?
  - Do you think the strategies described to punish those who refused to be examined were fair?
  - Why do you think people did not want to be examined and were willing to go to jail instead?
  - Is there a tension when it comes to sleeping sickness between public health and individual liberties? What is that tension, and why does it matter?

## Primaries

### Human sleeping sickness foci in East Africa \*

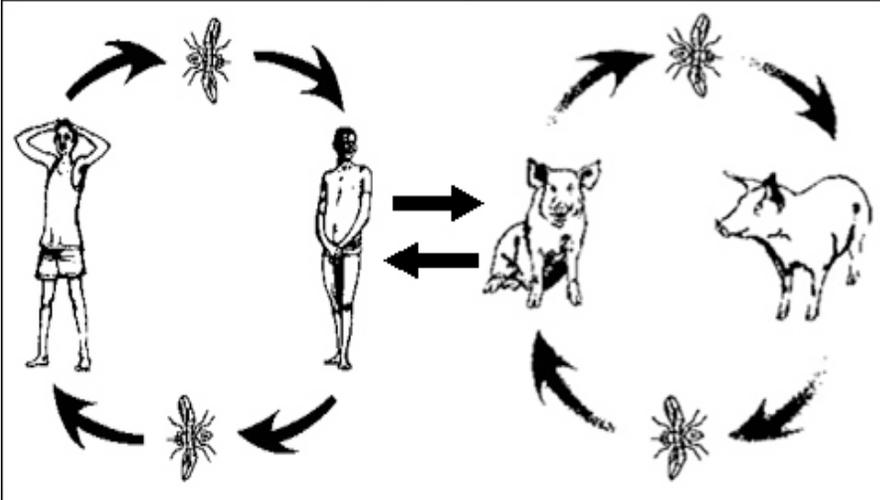


1. Busoga focus (Uganda and Kenya), epidemics, 1900, 1942, 1953 to 1960, and 1964, in Alego, Kenya, 1976 to 1983; and 1988 to 1992 in Tororo District.
2. Lambwe Valley focus (Kenya), epidemics, 1960 and 1980.
3. Gilo River focus (Ethiopia), epidemic, 1970.
4. Gambela focus (Ethiopia), epidemic, 1967.
5. Kasulu focus (Tanzania), epidemics, 1930s and 1957 to 1960.
6. Tabora focus (Tanzania), epidemics, 1930s and 1957 to 1960.
7. Rungwa River focus (Tanzania), epidemic, 1920 to 1921.
8. Maswa focus (Tanzania), epidemic, 1920.
9. Matandu River focus (Tanzania), epidemic 1925.
10. North Luangwa Valley focus (Zambia), epidemic 1970.
11. South Luangwa Valley focus (Zambia), epidemic, 1970.
12. Kafue River focus (Zambia), epidemic, 1960 to 1968.
13. Okavango Swamp focus (Botswana), epidemics, 1939 to 1942 and 1957 to 1971.
14. South Malawi focus (Malawi and Mozambique), epidemic, 1912.
15. West Nile (*T. b. gambiense*) focus (Uganda), epidemic, 1930.

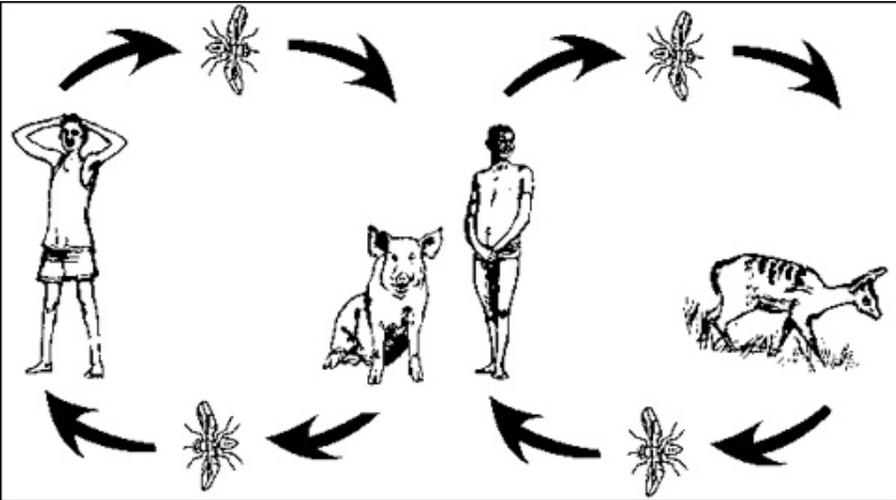
\* Graphic and caption taken from Geoff Hide, "History of Sleeping Sickness in East Africa," *Clinical Microbiology Reviews*, January 1999, 12, 1: 112-125.

16. Southern Sudan, recent epidemic, 1997 onward.

**Trypanosomiases Transmission Cycle, Option 1**



**Trypanosomiases Transmission Cycle, Option 2**



### Sleeping Sickness Control Techniques

Technique	Logic	Used by	Used when	Efficacy
Forced resettlement schemes	Separate people from flies by moving villages	British in E. Africa	Colonial era	Partially effective, did lessen infections, but led to growth of tsetse belts
Bush Burning	Destroy tsetse habitat and decrease the overall number of flies	Africans in E. and S. Africa	Pre-colonial	An effective practice, but must be timed right
Vaccines	Prevent the disease with a vaccine	Belgians and French in Congo and W. Africa	Colonial era	Ineffective. Has been impossible to create a vaccine
Game Control	Kill wild animals that serve as reservoirs for the disease	Africans in E. and S. Africa; British in E. Africa	Pre-colonial Colonial era	Effective, but human hosts & domestic animal reservoirs remains
Settlement Patterns	Carefully locate villages to minimize human-fly contact	Africans in E. and S. Africa	Pre-colonial	Partially effective, but impossible to avoid all sites of infection
Movement Patterns	Don't travel in tsetse-infested regions when flies are biting; travel at night	Africans in E. and S. Africa	Pre-colonial	Partially effective, but travel at night presents risks of other diseases (malaria)
Isolate/Treat Infected People	Lessen the number of human hosts by isolating or treating the infected	Africans in E. and S. Africa; Belgians and French	Pre-colonial Colonial era	Partially effective, but animal reservoir remains; dependent on locating all infected
Aerial and ground spraying of DDT	Decrease the number of flies, or eradicate them entirely		1950s-1970s Today	Partially effective, but flies often return; environmental side effects of DDT
“Trap and Target”	Reduce the overall population of tsetse by trapping flies	Zimbabwe	Today	Effective, but difficult to set up and maintain over time
Sterile Male Technique	Release sterilized male tsetse flies into a location so that the entire population will be eradicated	Zanzibar	Today	Effective, but requires that no new (non-sterilized) flies enter the location



# **Exploring Disease in Africa:**

**Smallpox**  
**Sleeping Sickness**  
**AIDS**

*A curriculum for advanced high school and college students*

**African Studies Center**  
Boston University  
Email: [africa@bu.edu](mailto:africa@bu.edu)

Copyright © 2010 by Melissa Graboyes  
[melissagraboyes@yahoo.com](mailto:melissagraboyes@yahoo.com)

## **AIDS: THE MAKING OF AN EPIDEMIC HEALTH, HUMAN RIGHTS AND ETHICS**

### **AIDS TODAY**

AIDS is the only disease in this curriculum that has emerged recently, in the past few decades rather than centuries or millennia ago. It is a disease that has captured a lot of peoples' attention, and although it is a pandemic, it is inextricably linked with Africa. As a continent, Africa has suffered the worst AIDS epidemic based on a number of different measures. The 2007 WHO/UNAIDS report stated that there were 22.5 million adults and children living with HIV in Africa (out of a total of 32.2 million globally). There were 1.6 million adult and child deaths due to AIDS, and nearly 2.2 million children under the age of 15 living with AIDS. On the continent as a whole, 5% of all adults aged 15-49 were infected with HIV or AIDS. While these statistics can only allude to the truly devastating toll AIDS has made in Africa, there have also been small successes. In this section, we will aim to correct some common misconceptions by exploring the epidemic through questions of health and human rights.

### **THE WORST EPIDEMIC?**

One of the first questions many people have about AIDS in Africa is why the epidemic is so bad there. Asked in another way, why are there so many cases of AIDS in Africa or why is Africa's epidemic so much worse than that in Europe or the United States?

The simplest answer to this question, and possibly the most persuasive one, was put forth by the historian John Iliffe. He argues that Africa has experienced the worst AIDS epidemic because it had the first AIDS epidemic. By this he means that since AIDS originated in Africa, the disease had a head start there, infecting people long before the disease had even been recognized. Thus, from the very beginning, Africa was at a disadvantage since the disease had been spreading silently for a decade or more before anyone noticed—let alone could do anything about it.

There are other answers, however, to this question. Some people point to the lack of a strong health care system in many parts of Africa, the large scale movement of people, and the low status of women. Each of these factors has surely contributed. The lack of a strong, functioning health care system in many countries has meant that prevention efforts in addition to diagnostic testing and treatment have all been stymied. One way to slow the epidemic is through diagnosing HIV, but in places where testing facilities are few and people are wary of visiting hospitals, HIV testing is unlikely. Since the 1960s when the first cases of HIV emerged in Central Africa, there have been huge movements of people around the continent. Just in East and Central Africa, fighting in the Congo and Uganda caused thousands of troops from neighboring countries to stream in. The movement of people is important since it is people who transmit the disease sexually, picking it up in one places and potentially bringing it to another place thousands of miles away. Finally, the low status of women in many societies has contributed to the epidemic's growth. In many places, women—be they prostitutes or faithful wives—are unable to negotiate for the use of condoms. When men have unprotected sex with infected prostitutes in urban areas and then unprotected sex with their wives in rural areas, the disease jumps from one realm to another.

The impact of the epidemic on the continent has been tremendous, and felt economically, socially and politically. AIDS typically afflicts the most productive members of society—adults of working age. As people grow sicker, they may seek professional care. Hospitals are overwhelmed and even cursory efforts to provide treatment or care for those already infected put a huge drain on health care systems that usually spend only an average of \$1-\$2 per person per year. When working age adults eventually succumb to the disease, they often leave behind sick spouses and orphans that must be cared for. They also leave behind jobs that someone else may or may not be able to fill. In some African countries, there are severe shortages of teachers and other professionals because of the epidemic. These have trickle down effects on many other parts of the country.

### **DISEASE ECOLOGY**

It is basically impossible to accurately identify the first case of HIV. General consensus now favors a theory that HIV emerged in Central Africa, and was a mutation of the animal disease Simian Immunodeficiency Virus, which affects monkeys. By studying both of these diseases, scientists have surmised that SIV began infecting humans due to human contact with infected monkeys. That contact may have come through the process of killing sick monkeys and coming in contact with contaminated blood, or through consumption of infected monkey meat.

As was discussed in the introduction, many potent human diseases were originally derived from animal diseases. But SIV's ability to infect humans was only the first step. At this stage, a person only became sick if they came in contact with an infected monkey. The more serious mutation occurred when SIV mutated into a purely human disease that could be transferred divertly from person to person, without the presence of a monkey. It was only at this stage that Human Immunodeficiency Virus emerged.

By combing through old hospital records and conducting interviews, scholars and journalists have found cases of HIV in Africa from the 1970s onward. Difficulties remain in determining how widespread it was, since records are often incomplete and many countries do not have centralized bodies for collecting health data. Furthermore, sporadic early cases in rural areas surely went unreported and even today; many people do not travel to hospitals in order to die. Deaths that occur in homes may or may not be reported.

Unlike sleeping sickness, AIDS is not an overtly environmental disease, in other words, there is no insect or plant vector needed to transmit the disease, nor does the virus need specific conditions to thrive. But if we consider the environment as what is all around us including landscapes that have been shaped by humans, we see that AIDS is affected by the environment. Since this is a disease of the modern era, we need to weigh how man-made changes have affected the course of the disease.

One of the most striking ways in which AIDS is clearly environmental is that while it can exist anywhere, the epidemic spread along very specific routes. The virus moved throughout the continent in the same way that an adventurous traveler would: by way of roads. Early research of prevalence rates showed that along major roads, the HIV rates were much higher than in nearby more remote areas. These roads connected different countries, weaving across the continent and allowing necessary goods to be moved from place to place. Once the roads were built and there was regular traffic, towns grew up next to these roads to service the many diverse needs of travelers. Places to eat, drink and sleep were

abundant, as were other locales that serviced more basic human needs. Prostitutes did a brisk business, and were exposed to diseases from across the continent. Once these women were infected, they became stationary hosts for the virus while visiting truck drivers served as mobile hosts, moving the virus around the continent. The truck drivers were nearly perfect vehicles to transport the disease since they were almost all men, frequently visited prostitutes in different towns and practiced unprotected sex. (Before you condemn their behavior as irresponsible remember there was little reason to use a condom prior to AIDS, and that condoms could be quite difficult to find.) As this example shows, if we recognize roads as part of the environment, we see how the presence of roads shaped the epidemic.

A second way that human impact on the land changed the epidemic was through the growth of urban areas. As millions of people across the continent made a transition from rural, primarily agricultural livelihoods to urban ones, the shape of the epidemic changed. Urban environments—cities—draw people from all over a country, maybe even from multiple countries. Part of what makes cities exciting and dynamic is this mixing of people from different backgrounds and with different experiences. This diversity is what makes cities such potent places for disease. In cities there is likely to be a larger pool of prostitutes and for sexual contact between people from different places. Prostitutes are again the static hosts. They may become infected after having sex with a man from another country. After infection, however, she is able to infect all the men she has sex with—who may come from a dozen different rural villages. Those infected men, in turn, become the mobile hosts. They carry the virus with them back to their rural homes. They may have a wife in the rural area that then becomes infected, or he may engage with a prostitute there. Either way, the growth of urban areas coupled with the greater contact between urban and rural areas allowed HIV to spread rapidly into rural areas.

### **PREVENTION AND TRANSMISSION**

You may wonder why people don't just prevent AIDS since it isn't contagious in the way a disease like smallpox is. Although AIDS is not spread easily and is not contagious in the same way, there are strong cultural barriers to prevention. HIV is spread through bodily fluids such as breast milk, semen, vaginal fluid and blood. The most common routes of transmission in Africa are: 1° from an infected mother to child either in the process of emerging from the birth canal or during subsequent months of breast feeding and 2° from heterosexual intercourse. Other ways to become infected that are less common in Africa include through intravenous drug use or blood transfusions, through homosexual anal intercourse, and through injections given with contaminated needles. One of the sad advantages to having a weak health care system was that blood transfusions were relatively uncommon in Africa, and that many people did not have extensive contact with hospitals in order to receive contaminated injections.

The primary mode of transmission is through heterosexual intercourse, which means there are additional burdens to talking about AIDS. In most African societies, sex is a taboo subject. Although information is shared, it is done so only under particular circumstances. In some cases, it may not be discussed between parents and children, but only through grandparents and children. In other cases, children may not become privy to information until they have participated in coming of age ceremonies and rituals that may not take place until the late teens. Despite this fact, though, there have been successful efforts to make sex—and thus AIDS—an appropriate subject for public conversation. Some countries, Uganda being a notable example, took very public approaches and had politicians and public

officials talking about AIDS. This approach meant that knowledge of AIDS increased as public conversation increased and that incidence of the disease has fallen.

Condoms have emerged as one of the best preventative measures against HIV. They allow for people to continue having sex while remaining protected from the virus. While condoms appear to be an easy solution, there are also barriers to this method. Prior to the AIDS epidemic, condom use was extremely low in Africa. If condoms were available, they were expensive. Even when condoms were more widely available, people weren't comfortable with them. More specifically, many men weren't comfortable using condoms. One of the biggest drawbacks to condoms is that it is primarily a male-controlled preventative measure. While women may ask that their husbands, lovers, or clients use condoms, it is ultimately his decision.

### **AFRICAN ACTION AGAINST AIDS**

One of the enduring myths of the AIDS epidemic is that the continent has been dependent on action by foreigners. Rarely have the actions of normal Africans citizens been recognized. People wonder what, if anything, Africans have done in response to the epidemic.

It's best to begin with a few facts. In the early years of the epidemic, African governments were incapable of responding to the AIDS epidemic. Initial lack of response could be attributed to lack of money and infrastructure. There was also apathy about talking about a sexually transmitted disease in public. From a financial perspective, there was not enough money in health budgets to pay for treatment at hospitals, or for prevention and education campaigns. In terms of infrastructure, there weren't enough clinics to provide testing and diagnosis. These were just some of the shortcomings. It took time for the devastating capacity of AIDS to be recognized, and its position as a truly global disease to emerge. Only after these things became apparent did many of the Western NGOs open up their doors, and did money from individual countries and global organizations flow in. In the time it took for all of this to happen, Africans already had devised coping mechanisms to deal with the fallout of the epidemic.

In the face of these realities, ordinary people were left to pick up the slack. The slack that remained was monumental. It meant providing care for the sick and dying, care for the spouses and children that remained, and some sort of education about how to prevent the disease. And amazingly, many ordinary people did rise to the challenge. Home-based care is a technique that is used across the continent, and is a direct response to the lack of available medical services. Home based care has semi-trained community members regularly visiting the homes of HIV and AIDS patients to provide basic care. This system allows for people to be helped who are living in areas without formal hospitals or clinics, and is a response to the lack of doctors and nurses. By training community members in basic health and hygiene practices, doctors and nurses remain free to deal with particularly difficult conditions. Home-based care workers have organized in countries across the continent, providing support to patients while also helping to lessen the stigma attached to the disease.

One of the tragic effects of the epidemic is the growing number of orphans left behind when AIDS-afflicted parents pass away. In many areas, these orphans are adopted into communities rather than being institutionalized. Community based care means that children remain in the communities they

grew up in, often times being taken in by relatives. It is a system that leaves individual families bearing the cost of the epidemic rather than the state. More recently, some states and private organizations have begun compensating these families with small subsidies of food, clothing or materials to repair their houses. As the number of orphans grows and the number of healthy parents decreases, a greater burden is being placed on grandparents and the elderly. While these people have nobly stepped forward to assume their familial duties, this is an issue that will only grow more complicated.

Possibly the best known response of citizens to the AIDS epidemic is the existence of the Treatment Action Campaign (TAC: <http://www.tac.org.za/community/about>) in South Africa. The organization was started in 1998, in response to the lack of anti-retroviral drugs available to HIV positive people in South Africa. Since the group's inception, they have fought for greater access to HIV drugs by raising public awareness and understanding about the availability, affordability and use of HIV treatments. In one landmark case, TAC sued the South African government, claiming that the constitution assured all citizens a right to health, and that right implied a right to drugs to treat HIV. (You'll read part of the constitution a little later.) The courts sided with the TAC activists and agreed that the government did have a duty to provide treatment to all, although it recognized that financial constraints might prevent instantaneous coverage. Since then, it has become law that all South African citizens have access to anti-retroviral drugs. Despite the law, actual access has been erratic and TAC has continued to protest and sue the government in order to speed up the roll out of drugs.

### **GENERIC DRUGS & SOUTH AFRICA**

Despite the initial reluctance of the South African government to provide anti-retroviral drugs, they eventually took a huge step and become one of the first countries in the world to produce generic ARVs. In the late 1990s, the South African government declared a public health emergency because of the AIDS epidemic. Coupled with their declaration, the government announced they would break international drug patents held by European and American pharmaceutical companies. This meant that the South African government had decided to produce these medicines without paying the companies that developed them. Technically, it was illegal to break these patents, but international guidelines stated they could be broken in times of health emergencies. The South African government argued that AIDS was causing a catastrophe, and that they had the right to break patents to help save the lives of millions of their citizens. The generic drugs are identical in chemical composition to those sold by the pharmaceutical companies, but are far, far cheaper. While South Africa made the preparations to begin production of the drugs (a huge task that involved building factories and gathering qualified personnel to run them), they began importing generic drugs manufactured in India. It was the importation of these cheaper drugs that allowed the government to start providing ARVs to its citizens.

### **AVAILABILITY AND REGIONAL DIFFERENCES**

What kind of treatment do Africans receive for AIDS? The treatment options in Africa are quite mixed, and are very dependent on which country you live in, whether you reside in a rural or urban area, and possibly most important, how wealthy you are. As may be obvious, people who are wealthier, live in urban areas, and are citizens of richer nations have a much better chance of procuring drugs. Many factors hinder access to drugs, though poverty is probably the biggest. Other reasons limiting access include the inefficiency of many health care systems, inadequate systems in place to distribute the drugs and provide follow up, and the lack of education and training of health care workers.

As an example, let's compare Botswana with rural Tanzania. Botswana is one of the richest countries in sub-Saharan Africa due to a vast natural reservoir of diamonds. The country has no international debts, and since independence has invested wisely in health, education and transportation infrastructure. Much of the population is located in the southern part of the country, and there is a strong network of health clinics and hospitals staffed with qualified doctors and nurses. Botswana also has one of the highest adult prevalence rates of HIV on the continent, probably just under 30%. Although this is a frighteningly high prevalence rate, the country has used its relative strengths to help combat the epidemic through free access to anti-retroviral drugs. Once a person has been diagnosed with HIV (and there is mandatory testing at all clinics) the patient becomes eligible to receive free drugs. The drugs are paid for by the government, and are available throughout the country, dispensed at the already-presented hospitals and by already-trained staff. Botswana may be one of the best examples of a positive response to a very bad situation.

A quite different example comes from Tanzania. It is a much poorer nation, has a far larger population that is spread throughout the country, not just concentrated in one region. Although the adult prevalence rate is roughly half of that in Botswana, there are other disadvantages. There are fewer hospitals and health clinics, and severe shortages of both supplies for the hospitals and doctors to staff them. In the past few years the Tanzanian government committed to purchasing anti-retroviral drugs, but the cost on the regular market was so expensive, very few could be procured. With help from the Clinton Foundation, a lower than normal price was negotiated for the drugs, which enabled the government to purchase a larger supply. But purchasing the drugs was only part of the problem. More than three years after the initial deal, access to drugs in rural areas is still low. Even today, those suffering from AIDS in rural areas are more likely to die without treatment than to receive access to these life-saving drugs.

## **HEALTH AND HUMAN RIGHTS**

The WHO notes that, "no other disease has so dramatically highlighted the stark injustices and inequalities in access to health care, economic opportunity and the protection of basic human rights as HIV/AIDS."

AIDS has come about in the golden age of discussions about human rights. To understand what types of human rights questions AIDS raises, we first must understand what it is meant by human rights. It turns out that there are two types of rights. Positive rights are outlined in the Covenant on Economic, Social and Cultural Rights. Negative rights are encapsulated in the Covenant on Civil and Political Rights.

Positive rights are typically thought of as things that governments ought to do for their citizens. For example, children have a 'right to education,' and governments must provide schools, teachers, and books to allow its citizens to fully appropriate that right. If there is a right to health, it is considered a positive right, since it requires governments to provide institutions and conditions so that can be achieved. Although this is not a hard and fast rule, these positive rights have been more fully embraced by formerly communist or socialist countries where provision of basic social services such as education and primary health care are provided, but where commitment to other rights (such as freedom of speech) is weaker.

The types of rights much more commonly discussed and embraced in the United States are negative rights, which serve as indicators of what governments should not do to citizens. Negative rights outline a sort of boundary around a space of activity that all citizens should be allowed to do. We often think of rights such as the ability to speak freely, practice religion or participate in politics as activities falling within this protected space. Freedom of political affiliation is a negative right since it means the government will not interfere with your right to be engaged with politics.

As you can see, depending on what document you read, and what covenants your country signs, what constitutes a “human right” can vary a lot from country to country. This is ironic since discussions about human rights began after World War II with the creation of the United Nations. The decades of ensuing treaties, declarations and covenants were meant to provide a global—universal—statement about what every person in the world was both entitled to (positive rights) and protected from (negative rights). This was a somewhat idealistic vision, however, since countries have chosen to adopt only those covenants that are appealing to them, and enforcement is virtually impossible. The reality of this situation has led many people to claim that rather than being truly attainable, human rights should be considered only as aspirational—describing what governments should strive to do, not what they actually can do. The AIDS epidemic has rendered these discussions more urgent, and as the TAC lawsuit demonstrates, courts around the world are now beginning to decide what a right to health truly means.

### **ETHICS OF SCARCITY**

The AIDS epidemic is also raising a lot of difficult ethical and moral questions about how to use scarce resources. In African countries that are among the poorest in the world, and where the epidemic has hit hardest, governments and citizens have had to make tough decisions about how to spend money. Should it be spent trying to prevent new infections, caring for HIV+ people, schooling for the orphans of AIDS victims or something else?

In countries like the small southern African nation of Lesotho, dilemmas like this are not just hypothetical. They are questions of severe scarcity where the decisions made determine who lives and who dies. To date, many governments have shied away from being too open about exactly how bad the situation is, fearful of citizens' anger when faced with the desperate reality. In these cases, politicians make important decisions about how to divide scarce resources without adequately involving affected populations.

If we look closer at the small country of Lesotho, we can see some of the dramatic—and difficult—decisions that must be made about how to use scarce resources. In Lesotho, there is a total population of 1.9 million people. Devastatingly, 30% of the adult population is HIV positive. The reality of the budget situation in Lesotho is that anti-retroviral drugs can only be purchased for somewhere between 1-20% of the people who are infected with HIV. In this situation, difficult choices must be made about who will get access to drugs. Someone—the government, citizens, funding agencies—must decide who will get access to the drugs. One possibility about how to decide include using a random lottery. From an ethical perspective, a lottery solution that every life is of equal worth, and thus there is no fairer way to distribute a scarce item than to do so randomly. An utilitarian approach on the other hand would try

to figure out a method that would generate the most good for the largest number of people. Using this logic, drugs might be given preferentially based on education, job or social status. Another approach would be to follow the tenets of distributive justice—trying to equally share the benefits and burdens throughout society. In this way, the drugs might be distributed equally across world regions or equally amongst different age groups, cities or occupations. No matter what method is used all of the available options lead to a tragic outcome for those left out.

### **Discussion Questions**

- Hillary Clinton recently said that if AIDS was a disease that primarily afflicted white women, much more would be done. Do you believe this is true? How do our stereotypes and Africa's history influence the response to AIDS in Africa?
- How has AIDS in Africa been an environmental disease? Explain AIDS in terms of disease ecology. How is it affected by geography, settlement patterns, and animal-human contact?

### Activity Ideas

1. Scarcity Exercise. If you were in a position to decide, how would you decide how to spend limited money for AIDS? To buy drugs to treat infected people, to prevent new cases, to care for orphans and families affected by an AIDS-death, or something else? Explain your reasoning.

- First, brainstorm who could receive the money. Why would they need it? What claims would they make?
- Second, given the competing claims, how would your group decide? Describe your process in detail and the logic guiding it. What would be your criteria to determine who received the money? Are there exclusionary criteria? And, who should make the decision?
- Finally, using the method your group outlined above, who would receive the funds? Share your method and the outcome with the rest of the class.

Now try your method in another scenario. In this case, you are deciding which person should receive access to a life-saving kidney dialysis machine, the only one that is available in your hospital. The people you must decide among include: a six week old baby; the Pope; a mother of three young children; a poet; a bachelor; the inventor of the dialysis machine; a Nobel-prize winning author; a researcher on kidney disorders; Hitler; and a teenage dropout. Use the method you outlined above. Does the method still seem viable?

If all the groups have not explored the full range of possibilities, make sure to discuss the pros and cons of randomly choosing (based on the view that all humans are equal and no one has more or less right to the use of the machine); eliminating criteria (over a certain age, preexisting medical condition); inclusion criteria (must be within a particular age range, good health); and determination of social worth (what has, or will, a person contribute to society).

2. Read and consider the following human rights documents excerpted below. Do you think that these documents imply that there is a right to health? What kinds of actions on the part of the state are required to fulfill the obligations described in these documents? Do you consider these documents to be aspirational or practical? Finally, compare the three human rights documents with the South African constitution. Is the right to health in the human rights documents are clear as that expressed in the constitution?

International Covenant on Economic, Social and Cultural Rights, Article 12

“The right of everyone to the highest attainable standard of physical and mental health.” Requiring states to work on, “the prevention, treatment and control of epidemic, endemic, occupational and other diseases” and “the creation of conditions which would assure to all medical service and medical attention in the event of sickness.”

World Health Organization Constitution Preamble

“The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.”

Universal Declaration of Human Rights, Article 25

“Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.”

South African Constitution, Section 27: Health care, food, water and social security

- (1) Everyone has the right to have access to -
  - (a) Health care services, including reproductive health care;
  - (b) Sufficient food and water; and
  - (c) Social security, including, if they are unable to support themselves and their dependants, appropriate
    - (ci) Social assistance.
- (2) The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realization of each of these rights.
- (3) No one may be refused emergency medical treatment.

# **Exploring Disease in Africa:**

**Smallpox  
Sleeping Sickness  
AIDS**

*A curriculum for advanced high school and college students*

**African Studies Center**  
Boston University  
Email: [africa@bu.edu](mailto:africa@bu.edu)

Copyright © 2010 by Melissa Graboyes  
[melissagraboyes@yahoo.com](mailto:melissagraboyes@yahoo.com)

## **APPENDIX**

### Stanley George Browne

Stanley Browne was a physician, leprologist, missionary, and near thirty-year resident of the Belgian Congo. He was a committed missionary for the British Missionary Society, but served concurrently as a representative of the repressive Belgian colonial government. While Browne was busy doing the work of a medical missionary in the interior of Africa—rising at 6 am and working until past midnight, by his own account—he had little time to reflect on the inconsistencies of his actions.

Like most people, Stanley Browne had multiple identities, or at least multiple titles. While he was most certainly a doctor and missionary, he was also an official representative of the Belgian colonial government. Missionaries were allowed into the Congo with the expectation that they would provide services in exchange for the right to proselytize. In the case of medical missions, they were responsible for the public health of large swaths of the country. Keeping sleeping sickness under control was one of the primary tasks, since it had been nearly eradicated during a forty-year campaign that ended around 1940.

The Belgian Congo differed from its neighbors, especially British East Africa, in the amount of control it exercised over its vast territory. The fact that sleeping sickness had been controlled was an impressive accomplishment, but it came only through severely oppressive techniques. The government relied on missionaries like Browne to implement a harsh set of measures that severely curtailed individual freedoms in the hope of protecting public health. The techniques included issuing medical books to men, and fitness certificates for women and children; mandatory health clinics; creation of *cordon sanitaire* (sanitary corridors); and building and staffing of *lazarettes* (medical check posts) throughout the country. Medical passbooks were required whenever traveling; failure to have an updated one often meant time in prison. A doctor like Browne would stamp passbook every few months at the mandatory medical clinics, indicating that the person was not infected with sleeping sickness and could travel freely. When Browne or another doctor discovered cases of sleeping sickness, quarantines were quickly set up, *cordon sanitaire* erected, and people forced to undergo therapy until they were cured. Some argue it was a public health miracle to control such a vast territory; many others found it to be a singularly cruel system.

Stanley Browne and other missionaries in the Congo played a vital role in keeping this oppressive system alive. Despite the incongruousness of a missionary being involved in such a brutal system, as a doctor, he was responsible for holding the required medical clinics. There are many letters where Browne describes these clinics, and they all follow a pattern. He would send a message to the chief a few days before he was planning on arriving. The chiefs were expected to beat the village drum, impress upon the villagers the importance of attendance and then gather *everyone* when the doctor arrived. Hundreds of people would line up and wait for Browne and the *infirmières* (his Congolese assistants) to check them for leprosy, yaws, and most importantly, sleeping sickness. Any enlarged cervical glands required a lymphatic gland puncture, which meant performing an invasive lumbar puncture to gather a sample of lymphatic fluid. If a person was found to have sleeping sickness, forced treatment would begin and a series of measures meant to stop an outbreak would be set in motion. When a person did not have any symptoms, books would be stamped and after a full day of work, Browne would move to the next village.

What follows are some excerpts from Stanley George Browne's own writings.

Describing the medical administration and supervision:

“And so, when everything is ship-shape and the people are massed into some sort of order, village by village, we are ready to begin the systematic examination. Family by family, they appear before me, and are examined specifically for sleeping sickness, yaws and leprosy, note being made of the general physical condition and of any pathological findings. The state identity books of the men are visaed, and medical certificates of fitness and freedom from the endemic diseases are given to the women and children. We are particularly anxious to detect and to treat sleeping-sickness in its early and curable stage, and so make a special point of lymphatic gland puncture in all cases of enlarged cervical glands, with microscopical examination of the gland fluid for trypanosomes. In tse-tse infected areas, the flies are caught and dissected and examined to discover what proportion are trypanosome-carriers...

What a motely crowd they are as they gather for examination! Most of them are very raw savages without superfluity of dress or other accompaniments of civilisation.”

In a letter home to his sister in 1938, describing one of the medical clinics:

“Tuesday and Wednesday were rather less hectic, and were mainly spent seeing stragglers who had failed to come to the medical recensement when they were called. If they had a good excuse, they were allowed to see me. If, as in the case of four men who had flatly disobeyed the chief’s command to present themselves and who went out fishing the same day, they were sent along to the doubtful mercies of the local prison. Sounds awfully incongruous, doesn’t it, for a missionary doctor to have to send folks to prison? But when you remember that this is state work, and that I am the representative of law and order as regards medical census of the population, and that any disobedience must be severely regarded in the interests of the natives themselves, you will understand the necessity of these measures.”

In a letter home to another sister in 1938, further describing the medical clinics:

“On Friday, we had the unusual experience of about thirty men in a neighbouring village refusing to come for medical examination. They had been warned twice, but went off into the forest to hunt and to tend their gardens. The chief was also to blame for not impressing on them sufficiently the important nature of the medical examination. When the state officials come round on their tours of inspection, they are very severe on those men whose medical passports are not up to date, and usually send them to prison for a couple of months. In order to avoid any unpleasantness in the future and difficulty of this nature, I sent around dozen of them along to Isangi for the kind of attention of local state official, who supported my action with disciplinary measures.”

## **Geography and Disease**

Before concluding this section, it is important to point out that there were some geographical features of the African continent that were not dramatically changed by humans, and which also influence the disease environment. One of the most important environmental features of the continent is not a geological formation, but is a weather phenomenon. The presence of the Inter-Tropical Convergence Zone is one of the defining features of much of the continent's weather patterns—which directly influence agriculture, living patterns and diseases. The ITCZ is an environmental phenomenon impacting rainfall in the central swath of Africa. The movement of this huge swath of rain-heavy clouds is from the north, to the south, returning to the north over a twelve month period. This means that the central regions of Africa receive two rainy periods per year and that rainfall can be unpredictable at the edges.

On the east side of the continent, the presence of the Rift Valley is the dominant feature—a huge, deep crevasse running in the north from Ethiopia to Malawi in the south. The valley is now home to a series of lakes, (Lake Tanganyika, Lake Victoria, Lake Malawi/Nyasa) and the mere presence of water creates habitats for vectors and wild animals that can also be disease reservoirs. The lakes are also sites of infestation of some parasites such as bilharzia (schistosomiasis) a type of snail that also infects humans that come in contact with the water. The valley also means that next to fertile valley low-lands with water sources, there are also highland regions running north to south where the disease environment is changed dramatically by cooler temperatures and higher elevation. (Nairobi, the capital of Kenya, was originally settled by British colonial officials because the high elevation meant there was less malaria). Needless to say, the flora and fauna that exist in lowland valleys and highland plateaus differ dramatically.

In the central part of the continent, the major feature is the Congo Basin, which is a huge low-lying region stretching across modern Democratic Republic of the Congo. As the name implies, this part of the continent acts as a basin for many of the major rivers, including the Nile. The fact that it serves as a runoff area for water sources from across the continent means that this region is perpetually moist and is composed almost entirely of rainforests. Damp, dense and fertile forests provide a lush living environment for both bugs and animals.

Deserts are also a major geographical feature on the continent. Across the wide northern part of the continent stretches the Sahara desert. The desert has served for millenia as both a barrier to contact, and as bridge—although not an especially easy one to cross. There are records of travelers and traders crossing the Sahara desert on camels from North Africa and the Middle East as far back as a thousand years ago. It is surmised that some diseases may have been introduced into some of the precolonial West African kingdoms (Mali, Songhai) this way, although that has been hard to prove. It seems just as likely that the desert could have functioned as a barrier. Since the journey was difficult and took months to complete, it would take a unique disease to be able to survive the length of the journey without burning itself out before the travelers arrived.

Map of Africa's physical geography



## General Vocabulary

**AIDS**—Acquired immunodeficiency syndrome, describes the collection of symptoms that result from the suppression of the body's immune system by infection with HIV.

**ARVs**—Anti-retroviral drugs. A cocktail of life-extending drugs for those who are infected with HIV or AIDS. The drugs prolong life, but are not a cure.

**Colonialism**—refers to the period of time when European countries went into Africa and divided the continent into territories that they controlled. Raw goods such as rubber, timber and minerals were extracted in the hopes of profits. This period began around 1900 with the “Scramble for Africa” and continued until the 1960s when most African countries received their independence.

**Demography**—the study of human populations, particularly focused on explaining increases and decreases in population size.

**Disease ecology**—refers to the study of disease in a more holistic manner. Not purely biological, entomological, or environmental. This approach to studying disease emerged around 1900 with the beginning of the discipline of ecology.

**Ecology**—refers to systems and the inter-relationships between land, people, flora, fauna and diseases. An ecological approach is looking for connections between a variety of actors or things.

**Endemic**—relative terms used in public health and medicine to describe when a disease is constantly present at low to medium levels.

**Epidemic**—relative term used in public health and medicine to indicate when the incidence/prevalence of a disease has increased (spiked) in a particular place. An epidemic is relative to the disease's presence in an area previously. There is no objective number of cases that determines when an epidemic has/is occurring.

**Epizootic**—an epidemic of disease among animals. Examples include nagana (the animal form of sleeping sickness), rhinderpest and bird flu.

**Eradication**—From a disease standpoint, this refers to total elimination. It can be used to discuss the eradication of a disease from the globe (smallpox), the eradication of a specific vector from a place (mosquitoes from the Southern U.S. and Europe), or the eradication of a specific reservoir for disease (wild pigs in southern Tanzania). The term is quite malleable and is used to refer to a variety of different phenomenon.

**Ethical Dilemma**—a problem with two or more mutually exclusive solutions. Each solution is supported by compelling arguments, and there is no one solution can be determined to be more “right” or “correct” than the others.

**HIV**—Human immunodeficiency virus, targets white cells in the blood that are vital to the functioning of the immune system. As HIV progresses, it eventually turns into full-blown AIDS.

**Host**—term used to describe the person or animal where a vector-borne disease is living. A host is typically negatively affected by being infected. For both sleeping sickness and malaria, humans are the host of the disease.

**Human Rights**—A concept long discussed philosophically, brought into the realm of modern law and politics after World War II with the creation of the United Nations and the 1948 Universal Declaration of Human Rights. The term now refers to a wide-ranging set of ideas and documents governments can agree to. The two most commonly cited documents are the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights. From an enforcement standpoint, declarations are non-binding, and covenants are only binding to the countries that have signed them.

**Land management**—when used in the context of disease, refers to controlling the physical environment in order to minimize or prevent disease. Specific techniques could include burning bush to destroy habitat for disease vectors such as tsetse flies or draining swamp lands to minimize mosquito breeding sites.

**Immunity**—confers protection against a particular disease. There are two types of immunity: genetic and acquired. Genetic immunity is passed through genetic material from blood lines. When a person is born, they already have this immunity. An example is the sickle-cell trait which protects against some forms of malaria. Acquired immunity comes through having and surviving an attack of a disease. By surviving, the body produces antibodies that help prevent against a future infection. Many people who live in areas with malaria have acquired immunity through surviving multiple bouts of infection when a child.

**Inoculation**—process of transferring smallpox artificially from someone infected with the disease to someone who isn't but hopes to get a mild case and thus immunity. It is synonymous with the term “variolation.”

**Inter-Tropical Convergence Zone**—an environmental phenomenon impacting rainfall in the central swath of Africa. The movement is from the north, to the south, returning to the north over a twelve month period. This means that the central regions of Africa receive two rainy periods per year and that rainfall can be unpredictable at the edges. This is related to the El Niño, La niña phenomenon.

**NGOs**—Non-governmental organizations, groups that are not run by the government but by private people or institutions. These organizations can work on any topic and be led by foreigners or host-country nationals.

**Pandemic**—a global epidemic of disease. Most recently used in relation to AIDS. When a disease has reached epidemic levels in multiple countries or on multiple continents. Other pandemics have included the 1918 influenza (flu) outbreak that killed 18 million people. Recently people have discussed the

possibility of bird flu or SARS becoming a pandemic, although neither disease has reached high enough levels.

Pre-colonial Africa—refers to the period of time prior to European partitioning and governing of the African continent; this period covers centuries from the peopling of Africa in until around 1900. During this huge swath of history, there were sophisticated, organized and populous states in West Africa (Sokoto, Mali), East Africa (coastal Swahili city-states) and Central Africa (Kingdom of Kongo, Great Zimbabwe).

Prevalence (of disease)—Refers to the number of people infected with a disease at a given moment in time. It is a measurement used to compare and discuss the impact of a disease.

Public health—an interdisciplinary field that includes epidemiology, entomology, medicine, biostatistics, law, and the environment. The goals of public health work include prevention of disease among whole populations (as opposed to just curing single patients—which is the focus of medicine.) Public health projects also often include components of education and outreach and can extend into the realm of policymaking.

Reservoir—a term used to refer to the person or animal where a vector-borne disease is maintained. A reservoir is not negatively harmed by being infected with the disease, and it is a place where the disease can be maintained over long periods of time, before infecting a host. For sleeping sickness, domestic or wild animals can serve as reservoirs.

Scarcity/Scarce Resources—refers to a shortage of a desired or valuable good. In the medical realm, the classic case of scarcity was the shortage of kidney dialysis machines in the United States in the 1960s. A current example is the shortage of anti-retroviral drugs to treat HIV and AIDS patients in Africa.

Sub-Saharan Africa/ Africa south of the Sahara—refers to the area of the African continent that is south of the Sahara desert. This excludes all of North Africa (the countries of Egypt, Morocco, Libya, Tunisia, Western Sahara, Algeria). The continent is often discussed in this way since the physical environments north and south of the Sahara differ considerably and the Sahara was often seen as a barrier, limiting contact between the two parts.

Vaccination—Generally used to refer to the practice of injecting a person with a vaccine to prevent against a particular disease. Specifically, the term is derived from Edward Jenner's experiments in the 1790s and is a reference to an injection with cowpox to give immunity to smallpox.

Vector—the vehicle (thing, object) needed to transfer a disease from a reservoir to a host. Oftentimes the disease will undergo changes while inside the body of the vector. For example, anopheles mosquitoes are a vector for the malaria parasite and the tsetse fly is a vector for sleeping sickness.

Virgin-soil epidemic—when an outbreak of disease occurs in a place where people have no immunity (either acquired or genetic.) These epidemics are often the deadliest since entire populations are

exposed to new pathogens without any prior experience. Examples include Native Americans being exposed to smallpox in the New World.

WHO—the World Health Organization, established in 1948. The organization is based out of Geneva, and is the health arm of the United Nations. It was born out of the League of Nations, which disbanded after World War II. Today, the WHO is the global body overseeing health campaigns around the world.

## **Additional (Recommended) Resources**

### **General Information**

Alfred Crosby. *The Columbian Exchange: Biological and Cultural Consequences of 1492* (Westport, Conn.: Praeger).

*This book is less about Africa and more about the exchange of plants and animals that occurred during the 1500s and 1600s. It is a great starting point for looking at how environments have been changed by human activity, through the movement of flora and fauna around the world.*

Kenneth F. Kiple, ed., *The Cambridge World History of Human Disease* (Cambridge: Cambridge University Press).

*The Cambridge World History of Human Disease) provide excellent introductions to a wide variety of topics. Articles are short, succinct and easy to navigate. If you'd like to give your students additional reading materials to go more in-depth about history or disease ecology, these are excellent choices. The articles below are particularly helpful:*

- Kenneth F. Kiple, “Diseases of Sub-Saharan Africa to 1860”
- Maryinez Lyons, “Diseases of Sub-Saharan Africa since 1860”
- K. David Patterson, “Disease Ecologies of Sub-Saharan Africa”

“Rx for Survival: A Global Health Challenge”. PBS Television Seires

*This is a 3 disc series produced by PBS. There are six separate episodes, each highlighting a different global public health issue (Disease Warriors; Rise of the Superbugs; Delivering the Goods; Deadly Messengers; Back to the Basics; How Safe Are We). The episodes present an excellent blend of historical and current information and are extremely well done. Students will like watching the videos and there is a nice degree of overlap between this curriculum and the episodes. (My students raved about these movies and were even willing to come in the evening, after class to watch. Additionally, you can rent this video from the BU African Studies Outreach Center.)*

### **Health and Human Rights**

Sophia Gruskin, Michael Grodin, et al., eds., *Perspectives on Health and Human Rights* (New York: Routledge).

Jonathan Mann, Sophia Gruskin, et al., eds, *Health and Human Rights: a Reader* (New York: Routledge).

*These two edited volume consist of separate, stand-alone chapters on a variety of different issues related to health and human rights. Many of the chapters are overly academic and dry. However, if there is a particular issue you'd like to explore more in depth (such as the production of generic drugs, or the TAC case against the South African*

government) it will provide useful information. Also reprints pertinent human rights documents.

## **AIDS**

John Iliffe, *The African Aids Epidemic: A History* (Oxford: James Currey).

*This book is a good, short, introduction into the AIDS epidemic across sub-Saharan Africa. Readable by advanced high school students, although it is quite dense. Much of my material about the epidemic was taken from this book.*

## **Smallpox**

Eugenia W. Herbert, "Smallpox Inoculation in Africa," *The Journal of African History* 16,4 (1975): 539-559.

*This is a brief article that presents information about the techniques used in Africa to control smallpox prior to colonization. It is a good general introduction and I have drawn upon it heavily in my section.*

## **Sleeping Sickness**

John Ford, *The Role of Trypanosomiasis in African Ecology: A Study of the Tsetse Fly Problem* (Oxford: Clarendon Press).

*This book is considered by many to be the bible of sleeping sickness. It is a huge book and quite technical. Although it is the place to go for detailed answers about sleeping sickness, it is unlikely to be useful for students.*

Kirk Hoppe, *Lords of the Fly: Sleeping Sickness Control in British East Africa, 1900-1960* (Westport, CT: Praeger).

*If you'd like to go more in-depth about colonial policies related to sleeping sickness, this is probably the most readable book available. It is written by a historian and details the many ill-fated (and occasionally cruel) policies used by the British colonial government while trying to eradicate and then control sleeping sickness.*

Helge Kjekshus, *Ecology Control and Economic Development in East African History: The Case of Tanganyika, 1850-1950* (London: Heinemann)

*This book was one of the first to be written about ecology in East Africa. The materials are focused entirely on colonial Tanzania, and take a more overt political economy approach. If you are looking to tie in colonialism and economics to the environment and disease, chapters of this book may be useful.*

Maryinez Lyons, *The Colonial Disease: a Social History of Sleeping Sickness in Northern Zaire, 1900-1940* (Cambridge: Cambridge University Press).

*This is a very challenging book, with a great deal of very specific information about sleeping sickness. Different chapters recount particular European scientific expeditions to study the disease, while others focus on the nuances of ecology and transmission. There are some good images (some reprinted in this curriculum) and you may find pages useful to hand out to students.*

### **Author Biography**

Melissa Graboyes received her Ph.D. in African history from Boston University in 2010. She has her Masters in Public Health with an emphasis on health law, human rights and medical ethics. This curriculum is borne out of her experience teaching a freshmen course (“Health and Disease in Africa: History and the Present”) at Boston University. Currently, she is a Faculty Fellow in the Department of History at the University of Oregon and is busy revising her dissertation about the history of human experimentation and medical ethics in East Africa. Comments, corrections, and questions can be directed to [melissagraboyes@yahoo.com](mailto:melissagraboyes@yahoo.com).

### **Boston University African Studies Center Outreach Center**

Opened in 1979, the Outreach Program seeks to increase awareness and knowledge of Africa by providing information, materials, and services to schools, libraries, museums, the media, and community groups in New England and throughout the country. The Outreach Program forms part of Boston University's [African Studies Center](#), established in 1953 as an interdisciplinary teaching and research center.

[Barbara B. Brown, Ph.D.](#), the Outreach Director, has extensive experience in education and African affairs. She has taught at the middle school and university level in the U.S. In Africa, she has taught at the University of Botswana and has worked for shorter periods in a number of other African countries, including South Africa, Kenya, Zimbabwe and Benin. Dr. Brown has prepared curriculum materials on several African countries and has led numerous workshops on Africa as well as on the broader issues of multicultural education.

The Outreach Resource Library houses a substantial collection open to the public. The library collection focuses on material of use to classroom teachers. Audio-visual materials may be borrowed through the mail, while print materials are generally lent only to visitors. The Outreach Resource Library is open Monday-Friday from 9:00 a.m. until 4:30 p.m., however appointments are recommended so as to better serve your needs. Summer hours are only by special arrangement. Resources include:

- 200+ curriculum guides and lesson plans
- 100+ [videos](#) for all ages
- [handouts](#) on key topics
- maps
- mounted [posters](#)
- background information for teachers
- referrals for speakers and performances

**Telephone:** 617.353.7303

**E-mail:** [africa@bu.edu](mailto:africa@bu.edu)

**Mail:** African Studies Outreach Center Boston University  
270 Bay State Road  
Boston, Massachusetts 02215

**Visit:** Above address, 4<sup>th</sup> floor

NARRATIVE  
OF AN  
EXPEDITION TO THE ZAMBESI

AND ITS TRIBUTARIES;

AND OF THE  
DISCOVERY OF THE LAKES SHIRWA AND NYASSA.

1858—1864.

BY DAVID AND CHARLES LIVINGSTONE.



With Map and Illustrations.

NEW YORK:  
HARPER & BROTHERS, PUBLISHERS,  
FRANKLIN SQUARE.  
1866.

on them by their being the object of the wheedling and coaxing of eager merchants, a feeling to which even the love of gain is subordinate.

The native medical profession is reasonably well represented. In addition to the regular practitioners, who are a really useful class, and know something of their profession, and the nature and power of certain medicines, there are others who devote their talents to some specialty. The elephant doctor prepares a medicine which is considered indispensable to the hunters when attacking that noble and sagacious beast; no hunter is willing to venture out before investing in this precious nostrum. The crocodile doctor sells a charm which is believed to possess the singular virtue of protecting its owner from crocodiles. Unwittingly we offended the crocodile school of medicine while at Tette by shooting one of these huge reptiles as it lay basking in the sun on a sand-bank; the doctors came to the Makololo in wrath, clamoring to know why the white man had shot their crocodile.

A shark's hook was baited one evening with a dog, of which the crocodile is said to be particularly fond; but the doctors removed the bait, on the principle that the more crocodiles the more demand for medicine, or perhaps because they preferred to eat the dog themselves. Many of the natives of this quarter are known, as in the South Seas, to eat the dog without paying any attention to its feeding. The dice doctor or diviner is an important member of the community, being consulted by Portuguese and natives alike. Part of his business is that of a detective, it being his duty to discover thieves. When goods are stolen, he goes and looks at the place, casts his dice, and waits a few days, and then, for a consideration, tells who is the thief: he is gen-

erally correct, for he trusts not to his dice alone; he has confidential agents all over the village, by whose inquiries and information he is enabled to detect the culprit. Since the introduction of muskets, gun doctors have sprung up, and they sell the medicine which professes to make good marksmen; others are rain doctors, etc., etc. The various schools deal in little charms, which are hung round the purchaser's neck to avert evil: some of them contain the medicine, others increase its power.

Indigo, about three or four feet high, grows in great luxuriance in the streets of Tette, and so does the senna plant. The leaves are undistinguishable from those imported in England. We set the Makololo to collect specimens, but the natives objected to their doing so, though they themselves never make use of them. A small amount of first-rate cotton is cultivated by the native population for the manufacture of a coarse cloth. In former times the Portuguese collected it at a cheap rate, and made use of it instead of the calico now imported, to exchange for the Manica gold dust. A neighboring tribe raises the sugar-cane, and makes a little sugar; but they use most primitive wooden rollers, and having no skill in mixing lime with the extracted juice, the product is of course of very inferior quality. Plenty of magnetic iron ore is found near Tette, and coal also to any amount, a single cliff-seam measuring twenty-five feet in thickness. It was found to burn well in the steamer on the first trial. The ash showed a large quantity of shaly refuse; but, suspecting that this was from the coal near the surface having been exposed to the weather for ages, we drove a shaft of some thirty feet, and the mineral was found to improve the farther we went in. Gold is washed for in the beds of rivers, within a couple of days of Tette. The

ward close by Mount Chiradzuru, among the relatives of Chibisa, and thence by the pass Zedi down to the Shire. And it was well that they got to the ship when they did, for our excellent quartermaster, John Walker, who had been left in charge, had been very ill of fever all the time of their absence, while those who had been roughing it for twenty-two days on the hills, and sleeping every night, except one, in the open air, came back well and hearty. Rowe, his companion, who had charge of the medicine, had not given him any, because he did not know what his illness was. One can scarcely mistake the fever if he attends to the symptoms already enumerated, or remembers that almost every complaint in this country is a form of fever, or is modified by the malaria. Walker's being a very severe case, a large dose of calomel was at once administered. This sometimes relieves when other remedies fail, but the risk of salivation must be run. When 20 grains are taken it may cause an abundant flow of bile, and a cure be the result. This is mentioned not as a course to be followed except when other remedies fail, or when jaundice supervenes. We have seen a case of this kind cured by a large dose of calomel, when a blister put on the pit of the stomach to allay vomiting brought out serum as black as porter, as if the blood had been impregnated with bile. These hints are given, though we believe, as we have before stated, that no Mission or Expedition ought to enter the country without a skillful surgeon as an essential part of its staff.

Quartermaster Walker soon recovered, though, from the long continuance of the fever, his system was very much more shaken than it would have been had the medicine been administered at once. The Kroomen had, while we were away, cut a good supply of wood for steaming, and we soon proceeded down the river.

people of the country, who were miserably poor and hungry. The women were gathering wild fruits in the woods. A young man, having consented for two yards of cotton cloth to show us a short path to the cataract, led us up a steep hill to a village perched on the edge of one of its precipices; a thunder-storm coming on at the time, the head man invited us to take shelter in a hut until it had passed. Our guide, having informed him of what he knew and conceived to be our object, was favored in return with a long reply in well-sounding blank verse; at the end of every line, the guide, who listened with deep attention, responded with a grunt, which soon became so ludicrous that our men burst into a loud laugh. Neither the poet nor the responsive guide took the slightest notice of their rudeness, but kept on as energetically as ever to the end. The speech, or more probably our bad manners, made some impression on our guide, for he declined, although offered double pay, to go any farther.

We brought cotton-seed to Africa, in ignorance that the cotton already introduced was equal, if not superior, to the common American, and offered it to any of the Portuguese and natives who chose to cultivate it; but, though some tried this source of wealth, it was evident that their ideas could not soar beyond black ivory, as they call slaves, elephant's tusks, and a little gold dust.

A great deal of fever comes in with March and April; in March, if considerable intervals take place between the rainy days, and in April always, for then large surfaces of mud and decaying vegetation are exposed to the hot sun. In general an attack does not continue long, but it pulls one down quickly, though when the fever is checked the strength is as quickly restored. It had long been observed that those

who were stationed for any length of time in one spot, and lived sedentary lives, suffered more from fever than others who moved about, and had both mind and body occupied; but we could not all go in the small vessel when she made her trips, during which the change of place and scenery proved so conducive to health; and some of us were obliged to remain in charge of the expedition's property, making occasional branch trips to examine objects of interest in the vicinity. Whatever may be the cause of the fever, we observed that all were often affected at the same time, as if from malaria. This was particularly the case during a north wind: it was at first commonly believed that a daily dose of quinine would prevent the attack. For a number of months, all our men, except two, took quinine regularly every morning. The fever sometimes attacked the believers in quinine, while the unbelievers in its prophylactic powers escaped. Whether we took it daily, or omitted it altogether for months, made no difference; the fever was impartial, and seized us on the days of quinine as regularly and as severely as when it remained undisturbed in the medicine-chest, and we finally abandoned the use of it as a prophylactic altogether. The best preventive against fever is plenty of interesting work to do, and abundance of wholesome food to eat. To a man well housed and clothed, who enjoys these advantages, the fever at Tette will not prove a more formidable enemy than a common cold; but let one of these be wanting—let him be indolent, or guilty of excesses in eating or drinking, or have poor, scanty fare, and the fever will probably become a more serious matter. It is of a milder type at Tette than at Quillimane or on the low sea-coast; and, as in this part of Africa one is as liable to fever as to colds in England, it would be advisable for

strangers always to hasten from the coast to the higher lands, in order that when the seizure does take place, it may be of the mildest type. This having been pointed out by Dr. Kirk, the Portuguese authorities afterward took the hint, and sent the next detachment of soldiers at once up to Tette. It consisted of eighty men, and, in spite of the irregularities committed, most of them being of the class termed "incorrigibles," in three years only ten died, and but five of fever. Although quinine was not found to be a preventive, except possibly in the way of acting as a tonic, and rendering the system more able to resist the influence of malaria, it was found invaluable in the cure of the complaint, as soon as pains in the back, sore bones, headache, yawning, quick and sometimes intermittent pulse, noticeable pulsations of the jugulars, with suffused eyes, hot skin, and foul tongue, began.\*

Very curious are the effects of African fever on certain minds. Cheerfulness vanishes, and the whole mental horizon is overcast with black clouds of gloom and sadness.

\* A remedy composed of from six to eight grains of resin of jalap, the same of rhubarb, and three each of calomel and quinine, made up into four pills, with tincture of cardamoms, usually relieved all the symptoms in five or six hours. Four pills are a full dose for a man—one will suffice for a woman. They received from our men the name of "rousers," from their efficacy in rousing up even those most prostrated. When their operation is delayed, a desert-spoonful of Epsom salts should be given. Quinine after or during the operation of the pills, in large doses every two or three hours, until deafness or cinchonism ensued, completed the cure. The only cases in which we found ourselves completely helpless were those in which obstinate vomiting ensued. We had received from Viscount Torrington a handsome supply of "Warburgh's fever drops," a medicine much esteemed in India; and, in consideration of his lordship's kindness in furnishing the drug at a considerable expense, as well as from a desire to find out a remedy that might be relied on for this formidable disease, we gave it as fair a trial as was in our power. In the shivering stage it caused warmth, but did not cure. One old man seemed cured, but died a day or two afterward. We regret that we can not recommend it for Africa, though we know of its high repute in India.

The liveliest joke can not provoke even the semblance of a smile. The countenance is grave, the eyes suffused, and the few utterances are made in the piping voice of a wailing infant. An irritable temper is often the first symptom of approaching fever. At such times a man feels very much like a fool, if he does not act like one. Nothing is right, nothing pleases the fever-stricken victim. He is peevish, prone to find fault and to contradict, and think himself insulted, and is exactly what an Irish naval surgeon before a court-martial defined a drunken man to be: "a man unfit for society." If a party were all soaked full of malaria at once, the life of the leader of the expedition would be made a burden to him. One might come with lengthened visage, and urge as a good reason for his despair, if farther progress were attempted, that "he had broken the photograph of his wife;" another, "that his proper position was unjustly withheld because special search was not directed toward 'the ten lost tribes.'" It is dangerous to rally such a one, for the irate companion may quote Scripture, and point to their habitat "beyond the rivers of Ethiopia." When a man begins to feel that every thing is meant to his prejudice, he either takes a dose of "rousters," or writes to the newspapers, according to the amount of sense with which nature has endowed him.

\* Finding that it was impossible to take our steamer of only ten-horse power through Kebrabasa, and convinced that, in order to force a passage when the river was in flood, much greater power was required, due information was forwarded to her majesty's government, and application made for a more suitable vessel. Our attention was in the mean time turned to the exploration of the River Shire, a northern tributary of the Zambesi, which joins it about a hundred

not indebted to frequent ablutions. An old man told us that he remembered to have washed once in his life, but it was so long since that he had forgotten how it felt. "Why do you wash?" asked Chinsunse's women of the Makololo; "our men never do."

On the Upper Shire Valley, a man, after favoring us with some queer geographical remarks, followed us for several days. The Makololo became very much annoyed with him, for he proclaimed in every village we entered, "These people have wandered; they do not know where they are going." In vain did they scold and order him away. As soon as we started, he appeared again in the line of march, with his little bag over his shoulder, containing all his worldly gear, and as ready with his uncalled-for remarks as before. Every effort failed to drive him away, until at length the happy expedient was hit on of threatening to take him down to the river and wash him; he at once made off, and we saw him no more. Much skin disease is seen among the Manganja. Many had ulcers on their limbs; indeed, an indolent almost incurable ulcer is the worst complaint we saw. Some men appeared as if they had blotches of whitewash all over them, and some were afflicted with the leprosy of the Cape. Many fowls, even, have their feet deformed by a peculiar thickening of the skin. We noticed also some men marked with small-pox, and asked the chief, Mongazi, if he knew whether it had come to them from the coast or from the interior. Being, as usual, amiably tipsy and anxious to pay us a compliment, he graciously replied he did not know, but thought it must have come to them from the English.

The superstitious ordeal by drinking the poisonous muave obtains credit here; and when a person is suspected of crime,

ening, had probably seen two hundred summers. Dr. Kirk found that the Mosibe is peculiar, in being allied to a species met with only in the West Indies. The Motsikiri, sometimes called Mafuta, yields a hard fat, and an oil which is exported from Inhambane. It is said that two ancient Batoka travelers went down as far as the Loangwa, and finding the Macā-tree (*jujube* or *zisyphus*) in fruit, carried the seed all the way back to the great Falls, in order to plant them. Two of these trees are still to be seen there, the only specimens of the kind in that region.

The Batoka had made a near approach to the custom of more refined nations, and had permanent grave-yards, either on the sides of hills, thus rendered sacred, or under large old shady trees; they reverence the tombs of their ancestors, and plant the largest elephants' tusks as monuments at the head of the grave, or entirely inclose it with the choicest ivory. Some of the other tribes throw the dead body into the river to be devoured by crocodiles, or, sewing it up in a mat, place it on the branch of a Baobab, or cast it in some lonely gloomy spot, surrounded by dense tropical vegetation, where it affords a meal to the foul hyenas; but the Batoka reverently bury their dead, and regard the spot henceforth as sacred. The ordeal by the poison of the muave is resorted to by the Batoka as well as by the other tribes; but a cock is often made to stand proxy for the supposed witch. Near the confluence of the Kafue, the Mambo, or chief, with some of his head men, came to our sleeping-place with a present; their foreheads were smeared with white flour, and an unusual seriousness marked their demeanor. Shortly before our arrival they had been accused of witchcraft; conscious of innocence, they accepted the ordeal, and undertook to drink the poisoned muave. For this purpose they made a journey to the sa-

cred hill of Nchomokela, on which repose the bodies of their ancestors; and, after a solemn appeal to the unseen spirits to attest the innocence of their children, they swallowed the muave, vomited, and were therefore declared not guilty. It is evident that they believe that the soul has a continued existence, and that the spirits of the departed know what those they have left behind them are doing, and are pleased or not, according as their deeds are good or evil: this belief is universal. The owner of a large canoe refused to sell it because it belonged to the spirit of his father, who helped him when he killed the hippopotamus. Another, when the bargain for his canoe was nearly completed, seeing a large serpent on a branch of the tree overhead, refused to complete the sale, alleging that this was the spirit of his father come to protest against it.

Some of the Batoka chiefs must have been men of considerable enterprise; the land of one, in the western part of this country, was protected by the Zambesi on the S., and on the N. and E. lay an impassable reedy marsh, filled with water all the year round, leaving only his western border open to invasion; he conceived the idea of digging a broad and deep canal, nearly a mile in length, from the reedy marsh to the Zambesi, and, having actually carried the scheme into execution, he formed a large island, on which his cattle grazed in safety, and his corn ripened from year to year secure from all marauders.

Another chief, who died a number of years ago, believed that he had discovered a remedy for tsetse-bitten cattle; his son Moyara showed us a plant, which was new to our botanist, and likewise told us how the medicine was prepared; the bark of the root, and, what might please our homœopathic friends, a dozen of the tsetse, are dried, and ground together

into a fine powder. This mixture is administered internally; and the cattle are fumigated by burning under them the rest of the plant collected. The treatment must be continued for weeks whenever the symptoms of poison appear. This medicine, he frankly admitted, would not cure all the bitten cattle. "For," said he, "cattle, and men too, die in spite of medicine; but should a herd by accident stray into a tsetse district and be bitten, by this medicine of my father, Kampakampa, some of them could be saved, while without it all would inevitably die." He stipulated that we were not to show the medicine to other people, and if ever we needed it in this region we must employ him; but if we were far off we might make it ourselves; and when we saw it cure the cattle, think of him, and send him a present.

Our men made it known every where that we wished the tribes to live in peace, and would use our influence to induce Sekeletu to prevent the Batoka of Moshobotwane and the Makololo under-chiefs making forays into their country: they had already suffered severely, and their remonstrances with their countryman, Moshobotwane, evoked only the answer, "The Makololo have given me a spear; why should I not use it?" He indeed it was who, being remarkably swift of foot, first guided the Makololo in their conquest of the country. In the character of peace-makers, therefore, we experienced abundant hospitality; and from the Kafue to the Falls, none of our party were allowed to suffer hunger. The natives sent to our sleeping-places generous presents of the finest white meal, and fat capons to give it a relish, great pots of beer to comfort our hearts, together with pumpkins, beans, and tobacco, so that we "should sleep neither hungry nor thirsty."

In traveling from the Kafue to the Zungwe we frequently

know what they say about us. The remarks are often not quite complimentary, and resemble closely what certain white travelers say about the blacks.

We made our camp in the afternoon abreast of the large island called Mparira, opposite the mouth of the Chobe. Francolins, quails, and Guinea-fowls, as well as larger game, were abundant. The Makololo head man, Mókempa, brought us a liberal present; and, in the usual way, which is considered politeness, regretted he had no milk, as his cows were all dry. We got some honey here from the very small stingless bee, called by the Batoka moandi, and by others the kokomatane. This honey is slightly acid, and has an aromatic flavor. The bees are easily known from their habit of buzzing about the eyes, and tickling the skin by sucking it as common flies do. The hive has a tube of wax like a quill for its entrance, and is usually in the hollows of trees.

Mokempa feared that the tribe was breaking up, and lamented the condition into which they had fallen in consequence of Sekeletu's leprosy; he did not know what was to become of them. He sent two canoes to take us up to Seshoke; his best canoe had taken ivory up to the chief, to purchase goods of some native traders from Benguela. Above the Falls the paddlers always stand in the canoes, using long paddles ten feet in length, and changing from side to side without losing the stroke.

Mochokotsa, a messenger from Sekeletu, met us on the 17th with another request for the doctor to take ivory and purchase a horse. He again declined to interfere. None were to come up to Sekeletu but the doctor; and all the men who had had small-pox at Tette three years ago were to go back to Moshobotwane, and he would sprinkle medicine over them to drive away the infection, and prevent it spreading in the

tribe. Mochokotsa was told to say to Sekeletu that the disease was known of old to white men, and we even knew the medicine to prevent it; and, were there any danger now, we should be the first to warn him of it. Why did not he go himself to have Moshobotane sprinkle medicine to drive away his leprosy? We were not afraid of his disease, nor of the fever that had killed the teachers and many Makololo at Lin-yanti. As this attempt at quarantine was evidently the suggestion of native doctors to increase their own importance, we added that we had no food, and would hunt next day for game, and the day after; and, should we be still ordered purification by their medicine, we should then return to our own country.

The message was not all of our dictation; our companions interlarded it with their own indignant protests, and said some strong things in the Tette dialect about these "doctor things" keeping them back from seeing their father; when, to their surprise, Mochokotsa told them he knew every word they were saying, as he was of the tribe Bazizulu, and defied them to deceive him by any dialect, either of the Mashona on the east, or of the Mambari on the west. Mochokotsa then repeated our message twice, to be sure that he had it every word, and went back again. These chiefs' messengers have most retentive memories; they carry messages of considerable length great distances, and deliver them almost word for word. Two or three usually go together, and when on the way the message is rehearsed every night, in order that the exact words may be kept to. One of the native objections to learning to write is that these men answer the purpose of transmitting intelligence to a distance as well as a letter would; and, if a person wishes to communicate with any one in the town, the best way to do so is either to go to or

send for him; and as for corresponding with friends very far off, that is all very well for white people, but the blacks have no friends to whom to write. The only effective argument for their learning to read is that it is their duty to know the revelation from their Father in Heaven as it stands in the Book.

Our messenger returned on the evening of the following day with "You speak truly," says Sekeletu; "the disease is old; come on at once; do not sleep in the path; for I am greatly desirous (*tlologelegeoe*) to see the doctor."

After Mochokotsa left us, we met some of Mokompa's men bringing back the ivory, as horses were preferred to the West Coast goods. They were the bearers of instructions to Mokompa, and as these instructions illustrate the government of people who have learned scarcely any thing from Europeans, they are inserted, though otherwise of no importance. Mashotlane had not behaved so civilly to Mr. Baldwin as Sekeletu had ordered him to do to all Englishmen. He had been very uncivil to the messengers sent by Moselekatse with letters from Mr. Moffat, treated them as spies, and would not land to take the bag until they moved off. On our speaking to him about this, he justified his conduct on the plea that he was set at the Falls for the very purpose of watching these, their natural enemies; and how was he to know that they had been sent by Mr. Moffat? Our men thereupon reported at head-quarters that Mashotlane had cursed the doctor. The instructions to Mokompa from Sekeletu were to "go and tell Mashotlane that he had offended greatly. He had not cursed Monare (Dr. Livingstone), but Sebituane, as Monare was now in the place of Sebituane, and he revered him as he had done his father. Any fine taken from Mr. Baldwin was to be returned at once, as he was not a Boer, but an English-

man. Sekeletu was very angry, and Mokompa must not conceal the message."

On finding afterward that Mashotlane's conduct had been most outrageous to the Batoka, Sekeletu sent for him to come to Sesheke, in order that he might have him more under his own eye; but Mashotlane, fearing that this meant the punishment of death, sent a polite answer, alleging that he was ill and unable to travel. Sekeletu tried again to remove Mashotlane from the Falls, but without success. In theory the chief is absolute and quite despotic; in practice his authority is limited, and he can not, without occasionally putting refractory head men to death, force his subordinates to do his will.

Except the small rapids by Mparira Island, near the mouth of the Chobe, the rest of the way to Sesheke by water is smooth. Herds of cattle of two or three varieties graze on the islands in the river: the Batoka possessed a very small breed of beautiful shape, and remarkably tame, and many may still be seen; a larger kind, many of which have horns pendent, and loose at the roots; and a still larger sort, with horns of extraordinary dimensions, apparently a burden for the beast to carry. This breed was found in abundance at Lake Ngami. We stopped at noon at one of the cattle-posts of Mokompa, and had a refreshing drink of milk. Men of this standing have usually several herds placed at different spots, and the owner visits each in turn, while his headquarters are at his village. His son, a boy of ten, had charge of the establishment during his father's absence. According to Makololo ideas, the cattle-post is the proper school in which sons should be brought up. Here they receive the right sort of education—the knowledge of pasture, and how to manage cattle.

Strong easterly winds blow daily from noon till midnight, and continue till the October or November rains set in. Whirlwinds, raising huge pillars of smoke from burning grass and weeds, are common in the forenoon. We were nearly caught in an immense one. It crossed about twenty yards in front of us, the wind apparently rushing into it from all points of the compass. Whirling round and round in great eddies, it swept up hundreds of feet into the air a continuous dense dark cloud of the black pulverized soil, mixed with dried grass, off the plain. Herds of the new antelopes, lechwé, and poku, with the kokong, or gnus, and zebras, stood gazing at us as we passed. The mirage lifted them at times half way to the clouds, and twisted them and the clumps of palms into strange unearthly forms. The extensive and rich level plains by the banks, along the sides of which we paddled, would support a vast population, and might be easily irrigated from the Zambesi. If watered, they would yield crops all the year round, and never suffer loss by drought. The hippopotamus is killed here with long lance-like spears. We saw two men, in a light canoe, stealing noiselessly down on one of these animals thought to be asleep; but it was on the alert, and they had quickly to retreat. Comparatively few of these animals now remain between Sesheke and the Falls, and they are uncommonly wary, as it is certain death for one to be caught napping in the daytime.

On the 18th we entered Sesheke. The old town, now in ruins, stands on the left bank of the river. The people have built another on the same side, a quarter of a mile higher up, since their head man Moriantsiane was put to death for bewitching the chief with leprosy. Sekeletu was on the right bank, near a number of temporary huts. A man hailed us from the chief's quarters, and requested us to rest under the

Makololo usually devour all the fat first, that being considered the best, and afterward eat the lean, and, last of all, the porridge or bread, if they have any. The people who, like them, live much on milk and meat, can bear fatigue and privation much better than those whose sustenance is chiefly grain and pulse. When the Makololo go on a foray, as they sometimes do, a month distant, many of the subject tribes who accompany them, being grain eaters, perish from sheer fatigue, while the beef eaters scorn the idea of even being tired.

A constant stream of visitors rolled in on us the day after our arrival. Several of them, who had suffered affliction during the doctor's absence, seemed to be much affected on seeing him again. All were in low spirits. A severe drought had cut off the crops, and destroyed the pasture of Linyanti, and the people were scattered over the country in search of wild fruits, and the hospitality of those whose ground-nuts (*Arachis hypogæa*) had not failed. Sekeletu's leprosy brought troops of evils in its train. Believing himself bewitched, he had suspected a number of his chief men, and had put some, with their families, to death; others had fled to distant tribes, and were living in exile. The chief had shut himself up, and allowed no one to come into his presence but his uncle Mamire. Ponwane, who had been as "head and eyes" to him, had just died; evidence, he thought, of the potent spells of those who hated all who loved the chief. The country was suffering grievously, and Sebituane's grand empire was crumbling to pieces. A large body of young Barotse had revolted and fled to the north, killing a man by the way, in order to put a blood-feud between Masiko, the chief to whom they were going, and Sekeletu. The Batoka under Sinamane, and Muemba, were independ-

ent, and Mashotlane at the Falls was setting Sekeletu's authority virtually at defiance. Sebituane's wise policy in treating the conquered tribes on equal terms with his own Makololo, as all children of the chief, and equally eligible to the highest honors, had been abandoned by his son, who married none but Makololo women, and appointed to office none but Makololo men. He had become unpopular among the black tribes, conquered by the spear, but more effectually won by the subsequent wise and just government of his father.

Strange rumors were afloat respecting the unseen Sekeletu; his fingers were said to have grown like eagle's claws, and his face so frightfully distorted that no one could recognize him. Some had begun to hint that he might not really be the son of the great Sebituane, the founder of the nation, strong in battle, and wise in the affairs of state. "In the days of the Great Lion" (Sebituane), said his only sister, Moriantsiane's widow, whose husband Sekeletu had killed, "we had chiefs, and little chiefs, and elders to carry on the government, and the great chief, Sebituane, knew them all, and every thing they did, and the whole country was wisely ruled; but now Sekeletu knows nothing of what his underlings do, and they care not for him, and the Makololo power is fast passing away."\*

\* In 1865, four years after these forebodings were penned, we received intelligence that they had all come to pass. Sekeletu died in the beginning of 1864: a civil war broke out about the succession to the chieftainship; a large body of those opposed to the late chief's uncle, Impololo, being regent, departed with their cattle to Lake Ngami; an insurrection by the black tribes followed; Impololo was slain, and the kingdom, of which, under an able, sagacious mission, a vast deal might have been made, has suffered the usual fate of African conquests. That fate we deeply deplore; for, whatever other faults the Makololo might justly be charged with, they did not belong to the class who buy and sell each other, and the tribes who have succeeded them do.

The native doctors had given the case of Sekeletu up. They could not cure him, and pronounced the disease incurable. An old doctress from the Manyeti tribe had come to see what she could do for him, and on her skill he now hung his last hopes. She allowed no one to see him except his mother and uncle, making entire seclusion from society an essential condition of the much-longed-for cure. He sent, notwithstanding, for the doctor; and on the following day we all three were permitted to see him. He was sitting in a covered wagon, which was inclosed by a high wall of close-set reeds; his face was only slightly disfigured by the thickening of the skin in parts, where the leprosy had passed over it; and the only peculiarity about his hands was the extreme length of his finger-nails, which, however, was nothing very much out of the way, as all the Makololo gentlemen wear them uncommonly long. He has the quiet, unassuming manners of his father, Sebituane; speaks distinctly, in a low, pleasant voice, and appears to be a sensible man, except perhaps on the subject of his having been bewitched, and in this, when alluded to, he exhibits as firm a belief as if it were his monomania. "Moriantsiane, my aunt's husband, tried the bewitching medicine first on his wife, and she is leprous, and so is her head servant; then, seeing that it succeeded, he gave me a stronger dose in the cooked flesh of a goat, and I have had the disease ever since. They have lately killed Ponwane, and, as you see, are now killing me." Ponwane had died of fever a short time previously. Sekeletu asked us for medicine and medical attendance, but we did not like to take the case out of the hands of the female physician already employed, it being bad policy to appear to undervalue any of the profession; and she, being anxious to go on with her remedies, said "she had not given him up yet, but would try

for another month; if he was not cured by that time, then she would hand him over to the white doctors." But we intended to leave the country before a month was up; so Mamire, with others, induced the old lady to suspend her treatment for a little. She remained, as the doctors stipulated, in the chief's establishment, and on full pay.

Sekeletu was told plainly that the disease was unknown in our country, and was thought exceedingly obstinate of cure; that we did not believe in his being bewitched, and we were willing to do all we could to help him. This was a case for disinterested benevolence; no pay was expected, but considerable risk incurred; yet we could not decline it, as we had the trading in horses. Having, however, none of the medicines usually employed in skin diseases with us, we tried the local application of lunar caustic, and hydriodate of potash internally; and with such gratifying results, that Mamire wished the patient to be smeared all over with a solution of lunar caustic, which he believed to be of the same nature as the blistering fluid formerly applied to his own knee by Mr. Oswell. *Its* power he considered irresistible, and he would fain have had any thing like it tried on Sekeletu.

The disease begins with slight discoloration of the surface, and at first affects only the cuticle, the patches spreading in the manner, and with somewhat of the appearance, of lichens, as if it were a fungus; small vesicles rise at the outer edges of the patches, and a discharge from the vesicles forms scabs. The true skin next thickens and rises in nodules, on the forehead, nose, and ears; and, when the disease is far advanced, foul fissures appear on the toes and fingers; these eventually drop off, and sometimes the deformed patient recovers. The natives believe it to be hereditary, and non-contagious; but, while working with this case, something very like it was

transplanted to the hands of Drs. Kirk and Livingstone, and was cured only by the liberal use of the caustic. The chief's health and spirits became better as the skin became thinner, and the deformity of face disappeared. The aged doctress, naturally wishing to obtain some credit for the improvement, began secretly to superadd her remedies, which consisted of scraping the diseased skin, and rubbing it with an astringent bark in powder. She desisted on receiving a hint from Mamiere that perhaps the medicine of the white doctors and the medicine of the black doctors might not work well together.

It was a time of great scarcity and hunger, but Sekeletu treated us hospitably, preparing tea for us at every visit we paid him. With the tea we had excellent American biscuit and preserved fruits, which had been brought to him all the way from Benguela. The fruits he most relished were those preserved in their own juices — plums, apples, pears, strawberries, and peaches, which we have seen only among Portuguese and Spaniards. It made us anxious to plant the fruit-tree seeds we had brought, and all were pleased with the idea of having these same fruits in their own country.

Mokele, the head man of Sesheke, and Sebituane's sister, Manchunyane, were ordered to provide us with food, as Sekeletu's wives, to whom this duty properly belonged, were at Linyanti. We found a black trader from the West Coast, and some Griqua traders from the South, both in search of ivory. Ivory is dear at Sesheke; but cheaper in the Batoka country, from Sinamane's to the Kafue, than any where else. The trader from Benguela took orders for goods for his next year's trip, and offered to bring tea, coffee, and sugar at cent. per cent. prices. As, in consequence of a hint formerly given, the Makololo had secured all the ivory in the Batoka country to the east by purchasing it with hoes, the Benguela

small, being only nineteen inches high, and twenty-two inches wide at the floor. A foot from the bottom it measured seventeen inches in breadth, and close to the top only twelve inches, so it was a difficult matter to get through it. The tower has no light or ventilation except through this small door. The reason a lady assigned for having the doors so very small was to keep out the mice!

The children have merry times, especially in the cool of the evening. One of their games consists of a little girl being carried on the shoulders of two others. She sits with outstretched arms as they walk about with her, and all the rest clap their hands, and, stopping before each hut, sing pretty airs, some beating time on their little kilts of cowskin, others making a curious humming sound between the songs. Excepting this and the skipping-rope, the play of the girls consists in imitation of the serious work of their mothers, building little huts, making small pots, and cooking, pounding corn in miniature mortars, or hoeing tiny gardens. The boys play with spears of reeds pointed with wood, and small shields, or bows and arrows; or amuse themselves in making little cattle-pens, or in moulding cattle in clay: they show great ingenuity in the imitation of various-shaped horns. Some, too, are said to use slings, but as soon as they can watch the goats or calves, they are sent to the field. We saw many boys riding on the calves they had in charge, but this is an innovation since the arrival of the English with their horses. Tselane, one of the ladies, on observing Dr. Livingstone noting observations on the wet and dry bulb thermometers, thought that he too was engaged in play; for, on receiving no reply to her question, which was rather difficult to answer, as the native tongue has no scientific terms, she said, with roguish glee, "Poor thing, playing like a little child!"

Like other Africans, the Makololo have great faith in the power of medicine; they believe that there is an especial medicine for every ill that flesh is heir to. Mamire is anxious to have children; he has six wives, and only one boy, and he begs earnestly for "child medicine." The mother of Sekeletu came from the Barotse Valley to see her son. Thinks she has lost flesh since Dr. Livingstone was here before, and asks for "the medicine of fatness." The Makololo consider plumpness an essential part of beauty in women, but the extreme stoutness mentioned by Captain Speke in the north would be considered hideous here, for the men have been overheard speaking of a lady whom we call "inclined to *embonpoint*" as "fat unto ugliness."

Two packages from the Kuruman, containing letters and newspapers, reached Linyanti previous to our arrival, and Sekeletu, not knowing when we were coming, left them there, but now at once sent a messenger for them. This man returned on the seventh day, having traveled 240 geographical miles. One of the packages was too heavy for him, and he left it behind. As the doctor wished to get some more medicine and papers out of the wagon left at Linyanti in 1853, he decided upon going thither himself. The chief gave him his own horse, now about twelve years old, and some men. He found every thing in his wagon as safe as when he left it seven years before. The head men Mosale and Pekonyane received him cordially, and lamented that they had so little to offer him. Oh! had he only arrived the year previous, when there was abundance of milk, and corn, and beer!

Very early the next morning the old town-crier, Ma-Pulenyane, of his own accord made a public proclamation, which, in the perfect stillness of the town long before dawn, was striking: "I have dreamed! I have dreamed! I have dream-

a district infested by tsetse; to preserve the horses from being bitten, this was passed through by night. The party slept at the different Makololo cattle-stations. At one a lion had been killed by a serpent. We have often heard of animals being so killed; but in a twenty-two years' residence in the country, Dr. Livingstone has only met with one case in which the bite was fatal to a human being. Ipecacuanha mixed with ammonia, and rubbed into the wound, is much esteemed in India. A key, pressed on the puncture for some time, extracts the poison; and when ipecacuanha is not at hand, a little powder ignited on the spot will do instead. Very large herds of kualatas were seen on the plains, and many black bucks, though their habitat is generally on the hills.\*

Sekeletu's health improved greatly during our visit; the melancholy foreboding left his spirits, and he became cheerful, but resolutely refused to leave his den, and appear in public till he was perfectly cured, and had regained what he considered his good looks. He also feared lest some of those who had bewitched him originally might still be among the people, and neutralize our remedies.†

\* A female kualata (*Aigoceros equina*) shot here measured—

	Ft. in.		Ft. in.
At withers.....	4 8	Length of horn.....	2 2
Entire length.....	6 8	Half circumference at chest	2 8

These measurements may be interesting to those who try to acclimatize animals. The elands in England are small. One we measured in Africa in 1849 was six feet four inches at the withers, and it seemed an animal of only ordinary size. Its power of taking on fat, and the quantity of fluid found in its stomach in the driest season, are quite remarkable. It browses chiefly on the leaves of trees.

† It was with sorrow that we learned by a letter from Mr. Moffat, in 1864, that poor Sekeletu was dead. As will be mentioned farther on, men were sent with us to bring up more medicine. They preferred to remain on the Shire, and, as they were free men, we could do no more than try and persuade them to hasten back to their chief with iodine and other remedies. They took the parcel, but there being only two real Makololo among them, these could neither return themselves alone nor force their attendants to leave a part of the

## CHAPTER XVII.

Down to Kongone.—Latest Bulletin of "the Asthmatic."—The old Lady's Demise.—Reach Senna by Canoe.—Unprofitable Trading by Slaves.—The Biter bit, or Sequasha squeezed.—Coals dear by Slave Labor.—His Excellency's Yacht.—Kongone.—English Papers.—Flesh, Fowl, Fish, and harmonious Crabs of the Mangrove Swamps.—Busungu.—The Sawfish.

THE Zambesi being unusually low, we remained at Tette till it rose a little, and then left on the 3d of December for the Kongone. It was hard work to keep the vessel afloat; indeed, we never expected her to remain above water. New leaks broke out every day; the engine-pump gave way; the bridge broke down; three compartments filled at night; except the cabin and front compartment, all was flooded; and in a few days we were assured by Rowe that "she can't be worse than she is, sir." He and Hutchins had spent much of their time, while we were away, in patching her bottom, puddling it with clay, and shoring it, and it was chiefly to please them that we again attempted to make use of her. We had long been fully convinced that the steel plates were thoroughly unsuitable. On the morning of the 21st the uncomfortable "Asthmatic" grounded on a sand-bank and filled. She could neither be emptied nor got off. The river rose during the night, and all that was visible of the worn-out craft next day was about six feet of her two masts. Most of the property we had on board was saved, and we spent the Christmas of 1860 encamped on the island of Chimba. Canoes were sent for from Senna; and we reached it on the 27th, to be again hospitably entertained by our friend, Senhor Ferrão.

A large party of slaves belonging to the commandant, after having been away the greater part of a year, had just re-

turned from a trading expedition to Moselekatse's country. They had taken inland a thousand muskets and a large quantity of gunpowder, these being, they said, the only articles Moselekatse cares to purchase. They started on their journey back with ivory, ostrich feathers, a thousand sheep and goats, and thirty head of fine cattle. Moselekatse sent, in addition, as a token that the traders and he had parted good friends, a splendid white bull to the commandant. The ostrich feathers had been packed in reeds; a fire broke out in the camp one night, and most of them were burned. On their way the cattle had to pass through a tsetse country, and they all died from the effects of the bite. The white bull perished within two days of Senna; six hundred of the sheep and goats had been eaten, either because they became lame, or because the drivers were hungry. The commandant, having an attack of fever, was unable to calculate his losses, but intended to imprison the slaves, who, as usual, thought more of their own comfort than of their master's gain. Slave labor is certainly very dear; for an Englishman with two wagons and ten people could have made a more profitable trip to Moselekatse's—from the much greater distances of Natal or the Cape—than was made by these hundreds of slaves.

When we met Sequasha, he confessed to having already amassed 800 arrobas or 25,600 lbs. of ivory, the most of it purchased for a mere trifle. His comrade had about half that amount, or 12,800 lbs. When Sequasha returned to Tette in the following year, he was cast into prison in the fort. He had brought down several tons of ivory, and was soon a free man again. The ostensible reason for his imprisonment was the disorders he had been guilty of in the interior; but this was only like the customary manipulation by which, in pisciculture, the salmon is made to yield her spawn

Lady Nyassa. Ground was leveled on the bank at Shupanga for the purpose of arranging the compartments in order: she was placed on palm-trees which were brought from a place lower down the river for ways, and the engineer and his assistants were soon busily engaged; about a fortnight after they were all brought from Kongone, the sections were screwed together. The blacks are more addicted to stealing where slavery exists than elsewhere. We were annoyed by thieves, who carried off the iron screw-bolts, but were gratified to find that strychnine saved us from the man-thief as well as the hyena-thief. A hyena was killed by it, and after the natives saw the dead animal and knew how we had destroyed it, they concluded that it was not safe to steal from men who possessed a medicine so powerful. The half-caste who kept Shupanga-house, said he wished to have some to give to the Zulus, of whom he was mortally afraid, and to whom he had to pay an unwilling tribute.

The Pioneer made several trips to the Kongone, and returned with the last load on the 12th of June. On the 23d the Lady Nyassa was safely launched, the work of putting her together having been interrupted by fever and dysentery, and many other causes which it would only weary the reader to narrate in detail. Natives from all parts of the country came to see the launch, most of them quite certain that, being made of iron, she must go to the bottom as soon as she entered the water. Earnest discussions had taken place among them with regard to the propriety of using iron for ship-building. The majority affirmed that it would never answer. They said, "If we put a hoe into the water, or the smallest bit of iron, it sinks immediately. How, then, can such a mass of iron float? it must go to the bottom." The minority answered that this might be true with them, but white men had medi-

cine for every thing. "They could even make a woman, all except the speaking; look at that one on the figure-head of the vessel." The unbelievers were astonished, and could hardly believe their eyes when they saw the ship float lightly and gracefully on the river instead of going to the bottom, as they so confidently predicted. "Truly," they said, "these men have powerful medicine."

Our distinguished countryman, Professor Owen, recommended our attention to be directed to the genesis of the tsetse, in order to discover a means for the extirpation of this pest. We frequently inquired of the different tribes if they could help us in our inquiries; and one of the Makololo remembered that this very question was once under public discussion at Linyanti, and, as usual, a bet was laid that no one could tell. After a number of days had elapsed, an old man claimed the prize, asserting that the tsetse laid its eggs, which were of a red color, on the leaves of the mopane-tree. These were probably only the eggs of an insect described in the "Missionary Travels" as depositing over its eggs a sweet gum, which is collected and eaten. Some denied that he had seen them; others affirmed that the red eggs were laid on the twigs of trees, and not on the leaves; and others insisted that the eggs were placed in the droppings of buffaloes, and these last were probably in the right. The destruction of all game by the advance of civilization is the only chance of getting rid of the tsetse.

We remember to have heard a furious discussion among the natives on the question whether the two toes of the ostrich represent the thumb and fore finger in man, or the little and ring fingers. On these occasions it is amusing to observe the freedom and earnestness with which men of the lowest grade assault the opinions of their betters. It is not often that

and liberty would spread to all the interior. We still think it may be a centre for civilizing influences; for any one descending from these cool heights, and stepping into a boat on the Upper Shire, can sail three hundred miles without a check into the heart of Africa.

We passed through a tract of country covered with mopane-trees, where the hard-baked soil refused to let the usual thick crops of grass grow; and here we came upon very many tracks of buffaloes, elephants, antelopes, and the spoor of one lion. An ox we drove along with us, as provision for the way, was sorely bitten by the tsetse. The effect of the bite was, as usual, quite apparent two days afterward, in the general flaccidity of the muscles, the drooping ears, and looks of illness. It always excited our wonder that we, who were frequently much bitten too by the same insects, felt no harm from their attacks. Man shares the immunity of the wild animals.

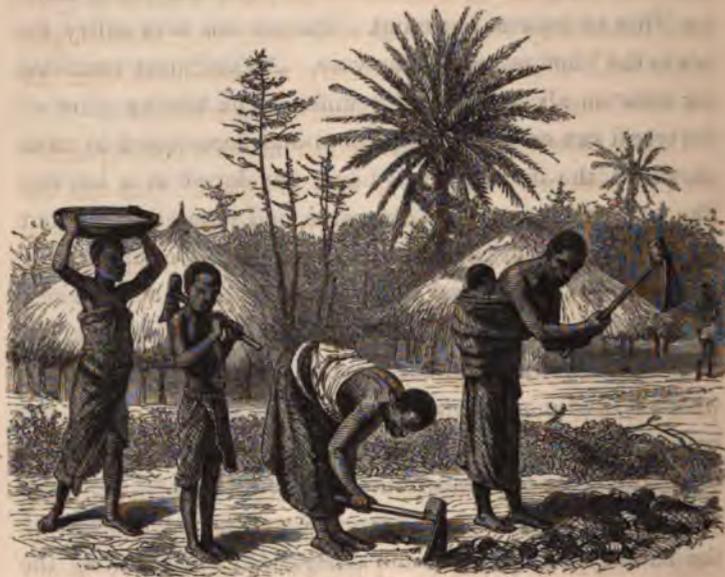
Though this was the dry, or rather hot season, many flowers were in blossom along our path. The euphorbia, baobab, and caparidaceous trees were in full bloom. A number of large hornbills attracted our attention, and Masiko, approaching the root of a tree in order to take sure aim at the birds, did not observe that within a few yards of the same tree two elephants stood in the cool shade fanning themselves with their huge ears. Dr. Livingstone fired a ball into the ear of one of the animals at thirty yards distance, but he only went off shaking his head, and Masiko for the first time perceived his danger as the beast began to tear away through the bush. Many Manganja skeletons were passed on entering a grove of lofty trees, under whose deep shade stood the ruins of a large village. Wild animals had now taken possession of what had lately been the abodes of men living in peace and plenty.

to the west of us, and no one was safe except in a stockade. We have so often, in traveling, heard of war in front, that we paid little attention to the assertion of Chembi, that the whole country to the N.W. was in flight before these Mazitu, under a chief with the rather formidable name of Mowhiriwhiri; we therefore resolved to go on to Chinsamba's, still farther in the same direction, and hear what he said about it.

In marching across the same kind of fertile plains, there was little to interest the mind. The air was very sultry, for this is the "hot season" of the year. A thick haze restricted our view on all sides to a few miles. The blazing glare of the torrid sun on this haze gives to one, accustomed to mists elsewhere, the impression of being enveloped in a hot fog. The cultivation was very extensive, and naturally drew our thoughts to the agriculture of the Africans. On one part of this plain the people had fields of maize, the plants of which towered far over our heads. A succession of holes three feet deep and four wide had been made in a sandy dell, through which flowed a perennial stream. The maize sown in the bottom of these holes had the benefit of the moisture, which percolated from the stream through the sand; and the result was a flourishing crop at a time of year when all the rest of the country was parched and dusty. On our counting the grains in one large cob or ear of maize, it was found to contain 360, and as one stalk has at times two or three cobs, it may be said to yield three or four hundred-fold.

While advantage is taken of the moist stratum in these holes during the dry season, grain, beans, and pumpkins, which are cultivated only in the rainy time of the year, are planted on ridges a foot high, allowing the superabundant moisture to run off. Another way in which the natives show their skill in agriculture is by collecting all the weeds and

grass into heaps, covering them with soil, and then setting fire to them. They burn slowly, and all the ashes and much of the smoke is retained in the overlying soil. The mounds thus formed, when sown upon, yield abundantly. The only instrument of husbandry here is the short-handled hoe; and about Tette the labor of tilling the soil, as represented in the wood-cut, is performed entirely by female slaves. On the



Females Hoeing.

West Coast a double-handed hoe is employed. Here the small hoe is seen in the hands of both men and women. In other parts of Africa a hoe with a handle four feet long is used, but the plow is quite unknown.

In illustration of the manner in which the native knowledge of agriculture strikes an honest intelligent observer, it may be mentioned that the first time good Bishop Mackenzie beheld how well the fields of the Manganja were cultivated

on the hills, he remarked to Dr. Livingstone, then his fellow-traveler, "When telling the people in England what were my objects in going out to Africa, I stated that, among other things, I meant to teach these people agriculture; but I now see that they know far more about it than I do." This, we take it, was an honest, straightforward testimony, and we believe that every unprejudiced witness, who has an opportunity of forming an opinion of Africans who have never been debased by slavery, will rank them very much higher in the scale of intelligence, industry, and manhood, than others who know them only in a state of degradation.

In two days' march we counted twenty-four cotton patches, each at least one fourth of an acre in extent. One was 240 paces broad. All, as before observed, had been kept so clear of weeds, that the fires passed by the cotton bushes in the regular grass-burnings without touching them.

Men and women were seen carrying their grain from villages toward the stockades; much corn strewed along the path evinced the haste with which it had been borne to the places of safety. Some were cutting down the large old euphorbia-trees, and an umbelliferous tree which surrounded the villages, in order that a clear view of the approach of the enemy might be obtained. Then one dead body lay in our path with a wound in the back; then another, and another, lying in the postures assumed in mortal agony, which no painter can reproduce. On coming near Chinsamba's two stockades, on the banks of the Lintipe, we were told that the Mazitu had been repulsed there the day before, and we had evidence of the truth of the report of the attack in the sad sight of the bodies of the slain. The Zulus had taken off large numbers of women laden with corn, and, when driven back, had cut off the ears of a male prisoner, as a sort of

These may be proofs of folly to some, but to others they are telling evidence that our religion has lost none of its pristine power. Nothing, in our opinion, is wanting to complete the title of many of these men to take rank with the saints and martyrs of primitive times. More experience of the climate has since greatly diminished the mortality, and in 1861 there were, on the West Coast, one hundred and ten principal Mission-stations, thirteen thousand scholars in the schools, and nineteen thousand members in the churches.

Bishop Mackenzie had in a short time gained the first step—he had secured the confidence of the people. This step it often takes several years to attain; and we can not but regret that subsequently the Mission of the Universities, when contrasted with others, should appear to so much disadvantage. In fact, though representing all that is brave, and good, and manly in the chief seats of English learning, the Mission, in fleeing from Marambala to an island in the Indian Ocean, acted as St. Augustine would have done had he located himself on one of the Channel Islands when sent to christianize the natives of Central England. This is, we believe, the first case of a Protestant Mission having been abandoned without being driven away.

In January, 1864, the natives all confidently asserted that at next full moon the river would have its great and permanent flood. It had several times risen as much as a foot, but fell again as suddenly. It was curious that their observation coincided exactly with ours, that the flood of inundation happens when the sun comes overhead on his way back to the equator. We mention this more minutely because, from the observation of several years, we believe that in this way the inundation of the Nile is to be explained. On the 19th the Shire suddenly rose several feet, and we started at once; and

stopping only for a short time at Chibisa's to bid adieu to the Ajawa and Makololo, who had been extremely useful to us of late in supplying maize and fresh provisions, we hastened on our way to the ocean. In order to keep steerage way on the Pioneer, we had to go quicker than the stream, and unfortunately carried away her rudder in passing suddenly round a bank. The delay required for the repairs prevented our reaching Morambala till the 2d of February.

The flood-water ran into a marsh some miles above the mountain, and became as black as ink; and when it returned again to the river, emitted so strong an effluvium of sulphureted hydrogen that one could not forget for an instant that the air was most offensive. The natives said this stench did not produce disease. We spent one night in it, and suffered no ill effects, though we fully expected an attack of fever. Next morning every particle of white paint on both ships was so deeply blackened that it could not be cleaned by scrubbing with soap and water. The brass was all turned to a bronze color, and even the iron and ropes had taken a new tint. This is an additional proof that malaria and offensive effluvia are not always companions. We did not suffer more from fever in the mangrove swamps, where we inhaled so much of the heavy, mousey smell that it was distinguishable in the odor of our shirts and flannels, than we did elsewhere.

We tarried in the foul and blackening emanations from the marsh because we had agreed to receive on board about thirty poor orphan boys and girls, and a few helpless widows whom Bishop Mackenzie had attached to his Mission. All who were able to support themselves had been encouraged by the missionaries to do so by cultivating the ground, and they now formed a little free community. But the boys and girls, who were only from seven to twelve years of age, and

*Anal. p. 509.*

©

FIRST FOOTSTEPS

IN

E A S T A F R I C A ;

OR,

AN EXPLORATION OF HARAR.

BY

RICHARD, F. BURTON,

BOMBAY ARMY,

AUTHOR OF "PERSONAL NARRATIVE OF A PILGRIMAGE TO EL-MEDINAH AND MECCAH."

© LONDON:

LONGMAN, BROWN, GREEN, AND LONGMANS.

1856.

formed of lines traced in the sand, and bits of dry wood or camel's earth acting pieces, they spend hour after hour, every looker-on vociferating his opinion, and catching at the men, till apparently the two players are those least interested in the game. Or, to drive off sleep, they sit whistling to their flocks, or they perform upon the Forimo, a reed pipe generally made at Harar, which has a plaintive sound uncommonly pleasing.\* In the evening, the kraal again resounds with lowing and bleating: the camel's milk is all drunk, the cow's and goat's reserved for butter and ghee, which the women prepare; the numbers are once more counted, and the animals are carefully penned up for the night. This simple life is varied by an occasional birth and marriage, dance and foray, disease and murder. Their maladies are few and simple †; death generally comes by the

\* It is used by the northern people, the Abyssinians, Gallas, Adail, Eesa and Gudabirsi; the southern Somal ignore it.

† The most dangerous disease is small-pox, which history traces to Eastern Abyssinia, where it still becomes at times a violent epidemic, sweeping off its thousands. The patient, if a man of note, is placed upon the sand, and fed with rice or millet bread till he recovers or dies. The chicken-pox kills many infants; they are treated by bathing in the fresh blood of a sheep, covered with the skin, and exposed to the sun. Smoke

spear, and the Bedouin is naturally long-lived. I have seen Macrobian hale and strong, preserving

and glare, dirt and flies, cold winds and naked extremities, cause ophthalmia, especially in the hills; this disease rarely blinds any save the citizens, and no remedy is known. Dysentery is cured by rice and sour milk, patients also drink clarified cows' butter; and in bad cases the stomach is cauterized, fire and disease, according to the Somal, never coexisting. Hæmorrhoids, when dry, are reduced by a stick used as a bougie and allowed to remain in loco all night. Sometimes the part affected is cupped with a horn and knife, or a leech performs excision. The diet is camels' or goats' flesh and milk; clarified butter and Bussorah dates—rice and mutton are carefully avoided. For a certain local disease, they use senna or colocynth, anoint the body with sulphur boiled in ghee, and expose it to the sun, or they leave the patient all night in the dew;—abstinence and perspiration generally effect a cure. For the minor form, the afflicted drink the melted fat of a sheep's tail. Consumption is a family complaint, and therefore considered incurable; to use the Somali expression, they address the patient with "Allah, have mercy upon thee!" not with "Allah cure thee!"

There are leeches who have secret simples for curing wounds. Generally the blood is squeezed out, the place is washed with water, the lips are sewn up and a dressing of astringent leaves is applied. They have splints for fractures, and they can reduce dislocations. A medical friend at Aden partially dislocated his knee, which half-a-dozen of the faculty insisted upon treating as a sprain. Of all his tortures none was more severe than that inflicted by my Somali visitors. They would look at him, distinguish the complaint, ask him how long he had been invalided, and hearing the reply—four months—would break into exclamations of wonder. "In our country," they cried,

their powers and faculties in spite of eighty and ninety years.

“when a man falls, two pull his body and two his legs, then they tie sticks round it, give him plenty of camel’s milk, and he is well in a month;” a speech which made friend S. groan in spirit.

Firing and clarified butter are the farrier’s panaceas. Camels are cured by sheep’s head broth, asses by chopping one ear, mules by cutting off the tail, and horses by ghee or a drench of melted fat.

in these Fiumaras we saw frequent traces of the Edler-game, deer and hog. At 1 P.M. our camels and mules were watered at wells in a broad wady called Jannah-Gaban or the Little Garden; its course, I was told, lies northwards through the Harawwah Valley to the Odlah and Waruf, two depressions in the Wayma country near Tajurrah. About half an hour afterwards we arrived at a deserted sheepfold distant six miles from our last station. After unloading we repaired to a neighbouring well, and found the water so hard that it raised lumps like nettle stings in the bather's skin. The only remedy for the evil is an unguent of oil or butter, a precaution which should never be neglected by the African traveller. At first the sensation of grease annoys, after a few days it is forgotten, and at last the "pat of butter" is expected as pleasantly as the pipe or the cup of coffee. It prevents the skin from chaps and sores, obviates the evil effects of heat, cold, and wet, and neutralises the Proteus-like malaria poison. The Somal never fail to anoint themselves when they can afford ghee, and the Bedouin is at the summit of his bliss, when sitting in the blazing sun, or,—heat acts upon these people as upon serpents,—with his back opposite

a roaring fire, he is being smeared, rubbed, and kneaded by a companion.

My guides, fearing lions and hyenas, would pass the night inside a foul sheepfold: I was not without difficulty persuaded to join them. At eight next morning we set out through an uninteresting thorn-bush towards one of those Têtes or isolated hills which form admirable bench-marks in the Somali country. "Koralay," a term corresponding with our Saddle-back, exactly describes its shape: pommel and crupper, in the shape of two huge granite boulders, were all complete, and between them was a depression for a seat. As day advanced the temperature changed from 50° to a maximum of 121°. After marching about five miles, we halted in a broad watercourse called Gallajab, the "Plentiful Water": there we bathed, and dined on an excellent camel which had broken its leg by falling from a bank.

Resuming our march at 5 P.M., we travelled over ascending ground which must be most fertile after rain: formerly it belonged to the Girhi, and the Gudabirsi boasted loudly of their conquest. After an hour's march we reached the base of Koralay, upon whose lower slopes appeared a pair



# Tsetse Eradication: Zanzibar

Tsetse flies (*Glossina* sp.) continue to make livestock production difficult or impossible throughout a very large part of Africa. One of the most promising techniques for eradicating tsetse from certain locations is the environmentally safe Sterile Insect Technique (SIT). In collaboration with the Tanzanian authorities, the Department of Technical Co-operation is sponsoring a programme, with technical support from the Joint FAO/IAEA Division, to eradicate tsetse from Zanzibar using the SIT.

## Scourge of Africa

The 22 species of tsetse fly carry a group of protozoal diseases causing trypanosomiasis. Trypanosomiasis, in one or more of its forms, is found throughout Africa between 15°N and 20°S latitudes and causes widespread loss to livestock due to sickness and death. Human trypanosomiasis, known as 'sleeping sickness' is also endemic in some parts of Africa.

As a result of the continuing presence of tsetse, livestock production (cattle, sheep, goats and horses) is not possible over many thousands of square kilometres. Human habitation may also be a risk and, even where there is settlement, agriculture has to function without the benefits of

livestock – draft power, utilisation of crop by-products and production of manure. The population is also denied nutritious animal products including meat and milk.

## Options for control

For four decades control measures for tsetse depended on spraying insecticides on vegetation favoured as resting sites by tsetse, or clearing such vegetation.

The cost in chemicals and personnel, and concern over widespread

The regions of Africa overshadowed by tsetse.

spraying of pesticides, has led to alternative, more environmentally sensitive control measures.

- Bait and trap. Blue or black attractant cloth screens impregnated with synthetic pyrethrins attract tsetse and contaminate their feet with a lethal dose of insecticide. This technique can reduce tsetse numbers substantially.
- Sterile Insect Technique. Where natural populations of tsetse have been reduced to pre-determined levels the sustained release of sterile male flies can reduce tsetse populations even further and ultimately eradicate a population entirely.

## Tsetse life-cycle

The tsetse is a unique insect. It gives birth every 9–10 days to a full-grown larva, which immediately burrows into the soil and forms a pupa. Thus the egg and larval stages of tsetse are not subject to the usual hazards and losses experienced by other insects.

Female tsetse produce at most nine larvae. Tsetse flies unquestionably have the lowest reproduction potential of any insect, and this fact makes them a good target for SIT.

A single mating provides sufficient sperm for fertilization through the female's 90–100-day lifespan. Since females usually mate only once, if they are mated by a sterile male they will not produce any offspring.

## The Sterile Insect Technique

The SIT is a specific, environmentally friendly technique to control or eradicate tsetse by using gamma radiation. It depends on rearing large numbers of insects in purpose-built 'fly factories', sterilizing the males with carefully controlled doses of gamma radiation, and releasing them in the target area.

The gamma radiation is sufficient to induce sterility but does not reduce the treated flies' ability to fly or to compete with native males or to mate. Mating between the sterile released insects and the native population produces no offspring. When sufficient sterile males are released (usually 15 sterile males to 1 native male) over a long enough period suppression or eradication results.

Other suppression techniques precede the SIT to reduce the native population so that fewer sterile insects are required. In this way the SIT complements other tsetse control techniques.

*SIT may be the key missing link of integrated tsetse and trypanosomiasis management in many parts of Africa*

Udo Feldmann,  
FAO/IAEA



Boxes of sterile tsetse flies being loaded

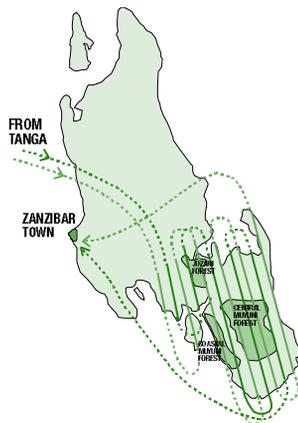
The FAO had an animal disease control project on Zanzibar from 1986–1993 with a tsetse control component using insecticide on cattle and artificial attractant devices. This programme greatly reduced the tsetse on the island but failed to eradicate it. This is why the programme has been followed up with this SIT model project.

# Tsetse Eradication: Zanzibar

## The model project

The model project was initiated on 1 January 1994. Its objective is to eradicate tsetse from Unguja Island, the main island of Zanzibar in the United Republic of Tanzania. Only one species, *G. austeni*, is present on the island and its attack is confined to wild and domesticated animals. Zanzibar is an excellent location for this project for two reasons:

- It is an isolated location and gives an opportunity to conduct research as well as refine techniques on all aspects of SIT.
- The isolation of the island means that the eradication will be enduring and have a lasting impact on livestock development in Zanzibar as trypanosomiasis will no longer be a problem.
- Following eradication, monitoring will continue and land will be freed for better utilisation.



areas are adjusted as required to make best use of the sterile flies.

Captured wild female flies are dissected to find out whether they mated with a fertile or sterile male. Those mated by fertile males should contain a developing larva whereas those mated by sterile males show a degenerating egg, developmental arrest of the larva, abortion or oviduct blockage.

Blood sampling of animals at risk is another way of monitoring the extent of trypanosomiasis transmission and therefore the presence or absence of tsetse flies. The absence of new infection is an indication of tsetse eradication.

## Project progress

The Tsetse and Trypanosomiasis Research Institute (TTRI) at Tanga now has the largest tsetse production system in the world. Two newly refurbished insectaries supported by quality control measures contributed to a steady rise in the female colony from less than 23,000 in December 1991 to more than 400,000 in December 1995. This colony produces more than 50,000 sterile males per week for aerial releases. As a result, the wild fly density in the primary tsetse habitat on Zanzibar, the Jozani Forest, has been reduced to a very low level. Only 0.02 wild males per trap/day were captured in December 1995, compared to 0.4 in March 1995 and 3.5 before initiation of control/eradication activities. During the last quarter of 1995 already 65% of the captured wild females were found to be mated by sterile males. In view of these developments it can be expected that the tsetse population in the Southern part of the island will collapse in 1996 and eradication activities for the entire island are anticipated to be completed in 1997.

## Refining procedures and techniques

In order to integrate the SIT into sub-regional area-wide efforts for tsetse and trypanosomiasis management (see box below), the Joint Division will increase the efficiency of tsetse SIT with special emphasis on:

- tsetse rearing automation
- improved attractants
- tsetse genetics



Newly designed fly rearing cage with partitions, which more than doubles fly breeding capacity

## Aerial release

Aerial release of tsetse from aircraft provides optimal dispersal of sterile insects even in inaccessible areas. The first aerial release of tsetse flies in Zanzibar was in August '94 and there have been releases every week subsequently. Currently flies are released twice a week over the southern part of the island (see map). In 1996, releases will be extended to cover the entire island.

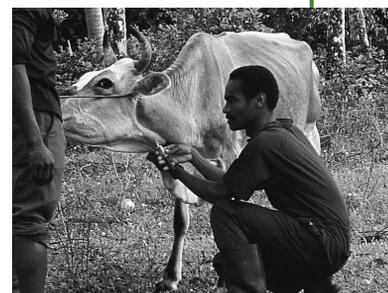
Aerial release is giving a much better distribution pattern of the flies and should enhance their quality and effectiveness in the field.

Insects are multiplied in a fly factory at Tanga on the mainland, where they are

sterilised with gamma radiation and packed into specially designed degradable cardboard containers, which open as they are ejected from the aircraft. Flies disperse widely and evenly.

## Monitoring objectives

Entomological and veterinary monitoring activities are essential to assess project progress. A series of 21 locations with at least 5 'leg panel' sticky traps have been established in the tsetse release area. The traps provide data on the distribution and survival of the released insects and establish the ratio of sterile to fertile insects in all these habitats. Based on this information, numbers released over certain



Blood sampling for presence of tsetse transmitted parasite trypanosoma

## Future prospects

- The SIT has a unique attribute, namely increased efficiency of tsetse control with decreasing population density of flies. After initial suppression of fly populations by conventional techniques, the SIT, with its applicability even in very inaccessible areas and its proven capability to eradicate with highest species specificity could be, for many situations, the key missing ingredient in the current mix of efforts to combat the tsetse fly.
- Several areas of the northern and southern limits of the tsetse belt should also prove suitable for tsetse eradication using the SIT to complement other control techniques. Sites in Senegal, Mali, Ethiopia and Zimbabwe are currently among those under consideration.
- Through the systematic and integrated use of conventional and SIT technologies, it seems possible that progressively larger areas could be cleared of the vector and the disease. Further, these tsetse-free zones could then be maintained at a smaller cost than conducting continuous tsetse control. Indeed, eradication could be achieved from some zones which have naturally occurring or man-made barriers against reinfestation.

Department of Technical Co-operation  
International Atomic Energy Agency, Wagramerstrasse 5, PO Box 100, A-1400 Vienna, Austria  
Telephone (+43 1) 2060 ● Fax (+43 1) 20607  
<http://www.iaea.or.at:80/programs/tc/index.htm>

