

The Coming Plague: Newly Emerging Diseases in a World Out of Balance Study Guide

The Coming Plague: Newly Emerging Diseases in a World Out of Balance by Laurie Garrett

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Plot Summary

The Coming Plague: Newly Emerging Diseases in a World Out of Balance by Laurie Garrett is a very detailed account of the new concerns arising over the possibility of a global plague epidemic. Garrett first discusses a variety of diseases, and then offers several solutions to avoid a global epidemic.

The Coming Plague begins with an introduction that discusses the overall need for global disease tracking and surveillance systems. Next, author Laurie Garrett discusses the outbreak of Bolivian Hemorrhagic Fever in Machupo, as mice were discovered to be the transmitters of the disease. Garrett points out, however, that the infrastructure of the area, decimated by industrialization, played an important role in the increase in the mice population. Next, Garrett examines the "Health Transition," or the push in the 1950s and '60s to eradicate all infectious disease. In Chapter 3, Garrett examines the Margurg virus, yellow fever, and the Brazilian Meningitis epidemic, again stressing the infrastructural issues that helped cause the spread of the diseases. Chapters 4 and 5 discuss the Lassa fever epidemic and the Ebola epidemic of Yambuku. In both cases, again, it is clear that poverty and political instability led to a more rapid spread of the disease.

In Chapter 6, Garrett examines outbreaks of swine flu and Legionnaire's disease in the United States, showing that even industrialized countries were ill prepared for an epidemic. In Chapter 7, Garrett returns to the idea of infrastructural problems as she examines Lassa, Ebola, and their link to the economic and social issues in the world. Chapter 8, highly technical, discusses genetic engineering and the discovery of oncogenes in an effort to explain how these microbes function in human beings. While Chapter 9 focuses on how inner cities help spread disease, Chapter 10 further explores this topic by focusing on STDs and drug use, popular in urban areas. Chapter 11 is Garrett's extensive examination of the origin of HIV, which explains in detail why the disease spread as rapidly as it did. Chapter 12 takes a brief look at TSS, or toxic shock syndrome. Chapter 13 explains how bacteria, viruses, and parasites are becoming drug resistant, and why this is a primary concern for the world health organizations. Chapter 14 discusses the epidemic of social structure, as thirdworldization is looked at in detail, explaining how even modern countries are stepping backward in the fight against disease. In Chapter 15, Garrett examines the hantavirus in the United States, again showing the US is not prepared for epidemics, while Chapter 16 discusses how the changing of the world's climate is leading to increased disease. Finally, in Chapter 17, Garrett examines several possible solutions to the world's health crisis, and offers possible solutions for a world wide health surveillance system.

Preface and Introduction

Preface and Introduction Summary and Analysis

The Coming Plague is a warning of epidemics of worldwide proportion to come. Author Laurie Garrett uses modern diseases to raise the alarm for a global early warning system that could help save the world from infectious disease.

In the Preface, Johnathan Mann of the Harvard School of Public Health discusses how our time in history will be tracked by newly emerging epidemics, such as the human immunodeficiency virus. The vulnerability of the world is increased due to modern travel, huge populations, trading of goods and services, and simply the penetration of modern society into even the most remote areas of the world.

In the Introduction, Laurie Garrett discusses her Uncle Bernard's experiences as a doctor in 1932. She also mentions the miracle of penicillin, but points out many, including herself, began to question if diseases thought gone could return. By the 1980s, AIDS was rampant, and by 1991, the Institute of Medicine convened a panel to discuss the severity of a microbial threat to US citizens. While the Centers for Disease control was on board, there were many critics who believed the emphasis was too narrow, that many emerging diseases were not viral, but bacterial or parasitic. Modernization efforts also increased disease in the poorer countries, as environmental hazards, overcrowding, and poor conditions led to mass epidemics. AIDS, Garrett points out, is a sign of things to come.



Chapter 1: Machupo

Chapter 1: Machupo Summary and Analysis

In Chapter 1, Karl Johnson finds himself deathly ill with Bolivian hemorrhagic fever. In 1962, Johnson was in Panama when his friend, Ron MacKenzie, headed to Bolivia to investigate a disease near Magdalena that local doctors had dubbed the Black Typhus. The patients were sweating, crying, and vomiting blood, and writhing in pain. Returning to Panama after taking blood samples, MacKenzie assured directors, as well as Johnson, that the disease was dangerous. MacKenzie and Johnson both thought the disease was much like a Latin American virus called Junin, which was airborne. Johnson visited Al Wieden, and the two created a portable lab to keep airborne disease from infecting the doctors. MacKenzie and ecologist Merl Kuns arrived in San Joaquin, where the locals believed the virus was born, and they found a highly impoverished village with severe malnutrition, where half the village was sick, and half of those died of the disease. They discovered the disease was a virus, and after a party to celebrate, both Johnson and MacKenzie became ill. They survived, thanks to an army doctor who had treated another viral hemorrhagic fever in Korea who knew to drastically increase fluids. Pat Webb, Johnson's fiancée, also became ill after visiting him in Panama, and as a virologist, she joined them in their research when she was healed. The team worked with every animal and insect possible, and when an assistant died of the disease following a bite and urine from a mouse, the team found the culprit. The mice were rampant in the village, and the mice carried the disease in their urine. The team set up mousetraps all over town, and within four weeks, the virus now called Manchupo virus was eradicated. Johnson and MacKenzie explained that the mice population swelled in the area due to corn production and a lack of native habitat. Once they invaded the village, they urinated on food supplies. Johnson and MacKenzie also realized there were no cats in the village, likely as a result of DDT spraying, even further increasing the mouse population. Johnson and the others, Garrett notes, were among the first of the disease cowboys who would hunt and kill diseases for the next twenty years.



Chapter 2: Health Transition and Chapter 3: Monkey Kidneys and the Ebbing Tides

Chapter 2: Health Transition and Chapter 3: Monkey Kidneys and the Ebbing Tides Summary and Analysis

In Chapter 2, Garrett discusses the transition in health care following the introduction of antibiotics. Discovered in the 1940s, these drugs were growing in potency and use, and with the polio vaccinations of the 50s, the health care profession began discussing the eradication of infectious disease. The Health Transition was developed, which implied that as nations moved out of poverty, pharmaceuticals could be used to eradicate disease. Yet some researchers in the field were beginning to understand RNA and DNA, and the ability of infectious viruses to mutate. Also, some bacteria was becoming antibiotic resistant. The study of parasites and tropical disease was also waning, because in post WWII health care, there was a shift to eradicate microbes from the planet. In one case, smallpox, efforts were highly successful. Spread by touch or respiration, the disease killed millions. A highly effective vaccine was developed, and through inoculation, the virus was eventually defeated. On the other side of the coin, the effort to eradicate malaria actually made the disease more rampant. Chloroquine and quinine were used as treatments, and DDT killed the mosquitoes that carried the disease. Malaria was cured in the US and other powerful nations, but in poorer nations, it lingered. Researchers soon discovered that the use of DDT only served to produce DDT resistant mosquitoes. Although they were close to eradicating the disease, when funding was pulled, the situation turned disastrous. Millions living in poor countries now had little or no immunity to the disease, and with the push for transition from forests to farmland, mosquitoes flourished. Chloroquine resistant malaria began to surface, and by 1975, malaria was claiming over two and a half times the number of people as prior to the push for eradication. The term iatrogenic, or disease created as a result of medical treatment, was born.

In Chapter 3, in 1967, an outbreak of an unknown virus occurred in Marburg, Germany, where three men became ill with nausea, enlarged spleens, bloodshot eyes, and bad tempers. The disease spread quickly to hospital staff. Within eight days, the capillaries were clogged, and patients were vomiting blood. By the third week, skin peeled off, the testes were damaged, and death soon followed. A WHO research team discovered all the original patients handled monkeys from Uganda. The vet in Marburg who autopsied the bodies contracted the disease, as did his wife. The virus was thus dubbed Marburg disease. Soon Jodi Casals, a leader in infectious disease, was called in to test the virus against samples of thousands of viruses in his lab, but he found nothing. The researchers assumed there was a reservoir of the virus, indicating it lived in a host that was unaffected, but they were unable to find it. As a result of the outbreak, WHO standards for the transport of animals changed.



Joe McCormick, in 1974, was in Brazil, overseeing a massive meningitis outbreak, and he knew the bacteria he was fighting was resistant to antibiotics. Type A was the infecting pathogen, but shortly, type C began to also emerge. To try to win against the virus, researchers quickly developed a Type A vaccine, and combined this with Type C. They then vaccinated over three million people in the epidemic area within five days. The results were successful, but no one knew where the disease had come from. The yellow fever epidemic was another example of a bacterial disease run amok. The disease had a high death rate, and was rampant in areas of West Africa. Spread by the *a. aegypti* mosquito, the disease was halted in the United States by covering clean water where mosquitoes could lay eggs, and with a vaccine developed in 1927. To control it, WHO vaccinated as many as possible, and educated even in the remotest of areas about leaving open water sources. They also set about eradicating the *a. aegypti* mosquito. Despite these efforts, five outbreaks occurred in Africa in the 50s. Again, no origin for the epidemics was found.



Chapter 4: Into the Woods

Chapter 4: Into the Woods Summary and Analysis

In Chapter 4, Uwe Brinkmann, Bernhard Mandrella, Adam Cargill, and three nurses were taken to an isolated facility in Germany, after Mandrella became infected with the Lassa virus. Two weeks prior, Mandrella's coworker treated a patient and soon became ill himself. Mandrella treated him and sent blood to the CDC which confirmed the Lassa virus. By that time, Mandrella was infected. When he went in for treatment, he was given blood from nurse Lily Pinneo. Dr. Jeanette Troup and Pinneo worked in Jos five years previously, when an outbreak occurred. Two nurses contracted the disease and died. Pinneo and Troup autopsied them, and one week later, Pinneo contracted the disease. She was flown to New York, and blood and tissue samples were sent to Jordi Casals for identification, but he was unable to identify the virus. Pinneo, however, began to recover. Casals continued to examine the virus, but he too became ill. He was given blood from Pinneo, in the hopes that her blood contained effective antibodies. It worked, and Casals recovered, and proved Lassa was spread through rodents. Back in Jos, Dr. Troup was treating even more Lassa patients, and contracted the disease herself. Casals and Pinneo were sent in, but Troup died before she received Pinneo's blood. The researchers were able to track the outbreak to a Lagos woman. She was hospitalized, and in that and another hospital visited by the woman's mother, sixteen people became ill. Outbreaks also occurred in Liberia. When another outbreak occurred in Panguma, researchers discovered the disease was transmitted by a certain species of small rat that was common in the area. However, they also discovered the virus shifted between locations, indicating Pinneo's antibodies would not always be effective. Kent Campbell began testing Irish nuns who worked as missionaries in Africa for the virus, but he too became ill with Lassa. Following his recovery, he was sent to investigate the Lassa outbreak in Germany, and met Mandrella, who was being cared for by Brinkmann. German and French authorities began to argue over the disease, and the entire group was transported to the holding facility, where they were kept for several months. Once finally released, Mandrella continued to heal, while Cargill went to Sussex and Brinkmann returned to Hamburg. While vacationing, however, Brinkmann's son was killed, and he effectively retired.



Chapter 5: Yambuku

Chapter 5: Yambuku Summary and Analysis

In Chapter 5, a man in Yambuku is treated for a malaria type illness, but dies before he can recover. In a nearby town, several others became ill and died as well. Soon after the funeral, the patient's wife and her mother were deathly ill as were others, and soon the mission was filled with the diseased. Some of the mission nurses became ill and were sent to Zaire, but they died as well, and another outbreak was seen at Kinshasha hospital. A team from the CDC arrived to find nearly all the staff deceased or dying. Yambuku was immediately placed in quarantine, while simultaneously, another outbreak was discovered in Maridi. Paul Bres, an expert of viruses at WHO, was dispatched to the area to gather samples, which were sent in for analysis.

Peter Piot at CDC processed the samples, and tests showed the virus was neither yellow fever, nor anything else they had seen. Piot was sent to Zaire to study the virus, while in the CDC's lab in Atlanta, the virus was worked on in a highly protected lab by Patricia Webb and Fred Murphy. Webb built a team, including Joel Breman, to travel to Yambuku. Some of the ill were sent to Kinshasa, and Joe McCormick was soon dispatched there. Back in Yambuku, the researchers began village to village examinations and found the disease had ravaged the locals, killing over 350. Van der Goen discovered a way to detect antibodies in those who survived the disease, while the group in Yambuku discovered a hospital they believed was responsible for the original outbreak, and McCormick discovered another outbreak in N'zara. McCormick left the area but returned a month later and found the death rate of the disease, now called Ebola, was 90 percent.

In Yambuku, Del Conn contracted the virus from handling tissue samples. Although Conn was supposed to be air lifted out, the Zairian government, always difficult, refused to cooperate. After driving Conn for hours and waiting overnight, he was finally transported. Conn, it was discovered, did not have Ebola, but instead had an entirely new virus. Don Francis in Maridi saw first hand the devastation at the hospital as hundreds lay sick and dying. After stopping ancient funeral rights that involved removing the deceased's insides with bare hands, the CDC team virtually stopped Ebola in Maridi. In N'zara, Francis found that McCormick had detailed the spread of the disease in N'zara. Researchers, however, were unable to determine the source of the disease, and the animal source of Ebola is still a mystery. However, they were able to show that improper hygiene at hospitals and the mission were likely the cause of the spread of Ebola.



Chapter 6: American Bicentennial

Chapter 6: American Bicentennial Summary and Analysis

In Chapter 6, two viruses hit the United States, swine flu and Legionnaire disease. The influenza virus developed mutation strategies that made antibodies nearly impossible and in 1918, the worst flu epidemic in the twentieth century struck, killing millions. Richard Shope discovered that the flu lived harmlessly in pig mucus, and thus, the new virus was dubbed swine flu. In 1976, a similar flu struck in the United States in Texas, although simultaneously with another, less deadly strain. The WHO network had previously set up a series of hundreds of labs in an effort to monitor flu strains, and when the virus was also found in New Jersey, the alarm was raised. The CDC and several top scientists, in response to the fear of an epidemic, began to develop a vaccination, and while most of the nation was supportive, there were voices of dissent. Arguments between the pharmaceutical companies and government began as questions of liability were asked. Worldwide, the health care systems were lukewarm to the idea of a mass immunization procedure, and a vaccination was proving difficult to formulate.

However, in July of 1976, a pneumonia-like epidemic in Philadelphia began to change minds. Legionnaire's disease struck over one hundred people, many of whom were Legionnaires who had stayed at a hotel together during a convention. This turn of events forced through the Swine Flu bills being argued at the time, even though the illness was clearly not influenza. On the swine flu front, however, the CDC was also being berated, since three elderly individuals died following their vaccinations, and when Guillain-Barre syndrome, causing paralysis and occasionally death, began to crop up. Law suits began flooding in, and the government would be leery forever forward of vaccination campaigns. Eventually, two researchers for the CDC discovered the bacteria that caused Legionnaire's disease. CDC director David Sencer was fired over the entire incident, however, and the nation now understood it was not prepared for an epidemic. Scientists noted, however, the bacteria causing Legionnaire's disease had likely existed since the invention of indoor plumbing, but deaths had been attributed to pneumonia. Additionally, they pointed out that the earth, water, and air contained millions of bacteria specimens that could harm humans under the right circumstances.



Chapter 7: N'zara and Chapter 8: Revolution

Chapter 7: N'zara and Chapter 8: Revolution Summary and Analysis

In Chapter 7, Joe McCormick was called to Monrovia during his Lassa research, and met with Soviet scientists who wanted samples of the disease. For years the two sides worked independently, because each feared the other would use Lassa as a biological weapon. McCormick did find that the Lassa virus was embedded in Africa. As McCormick sought to eradicate the disease, he knew that the infrastructure in Africa was a huge obstacle, as poverty, poor hygiene, a lack of supplies, and other problems plagued his efforts. By 1975, even the World Bank saw the need for better health care in these countries, and began offering loans for health related expenditures. In some cases, such as with the building of the Aswan High Dam, modernization projects actually caused increases in disease. Some countries such as Tanzania sought to improve their own infrastructures with little funding, relying instead on education.

Africa was ripe for infrastructure issues as a result of political instability. Following a five month war between Tanzania and Uganda, both countries were ravaged with poverty. Malaria and other diseases were rampant, and as refugees fled, they took their diseases into new countries. In response, WHO created the Declaration of Alma-Ata which sought to unite the world in a push to create healthy living conditions for everyone by 2000, but there were many theories of why diseases occurred in these areas. Back in West Africa, McCormick knew that Lassa would only be eradicated if housing and hygiene in the area could improve. He was called in to Sudan to help solve an Ebola outbreak, and he again saw a huge obstacle in their political upheaval and poor infrastructure. He traveled to N'zara and found many ill individuals, all with Ebola. Over the next week, he compiled a description of the signs and symptoms of Ebola. To combat the disease the locals were given respirators and masks to deal with their dead, which stopped the spread quickly but McCormick noted again that without a proper infrastructure, these infectious diseases would continue.

In Chapter 8, the medical field discovered genetic engineering, and things drastically changed. As the scientists looked, they discovered viruses could do many things, such as use the immune system to their advantage, hibernate, and even cause cancer far more readily than had been thought. They also found genetic signals could move, allowing a cell to resist antibiotics. Retroviruses were also discovered, as were oncogenes. These retroviruses could hide in oncogenes, which were also transferred from mother to child. It was also discovered that cancer cells used the ability to mutate healthy cells into cancer cells to spread. Dr. Robert Gallo and others soon discovered that there were strands of cancer caused by a virus that attacked the T cells of the

immune system and as more were found, cancer research shifted to virology. As researchers studied more cancer causing viruses, they discovered slow viruses.



Chapter 9: Microbe Magnets and Chapter 10: Distant Thunder

Chapter 9: Microbe Magnets and Chapter 10: Distant Thunder Summary and Analysis

Chapter 9 explains that prior to 6000 B.C., large cities were rare, and most of the illness threats were parasitic, or transmitted by insects. Over time, as cities grew, microorganisms had many more opportunities to infect. Pandemics are recorded in historical accounts, and those diseases included smallpox, plague, typhus, leprosy, syphilis, bubonic plague, and, by 1346, the Black Plague had erupted, killing millions. The Great Plague hit London in 1665, killing over one hundred thousand. Leprosy was another killer in Europe, followed quickly by tuberculosis. TB also came to the Americas with the settlers, and by the Civil War, TB was rampant. In the US, the crisis peaked in 1830 and 1896 with the onset of cholera pandemics spread through fetid water systems. Blamed on the filth in the cities, reforms followed in some areas resulting in improved conditions, but in other areas people saw low class morality as the issue. Over time, however, as infrastructures improved, disease rates dropped. Scientists pointed to improved nutrition, improved working conditions, and better hospitals, but a study in Africa related to TB showed the decrease was likely due to improved housing. On the other hand, cities caused an increase in sexually transmitted diseases, since multiple partners were more commonplace. Over time, urbanization was common, with the poorest megacities being the most damaged in terms of infrastructure. They owed more money than they could make, access to health care was unheard of, ecological changes such as dams, increased deforestation, floods, and famine all increased the problems. Parasites soon began infesting the cities, transferred through freshwater sources. An increase in sand flies resulted in an increase in dengue fever, and as DDT and other chemicals were used to eradicate the mosquito, these flies increased. When another, more deadly strain of this disease began to emerge, researchers discovered the virus actually used human's antibodies against a previous strain for its benefit. WWII helped the *A. aegypti* mosquito greatly, which then carried the virus all over the world. Later wars and air travel simply worsened this problem, and dengue became a common illness worldwide.

In Chapter 10, gay rights activists began to protest for equal rights in the 70s, and in 1978, Harvey Milk, a major player, was assassinated. By the late 70's, the gay communities were overtly sexually active, and prostitution flourished. Gonorrhea and syphilis infection rates soared, which increased pelvic inflammatory disease, as did Herpes simplex I and II and almost every other sexually transmitted disease. In 1978, Subhash Hira opened a sexual disease treatment facility in Lusaka, Zambia, and found an alarming rate of disease in the cities. Simultaneously in Michigan, Dr. June Osborn was finding alarming rates among gay men in the US, some of which included highly rare sexual diseases. Don Francis, again working for the CDC, was now tracking the



Hepatitis B virus, and also saw a huge rise in gay men. Another urban issue, drug use, helped spread disease as microbes used shared needles, compromised immune systems, and the various chemicals used to cut the heroin as passageways into the blood. A New York outbreak of malaria in the drug using population even prompted heroin dealers to cut their drug with quinine, a drug for the disease. Endocarditis, bacterial and fungal infections, and TB were spread rapidly, and the drug users' use of antibiotics only served to create drug resistant strains. As drug users then sold their blood for money, these diseases spread rapidly into the blood supply.



Chapter 11: Hatari: Vinidogodogo and Chapter 12: Feminine Hygiene

Chapter 11: Hatari: Vinidogodogo and Chapter 12: Feminine Hygiene Summary and Analysis

In Chapter 11, in a hospital in Lusaka, the doctors were following what they thought was a particularly virulent strain of herpes. In LA, a doctor saw an otherwise healthy gay patient dying of a disease, PCP, known to only affect the already chronically ill, and his T-cell count was virtually zero. PCP was soon also linked with Kaposi's sarcoma in the same diseased men. The CDC quickly created a quiet division to work on the problem, while Harold Jaffe traveled to see San Francisco first hand. Once there, he learned of the diseases of gay men, and the increasing obscure diseases affecting them. Many physicians began to see similar issues, and Peter Piot, still in Africa, recalled seeing a similar case in the 1970s. Piot found three more cases on the books, all from Zaire. The disease was coined GRID, or Gay Related Immunodeficiency Virus. Autopsies of those with the disease began to show more opportunistic diseases, and all men studied showed no helper T cells. It was soon discovered that homosexual men were not the only victims, as women, drug users, heterosexual men, and children were also dying of the disease. However, the CDC continued to struggle for funding. Researchers were able to link a series of gay lovers together with the disease, proving a sexual transmission, but the government did not want to go public, advocating condom use, since the Washington leaders were mostly anti-birth control. Researchers were more confused when the disease hit heterosexual, non drug using Haitian refugees, and again, when hemophiliacs began to die, having received contaminated blood. The disease was renamed AIDS, or Acquired Immune Deficiency Syndrome, when newborn babies were soon found with the disease. Politically, AIDS became a disaster. The hemophiliac organizations sought to find a way to screen the blood supply, but met resistance. Eventually, French and Belgium scientists began to suspect the disease was a virus with African origins that succeeded by simply burning up the immune system. It was the Paris lab which found that AIDS was caused by a retrovirus. Dr. Gallo in the US believed this to be his discovered virus, HTLV-1, but the French disagreed. Over time, studies also showed the disease was spread homosexually, heterosexually, through needles, through blood transfusion, and through birthing. Gallo and the French team continued to compete, and the French finally announced they had discovered LAV, the virus believed to cause AIDS. Eventually, after long fights between the French and Gallo, the virus was found to be identical in both studies and was renamed HIV.

In a small village in Uganda, young women began becoming ill following sex with a traveling salesman. The disease, dubbed "Juliana's disease," began to rise in mortality. Surgeon Clint Nyamurkunge traveled to the capital, only to discover their virus matched the AIDS epidemic. Unfortunately, the AIDS epidemic in Uganda was more far reaching, since the people were already damaged by malnutrition. Uganda had an infrastructure



problem that caused hospitals to reuse needles. It did not take researchers long to find the epidemic in West Africa, where they also found the disease was unrelated to drug use, but was directly related to sexual activity. Project SIDA was created as an international effort to prove AIDS was not just a homosexual disease, and the researchers found there was a latency period in the disease where the patient had the virus, but no symptoms. In 1985, the CDC called the first International AIDS conference, where researchers realized the Africa epidemic was massive. They also discovered the virus was a monkey virus that recently spread to humans. In Uganda, a disease called "slim disease" was found to be identical to AIDS disease, and the African's used this to attempt to show the disease was not African born, since it arose after the US pandemic. By a 1985 meeting in Bangui, nearly everyone was at odds. The virus, by the close of the meeting, had clearly won the battle, having caused political strife throughout the world, killing millions.

In trying to determine the cause later, no single factor could be pinpointed. Signs did, however, point to intravenous drug users in the US having HIV as early as the 1970s. Haitian AIDS was blamed on international gay tourists, blood transfusions, and African immigration. African AIDS was blamed on mother to child transmission, but primarily on the civil wars at the time, and the resulting rapes, famine, and malnutrition that all led to an increase in disease transmission. However, studies did show HIV outbreaks were largely caused by the declining morality of the city life in Africa. In terms of studying the life of the virus, problems were found in comparing monkey AIDS to human AIDS, in that cross contamination was occurring all the time. They also determined that monkey scratches were likely the cause of small scale AIDS infections in Africa, which then spread through various methods. Eventually, all the variations of HIV were cataloged into a computer system, and eight types of the virus emerged. Garrett points out that popular opinion denied the power of the virus, simply because they didn't understand the ecology of the microbe. She also notes that the cultural, political, environmental, and social conditions of the late 70s and early 80s undeniably helped spread HIV to pandemic levels.

In Chapter 12, Toxic Shock Syndrome was a heated debate. In the 60s, tampons were developed, and by the 70s, they were in widespread use. As absorbency increased, so did the toxic materials used to make tampons. Unfortunately, these tampons often absorbed too much, resulting in swelling and sticking to the vaginal walls, causing lacerations. Additionally, the tampons helped give a host for bacterial infections. By 1975, episodes of a particularly dangerous staph infection were seen in several menstruating women. The disease was resistant to antibiotics and it secreted a toxin that entered the bloodstream. Within a short time, the CDC discovered that there were over fifty cases, most of whom were menstruating girls. The CDC continued to find that most of those women wore super absorbent tampons, and Proctor and Gamble voluntarily pulled their highest absorbent brand. The FDA became involved, and began regulating the industry. However, as more cases occurred, researchers began noting all tampons were dangerous, and started to seek the underlying cause of TSS. Patrick Schlievert eventually proved that a streptococcal poison called pyrogenic exotoxin was causing the infection, causing the immune system to attack itself. Tampon manufacturers were forced to label their products, and several strains of the disease

were linked together. Using molecular biology techniques, researchers were able to explain how the strain developed, functioned, and why it was immune to antibiotics.



Chapter 13: Revenge of the Germs

Chapter 13: Revenge of the Germs Summary and Analysis

By 1982, many viruses were resistant to antibiotics, including the staph infection. MRSA (methicillin resistant staphylococcus aureus) became a huge problem world wide, and all staph infections began to increase. Staph continued to adjust to new drugs, and other viruses, such as strep, began to mutate as well as those of pneumonia, ear infection viruses, and rheumatic fever. These diseases were much worse in third world countries due to poor supplies, lack of antibiotics, and resource issues. In addition, various types of *S. pneumoniae* were resistant to almost all forms of antibiotics. Microbes were also found to change in other ways, such as adapting to scavenge DNA instead of absorbing plasmids. In poverty stricken areas, people accidentally encouraged drug resistant bacteria by self medicating, using black market antibiotics. Leprosy, gonorrhea, and bacterial intestinal disease continued to be on the rise, with fewer antibiotics to treat the disease. When *E. faecium* became resistant to the last available antibiotic, vancomycin, this disease became even more deadly. As was shown when giving antibiotics to animals, when a strain was resistant, that resistance spread to both the bacteria in the eggs and in the meat, as was shown with salmonella. When *E. coli* 0157:H7 arrived, transmitted from contaminated meat, the argument against over drugging farm animals was clear, in that the antibiotics fed regularly caused the bacteria, always present, to spread rapidly. Some bacteria began using sporulation to defend against antibiotics, as well, and this worked well against chlorine, which the US was already reducing in water supplies due to cancer scares. Combined, the two resulted in contaminated water supplies which sickened and killed many. Scientists did come to discover that plasmids and transposons were vital to cell transformation. The herpes epidemic was another example of resistance; only in this case, the resistant drugs were antiviral. The number of antibiotics and antiviral drugs for herpes patients increased with AIDS, because the herpes / AIDS cases were often bombarded with viruses. This resulted in even further resistance to both classes of drugs. AIDS itself mutated frequently in response to AZT as well, which was used to treat the disease.

Poor countries were hardest hit by these resistances, since they could not afford new antibiotics, could not afford to make their own, and could not distribute what they could make or purchase. Malaria was another disease that went through resistance. Following the earlier effort to eradicate malaria, the disease altered and became much more deadly and resistant. Soon, children with the disease began requiring nearly complete blood transfusions to survive the disease, and these often ended up with HIV. Because the malaria virus adapted so rapidly, the immune system didn't know to respond, so many died from the disease. Additionally, overuse of quinine caused blackwater fever, another deadly disease. Asian malaria was resistant to all forms of medication. In the early 90s, Cambodia saw a surge in malaria that was resistant to even new

antimalarials, such as mefloquine. Beginning with miners who used black market supplies, the completely resistant strains spread throughout Asia.



Chapter 14: Thirdworldization

Chapter 14: Thirdworldization Summary and Analysis

In Chapter 14, Johnathan Mann of the WHO Global Program on AIDS told a gathering in London of over a thousand representatives that they must share information, and must not isolate or exclude populations due to the disease, or they would risk losing to AIDS. Mann's team advised global education, syringes for all countries, scanning of donated blood, and counseling for the already infected. However, many countries began to deport immigrants with the disease, refuse travel visas, quarantine the diseased for life, and even imprison those believed to be carrying the disease. Although Mann tried to argue against these policies in Asia and other countries, the leaders pointed out they were following the policies of the United States. Prior to the London meeting, WHO noted three social epidemics within the biological one of AIDS, those of denial of the plague, fear of the plague, and finally, repression of those with the plague. As researchers examined their educational efforts, they realized that AIDS, once an epidemic, was nearly impossible to stop. Without social stability, and in areas of poverty, class dispute, famine, prostitution, alcohol and drug use, dense housing, marginalization, and discrimination, AIDS could divide nations. Soon, HIV became a human rights issue. In addition, AIDS soon also became a macroeconomics issue, as poverty stricken nations struggled to afford the necessary health care. When all calculations were done, it was clear Africa and other impoverished countries faced financial ruin, and infection of epic proportion, pushing all attempts for stability in those countries into chaos. Several studies showed lost revenue, while others showed population decline and lowered life expectancies. Still further studies showed a horrific impact on the children of these nations, as their parents died, or they themselves contracted the disease.

AIDS hit India as well. A study by Jim McDermott, a US Representative, showed that the poor areas of India were already seeing an epidemic by 1991. A variety of studies showed the same problems were occurring in India that were occurring in Africa, resulting in the potential for thirdworldization. Additionally, India's strong opium culture only furthered the spread of the disease. Thailand had further issues, in that two separate strains of the disease were erupting, causing two separate epidemics in two populations. Many of the issues were blamed again on the social situation in Thailand as civil war erupted just as AIDS was evolving. In China, the heroin use was encouraging AIDS to spread. In almost all cases, thirdworldization was predicted for Asia, Africa, and Latin America.

When East and West Germany merged in 1989, AIDS struck fiercely. As prostitution and drug use increased, so did the disease. In Russia, a poor health care system, impoverished following the fall of Communism, forced the reuse of syringes. They too experienced drug use and prostitution, increasing the AIDS epidemic. The fall of the Soviet Union was the perfect example of thirdworldization. All forms of disease increased, and death rates soared. Even in America, policy makers realized they were



losing the battle as social poverty deterred any attempts to reform society in a way that would help health care. Homelessness, malnutrition, and other signs of thirdworldization also rose, and a measles epidemic proved the US was in rough shape, and in need of timely vaccinations. For many or the urban poor, however, vaccination wasn't available. Child health in America had sunk to the levels of third world countries. Also, poverty areas in the US saw a rise in tuberculosis as these areas were dens of social issues that led to inadequate immune systems. With the increase of AIDS and its effect on the immune system, TB also increased, both in the US and in third world countries. In addition, as those in poverty refused to take their medications consistently, they helped breed resistant strains of TB and an epidemic began.



Chapter 15: All in Good Haste and Chapter 16: Nature and Homo Sapiens

Chapter 15: All in Good Haste and Chapter 16: Nature and Homo Sapiens Summary and Analysis

In Chapter 15, an outbreak of a respiratory illness that caused death broke out in reservations in New Mexico in 1993. After at least nineteen cases, with twelve deaths, and after failing to find a cause for the disease, epidemiologist Jay Butler began to work on the issue with the CDC. Eventually, the researchers discovered the virus was a hantavirus. First seen in 1951 in the Korean war, the hantavirus was carried by field mice. In the New Mexico area, an increase in vegetation due to moist weather helped explode the rodent population, and researchers eventually found the virus in deer mice. Soon, outbreaks of the disease spread throughout the United States, and other strains of the disease began cropping up. The virus was eventually named Muerto Canyon.

In Chapter 16, Garrett notes that by the twenty first century, it was clear the human population and nature were at war, and nature was winning with disease. Nature alone has balance, but when humans throw off that balance and cause smaller diversity, more microbes emerge. Lyme disease emerged in this way, as natural predators were killed off in New England, giving rise to rodents and small mammals, including a species of mouse that carried the disease, and passed it to ticks, which passed it to humans. The "Rivet Hypothesis" (See Objects/Places) was proposed. Less oxygen due to fewer plants, more carbon dioxide, and destruction of the ozone layer led to a greenhouse effect, changing all weather patterns, and thus, all microbial, bacterial, and parasitic disease. When seals began to die in mass numbers in 1988, scientists discovered they had contracted a new disease. In 1990, dolphins began suffering respiratory illness. As a result of algae, due to massive pollution, the chemistry of the oceans was changing, and disease was rampant. Rita Calwell showed that diseases such as cholera could live inside algae for years, and eventually trigger an outbreak. In Peru, cholera infected the shellfish, thereby infecting humans, and also transferred through unchlorinated water. Shortly an endemic was present in Latin America, including several resistant strains. Researchers realized that with global warming would come higher rates of disease due to increased algae, higher rates of mosquitoes and flies, which carried the diseases, and changes in weather patterns, which would completely alter the ecology. Further increased exposure to UV radiation, dependance on air conditioning, and closed windowed buildings in urban areas all increased the likelihood of disease. Jet travel was a petri dish of disease, as were prisons and hospitals. Many diseases were found to be caused by transfer from animal to human, and often, these were particularly vicious infections, and many were found to be airborne. At the same time, doctors were experimenting with transplanting baboon organs to humans, and the infectious disease experts were furious, realizing that these diseases could quickly kill off mankind. Any slacking in the killing of insect populations could create epidemics, as the insects



continued to carry disease. Researchers also soon discovered RNA and DNA based diseases mutated often, perfecting their abilities to infect human hosts. While some mutations were random, many scientists showed that some were directed. Virulence factors turned off and on, as the microbes required, and it was even discovered that microbes became more virulent as they spread among those of the same population, or the same family. Overall, human behaviors, environmental changes, and the actions of the microbes themselves helped further global epidemics.



Chapter 17: Searching for Solutions

Chapter 17: Searching for Solutions Summary and Analysis

During the civil war in Rwanda, HIV spread rapidly among the refugees, as they were forced into crowded refugee tents. Five years earlier, a disease preparedness meeting involving 800 of the top disease specialists had shown the potential for such an outbreak among refugees. A scenario played out showed a total lack of supplies, knowledge, and readiness across the globe. In 1989, the spread of a thankfully harmless virus from monkeys in the Philippines across the globe showed the dangerous potential, and the unpreparedness of the health care system. Within one week, hundreds across four continents were infected. The disease outbreak did cause a change in animal handling legislation to avoid a real transmission of disease. Scientists and researchers also began looking for a large scale monitoring and surveillance system to catch outbreaks before they became endemics. Arguments over the type of network, the expansiveness, and who would head the network arose, and an exhaustive examination of the US health care reporting system showed severe weaknesses at every level. Worldwide efforts had similar weaknesses, and areas of political unrest were nearly impossible to reach.

To combat the coming plagues, Garrett suggests a focus on behavioral changes, such as sexual education and more effort to monitor prostitutes and sex houses, to prevent the spread of STDs and viruses such as AIDS. Additionally, focusing on increasing medical supplies to impoverished areas to avoid reuse of needles, improving vaccinations in those same areas, and providing sterile needles for drug users are also important. Clean air conditioning and sterile supplies are equally vital. Garrett also suggests studies to determine which factors of urban life, and which of rural life, contribute to the spread of disease. SatelLife, a vast interconnected network of physicians and medical staff all over the world, now allows physicians to be in contact with over fifteen nations, alerting everyone if there is a question or crisis. Additionally, an increase in genetic databases helps to quickly identify viral species for rapid treatment. But as funding decreases, so does the ability to maintain such systems, and even vaccinations are losing ground, because there is no profit for pharmaceutical companies. Garrett promotes the idea of a global village and warns of a worldwide plague without it.

In the Afterword, Garrett explains that MacKenzie and Karl Johnson revisited San Joaquin thirty years after the outbreak they investigated of Bolivian hemorrhagic fever. They were greeted with parades, medals, and the knowledge that in the area, they were known as the heroes who saved the country from the plague.



Characters

Karl Johnson

Karl Johnson is a US based virologist who proved to be critical in the Bolivian Hemorrhagic Fever outbreak in San Joaquin. Having been enlisted to help by friend and colleague Ron MacKenzie, Johnson helped to create the protective suits that the researchers wore to help protect them in the field from the mass of airborne disease in the tropics. Additionally, Johnson and his coworkers helped to isolate the cause of the virus, stopping it from killing everyone in the area. Johnson, however, did contract the disease, and was only saved as a result of an army doctor who had treated another viral hemorrhagic fever in Korea who knew to drastically increase fluids. Without his expertise, the Bolivian Hemorrhagic Fever may have taken over the area, causing even more of an epidemic. When Johnson returned to the area thirty years later, in fact, the people of the city held banquets and parades in his honor, because he had become a legend in their minds as a savior of the people. Johnson continued to fight disease throughout his career, and became known as one of the pioneering virologists of his time. He stressed the need for calm reactions to disease, and a need for a diverse range of expertise to help with an epidemic.

Ron MacKenzie

Ron MacKenzie had traveled to Bolivia to do nutritional studies when he was asked to look into a recent epidemic in the small city of San Joaquin. MacKenzie was a pediatrician and epidemiologist, so he was qualified to look at the patients, although he was less than qualified to discover the underlying disease. His work did show, however, a severely dangerous disease, and he was soon determined to solve the puzzle. He enlisted the help of many well known virologists and other scientists, and went to work in San Joaquin for months, trying to determine the cause and solution for the disease. After contracting the disease himself and surviving, MacKenzie and the others did discover the spread of the disease was due to a mouse population. By eradicating the mice, the team solved the issue. MacKenzie, going back years later, was shocked to discover that the town remembered him as well as his staff, and had lifted them to hero status as a result of their efforts in helping to save the population from their plague.

Without MacKenzie's quick thinking and determination, it is likely the epidemic of Bolivian hemorrhagic fever would have continued, killing thousands. He is hailed as one of the original disease cowboys who, in the face of adversity, continued to forge ahead, solving some of the most intricate issues of his time.

Jordi Casals

Jordi Casals is a Barcelona-born scientist who had the largest collection of insect carried and hemorrhagic viruses in the world. These highly volatile samples were stored



in secure areas in deep freezers at the Yale arbovirus lab. When scientists in the field needed to see if a virus with which they were working was a new one, or one that had previously existed, samples were generally sent to Casals for analysis. In the case of the Marburg virus, Casals was unable to find a match, and he was again stumped when they sent him samples of Lassa. However, Casals also went into the field with Lassa to help determine the source of Joe McCormick infection. Without his organization of the known viruses of the world, the scientific organizations may have been unable to identify outbreaks of disease, resulting in epidemics. Casals was also vital in his role in the Lassa epidemic, when he contracted the disease and then agreed to travel into the hot zones, donating his antibodies.

Joe McCormick

Joe McCormick originally worked with meningitis epidemic in Sao Paulo in 1974. McCormick, at the time on loan from the CDC Special Pathogens and Bacteria Branch to the Pan American Health Organization, was new, but had experience. He had worked in the past in Zaire, where he quickly went from teaching to becoming a physician. Now in Brazil, he understood quickly the disease was a blend between Type A and Type C that had never been seen. When a vaccine that proved effective was developed, McCormick and other doctors helped to save the area from a pandemic. By 1976, McCormick was sent to Sierra Leone to investigate the Lassa virus, but just as he arrived, he was sent to Kinshasa, where he helped with the Ebola investigation. He was sent north and discovered an outbreak of the virus in N'zara. For three weeks, he slept in his Land Rover and worked on the virus during the day, interviewing survivors and families. It was McCormick who realized there were two completely isolated epidemics of Ebola in the area. Returning to work on Lassa, McCormick was also instrumental in halting that virus.

Uwe Brinkmann

In the summer of 1974, Uwe Brinkmann was being taken into holding by German soldiers, after combating an epidemic of Lassa fever. Brinkmann's patient, Bernhard Mandrella, was severely ill, and physician scientist Brinkmann knew he was near death. Brinkmann came from a part English family, and had never felt comfortable among the German's who were also his people. After his work with famine relief efforts, he was hailed by Germans as a communist, attempting to create communes in Ethiopia. When Brinkmann was finally released, he was ridiculed and tormented, but did continue his work. He studied river blindness in West Africa, and also other diseases in Central America, the Congo, and Mali.

Lily Pinneo

Lily Pinneo worked as a nurse with Jeanette Troup on Lassa victims. During an autopsy, Pinneo became aware of the devastation of the disease within the body. Within a week,



she too was ill with the disease. Given massive doses of antibiotics and other treatments, Pinneo seemed to be waning but eventually she survived. Within her blood, there were precious antibodies against the disease. When another outbreak occurred, and Pinneo's blood was given to the victims, the antibodies helped to save their lives. Pinneo's blood has been used to save many lives, and she believed it was God's purpose for her to live.

Paul Bres

Paul Bres, an expert in the virus branch of WHO at Geneva, worked with the Ebola epidemic in Sudan. Despite political upheaval in the area, Bres pushed for samples of disease in order to isolate the cause. Unable to find qualified, willing doctors to go to the area, Bres himself, along with several others, agreed to go, in an effort to investigate the mysterious illness. Once the team arrived, they realized that the burial procedures of the natives, which included the pulling out of the intestines with bare hands, was causing the spread of the disease. To help, Bres and others agreed to take the bodies from the locals, and complete the same burial rites, with protection. Through his efforts, along with others, the Lassa epidemic in Maridi was stopped.

Peter Piot

Peter Piot first handled the Ebola virus unknowingly when he examined samples sent from Zaire. After completing a series of tests on the viruses, and he eventually found the virus resembled small question marks. After being told to stop working on the project, Piot offered to go to the zone instead, allowing him to work on the issue live. Once he arrived, Piot realized he was woefully unprepared for the situation, as he and his colleagues lived daily with death from Ebola. When Piot refused to fly with drunk pilots to meet with US Embassy officials, he was spared, since the helicopter crashed on the way. He was accused by the government, however, of sabotaging the craft, and was sent to retrieve the bodies. Piot's experience showed the massive problems of the government of Zaire at the time, which contributed to the spread of the disease.

Johnathan Mann

Johnathan Mann was originally approached to work on AIDS in Africa in 1983. As an epidemiologist and bubonic plague expert at that time, Mann had been very qualified to help with the issue. He and his family moved to Kinshasa, but he made rapid enemies since his policy of not speaking to anyone without government permission tended to leave him quiet. Mann proved to be pivotal in AIDS research, not only in terms of the disease, but in pointing out the human rights issues surrounding it. As founder of the Global AIDS Policy Coalition, Mann sought to analyze the scope of the AIDS pandemic.

Don Francis

Don Francis was working as a pediatric physician in Los Angeles in 1972 when he signed up to work with the CDC on smallpox. He went from an epidemic in Belgrade to Sudan, and from there to India and Bangladesh. Years later, Francis would be vital to the AIDS research projects in his work with the CDC and WHO, spearheading campaigns to eradicate the disease. He also played an instrumental role in research that helped follow the hepatitis virus among gay populations in San Francisco.



Objects/Places

San Joaquin

San Joaquin is the small city where Bolivian Hemorrhagic Fever broke out, where researchers discovered the virus was spread by mouse urine.

Health Transition

The Health Transition was the concept that as nations moved out of poverty and basic needs were met, scientists could use pharmaceutical and chemical tools to wipe out parasites, bacteria, and viruses.

Iatrogenic

Iatrogenic is defined as the concept that some diseases are created as a result of medical treatment.

Genetic engineering

Genetic engineering is the ability to manipulate the genetic material of plants, animals, and microbes.

Oncogenes

Oncogenes are DNA sites of special viral vulnerability.

T-Cells

T-Cells are the disease fighting white blood cells that help the immune system fight off infection.

Slow virus

A slow virus is a virus that has no signs or symptoms for years, making it difficult to detect early enough to stop transmission.



PID

PID, or pelvic inflammatory disease, is a disease that affects the ovaries and fallopian tubes, causing inflammation and pain, and is often associated with sexually transmitted diseases.

GRID / AIDS

GRID, or Gay Related Immune Deficiency, or Acquired Immune Deficiency Syndrome, is an autoimmune disease spread through sex, blood, or other bodily fluids.

Smallpox

Smallpox is a disease that is lethal, but against which medical professionals have created a highly effective vaccine.

Malaria

Malaria is a disease that kills thousands each year, primarily in areas of high poverty and political and civil upheaval.

WHO

WHO, or the World Health Organization, is a branch of the United Nations that is responsible for the health activity of the nations of the world.

CDC

The CDC, or Centers for Disease Control, is a US based organization responsible for the monitoring and research of health issues in the United States, and within the World Health Organization.

Thirdworldization

Thirdworldization is the backwards slide of developed or developing nations as a result of poverty, political or structural instability, and other social issues. Often, thirdworldization is furthered by disease.

Rivet Hypothesis

Rivet Hypothesis is the concept that the ecosphere is like an airplane held together with species, or rivets. As each species, or rivet, is removed, the airplane, or ecosystem, becomes less stable. Eventually, the ecosystem, or plane, falls apart.



Themes

Social and Political Causes for Disease

One of the primary themes conveyed within the novel is the idea that although bacteria, viruses, and parasites are the cause of disease, there are social and political aspects that cause epidemics. Issues such as prostitution and drug use tend to help spread blood born disease, while poor housing, improper medical care, and a lack of access to drugs cause even more issues. In third world countries, the reuse of needles causes issues, as does the lack of sterile working conditions. Political upheaval causes economic issues, resulting in famine and malnutrition, making opportunist diseases even more prevalent. Changes in local ecology, such as the loss of forestation for agriculture, causes a loss of local natural habitat, which can increase all forms of disease. Even modernization causes issues, as the problems of urban life are introduced to native populations. Also from a political standpoint, those diseases that seem to spread as a result of "improper behavior" such as AIDS, often see little funding, even in the face of massive outbreaks. Also, diseases in remote areas are seen as less concerning, since they do not amass victims like those in urban areas. As the book shows, however, even these small outbreaks can quickly become worldwide epidemics. In such situations, while the microbes and diseases exist, these other situations are the true cause of epidemics.

Understanding of Changing World Conditions

Another theme in the novel is the grasping of an understanding of the ecological issues surrounding disease. An increase in global warming changes the ecology of the world, resulting in floods, and changing weather patterns. In turn, these can lead to an increase in mosquito populations, which carry a variety of diseases. Pollution causes an increase in toxins in the water, which increase algae. As algae can carry some diseases, this helps in the spread of these diseases to new areas. Changing vegetation patterns can also change the species in any given area, possibly giving rise to a number of new, animal borne diseases. Increases in UV rays due to holes in the ozone later can lead to suppressed immune system responses, furthering the opportunistic diseases. An increase in dependance on air conditioning can lead to an increase in the transmission of airborne illnesses. Increased flight use, and the recirculation of air on aircraft, can lead to the spreading of disease to a number of passengers from all over the world. Urban buildings without windows increase these types of diseases, as well, and air pollution leaves the lungs susceptible to disease. Even such techniques as increases in organ transplants can lead to increased disease, and Garrett warns that to combat these issues, a multifaceted approach is necessary.



Global Surveillance System / Worldwide Effort Needed

One of the other themes mentioned in Garrett's book is the need for a Global Surveillance System for disease. As Garrett points out, the need for such a system has proven itself again and again. From the flu epidemic to AIDS, a system that would have allowed even the remote areas of Africa to transmit their information on recent illness may have stemmed any global epidemic. Without such systems in place, remote areas have little access to recent medical advice, and little access to necessary treatment. Needles are scarce, as are vaccinations that would save millions of lives. Even such protection as mosquito netting, so basic in many areas, could lead to a decisive end to a pending endemic. Without a surveillance system, however, these remote areas do not know the diseases they are facing, and even if they do, do not have the tools to combat them. Even in areas in the US, a network of medical, scientific, and research faculty is needed in order to convey disease information in a timely manner that can help solve world disease. The beginnings of systems such as SatelLife, a network of satellite provided communications across fifteen countries, is a vital step toward providing this communication. Without this global village perspective, Garrett points out, all of humanity could be at risk.



Style

Perspective

The book is presented primarily in third person perspective, since it is a series of stories about the fight against various viruses, bacterial infections, and parasites around the world. There are tens of stories told in the book, and each tale includes both third person explanations of the disease being discussed and the situation at hand, as well as first person accounts of the individuals' own experiences. These third person accounts help the read to understand the political, economical, and social elements of the disease, without a first person bias. At the same time, the first person accounts help to explain the realities of the situations, as seen by the doctors and scientists who studied the diseases. Both elements are crucial to Garrett's primary focus, that of giving a multiple level understanding of ecology and microbiology in a way that helps readers fully understand all the elements at work in the scare of a worldwide epidemic. Without both perspectives, there would be either a biased account, or no information of what the personal side of disease really is. This blended perspective helps to show all sides of the story, from the victim to government to scientific to medical. While it is true there is some bias, in that the statistics given all help to prove Garrett's point that a surveillance system is needed, the biases are still in line with the telling of the story of disease in the world today.

Tone

The tone of the novel is highly varied, since Garrett does try to show all sides of the story of disease in the world. At times, the individual stories being told are combative, in that there were many professionals along the way who combated government and social policies in place that helped give rise to a variety of different diseases. These pioneers in the medical profession sought to change and break the rules in an effort to help save the world from epidemics. Additionally, at times the stories in the book can be accusatory, as each side seeks to lay blame on another party. From one researcher to another, from one government to another, the eradication of disease was as much political and social as it was medical. Because of this, any failure led to finger pointing and judgements, which only helped to further complicate the already difficult situation. Still, at other times, the tone of the book is highly technical, as the author simply gives statistics and medical concepts. These areas are necessary to really show the research being done in an area, but also help to convey a scientific sense to the book.

Structure

The structure of the novel is highly organized, with a Preface that serves to introduce the concepts of the book, and an Introduction, where Garrett lays out her plan for the novel. Each chapter is then numbered and named according to the particular issue



being addressed within that chapter. This helps to really be able to focus on a specific epidemic at each phase of the book. There are seventeen chapters in total, covering topics from diseases to transitioning health issues to revolutions to thirdworldization. There is also an Afterword, discussing some of the characters mentioned at the beginning of the book. Finally, there is a lengthy notes section, with information used throughout the book, acknowledgements, an index, and a maps section. The book is lengthy at 750 pages total. The book is also highly technical, because there are many chapters that focus on issues that require at least a basic knowledge of medical terminology. While some of these terms are explained, there are many that are not, forcing the reader to locate definitions. Also, the novel is highly descriptive in some of the disease sections, making it a graphic read. Although interesting, this does add to the complexity of the book, and does lend to difficult reading, at times. On the whole, however, the book is highly informative as it presents a broad view of the changes occurring in the world that lead to disease.



Quotes

"At a time when mothers of the world's wealthiest nations arranged to have their children 'immunized' by deliberately exposing the youngsters to measles, mumps, even chicken pox, these diseases were forcing parents in some of the world's poorest nations to find ways to cope with the expected deaths of more than half their children before the age of ten."

Introduction, pg. 8

"Every problem seemed conquerable in the decade following World War II; humanity could reach the moon, bombs too terrifying to ever be used could create a balance of terror that would prevent all further worldwide wars. American and European agriculturalists could 'green' the poor nations of the world and eliminate starvation, civil rights legislation could erase the scars of slavery and bring racial justice, democracy could shine in startling contrast to communism and produce a beacon to which the nations of the world would quickly flock..."

Chapter 2, pg. 31

"It was considered too obvious to mention that animal caretakers every step of the way should wear appropriate gloves and protective garb, take steps to ensure that they are not bitten by the animals, and remain ever vigilant against allowing animal fluids or tissues to come in contact with any skin cuts or their mouths. Regrettably, these instructions would be violated repeatedly in years to come; sometimes with tragic consequences."

Chapter 3, pg. 58

"The source of both horribly lethal viruses - Marburg and Ebola - remains a complete mystery."

Chapter 5, pg. 148

"Among the factors said by prominent American physicians to be responsible for influenza in 1918 were nakedness, fish contaminated by Germans, dirt, dust, unclean pajamas, Chinese people, open windows, closed windows, old books...and 'some cosmic influence.'"

Chapter 6, pg. 158

"As was the case with Lassa, poorly run hospitals operating under conditions of extreme deprivation were the amplifiers of microbial invasions. What might have otherwise been individual illness, limited to one or two cases of Ebola, was magnified in a hospital setting in which unsterilized equipment and needles were used repeatedly on numerous patients."

Chapter 7, pg. 220

"The nights of Friday, June 27, 1969 and Saturday, June 28, 1969, will go down in history as the first time that thousands of homosexual men and women went out into the streets to protest the intolerable situation which has existed in New York City for many



years - namely the Mafia control of this city's gay bars in collusion with certain elements of the Police Department of the city of New York..."

Chapter 10, pg. 261

"Though evidence for HIV as the cause of AIDS, the bona fide existence of a pandemic of infectious immunodeficiency, its evolutionary link to a family of monkey viruses, and its recent large-scale outbreak on earth was overwhelming, collective denial coupled with historically valid feelings of group persecution would continue to support acceptance of dark, conspiratorial theories."

Chapter 11, pg. 383

"All in all, it was a clever design that caught on immediately, despite a widespread hue and cry about the immorality of such a device. It was said that tampon insertion stimulated the female excitatory nerves, prompting wanton masturbation. It was also asserted that tampons would puncture the hymen, thus destroying a girl's premarital proof of virginity."

Chapter 12, pg. 391

"The foci of attack were homosexuals, 'immoral lifestyles,' drug users, and sinners - the purported purveyors of viral ruin."

Chapter 14, pg 469

"But it was hard to imagine what kind of stability - or, more likely, instability - the world would then face, particularly given that the bulk of that human population growth would be in the poorest nations on earth."

Chapter 16, pg. 551

"While the human race battles itself, fighting over ever more crowded turf and scarcer resources, the advantage moves to the microbes' court. They are our predators and they will be victorious if we, Homo Sapiens, do not learn how to live in a rational global village that affords the microbes few opportunities. It's either that, or we brace ourselves for the coming plague."

Chapter 17, pg. 620.



Topics for Discussion

Do you think Garrett is right in her assumptions that the world is headed for a global epidemic? Why or why not? If so, what are the factors that are increasing the possibility for this epidemic? If not, what prevention strategies are in place to keep it from happening?

Describe the dual scenarios of smallpox and malaria eradication. What did the world do to try to eradicate smallpox? Was it successful? What did the world do to try to eradicate malaria? Was this successful? Why or why not? Be sure to explain in detail each situation, and why it did or did not work. How could any failures have been avoided, and why do you think those failures were allowed to happen?

Explain the social issues that lead to the spread of disease in urban areas. Be sure to discuss such issues as housing, sexual relations, poverty, malnutrition, drug use, homelessness, access to health care, and other social issues. How do these lead to an increase in communicable disease?

Discuss the AIDS epidemic. Where did it begin? How was it transmitted? Why was it mostly ignored in the beginning? How many countries were affected? What were the prognoses for the patients? Why was there so much political and social dissidence about the disease? Do you think the AIDS epidemic in Africa or the United States could have been avoided? How? What should have occurred that did not? Do you think AIDS is now under control? Why or why not?

Discuss how genetic engineering and the discover of oncogenes helped the scientific world to understand microbes. What are oncogenes? What is mutation? How does mutation help a virus survive, or become resistant to antibiotics? How does this lead to increased disease?

Discuss how and why changes in ecology lead to an increase in disease. Be sure to include such topics as global warming, UV rays, famine, flood, and algae growth in your answer, and explain how all of these can lead to increases in bacteria, virus, and parasite activity. What is causing these changes to ecology? Can we stop this from occurring? How? What are the social and political barriers to these changes?

What is meant by thirdworldization? How does this process begin? What are the dangers of thirdworldization? Who is at risk for this? How is the United States affected? What disease is proof that thirdworldization is already occurring? How can countries help stop thirdworldization? What is needed and why are these things so difficult to obtain for some countries, such as those in the former Soviet Union?

What solutions does Garrett propose that might help stem the tide of a global epidemic? Which solutions do you feel are viable? Do you think spending money on a global solution is a good idea? Why or why not? What are the pros for such a move? The cons?