

CHAPTER 34

PUBLIC HEALTH AND COMMUNITY SANITATION

34. 1. INTRODUCTION

In a text on island ecology and resource management, a chapter focusing on public health and community sanitation may seem out of place. But it is not. The environment has profound effects on the health of individuals and of societies at large. In turn, the health of our community may change the ways we deal with our environment, for better or for worse.

If we were to look down from space at *Spaceship Earth* we would see a whole world all at once. The air surrounds the globe, whether that air is clear or polluted. The oceans all inter-connect. Every place is connected.

A full discussion of the entire topic of public health and community sanitation would fill a textbook and then some, for those studying *Public Health* as a major discipline. Instead we will concentrate on some examples important to our islands.

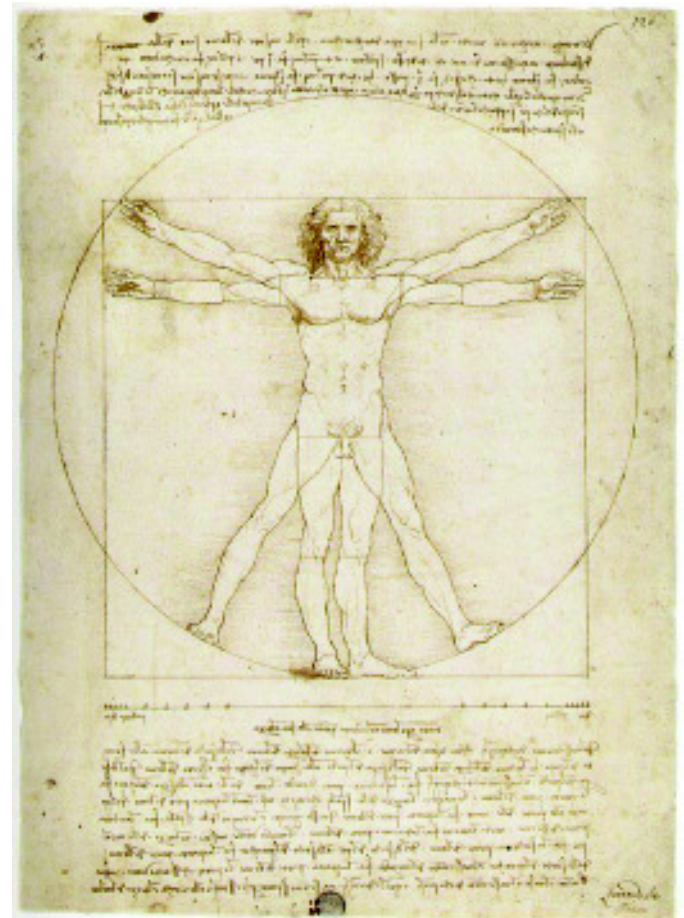
34. 2. OUR ENVIRONMENTS

34. 2. 1. Introduction

Our environment is actually our *environments*. Not one, but many. We live within our physical environment — the earth, the water, the air we breathe. This is the non-living part of our world. We also are surrounded by a living environment, our biological environment. The trees, grass, even the insects and microscopic organisms make up a sea of life which surrounds us.

We also share our social environment with our family and friends. We have certain *customs and beliefs* which can profoundly affect our behavior, and which, in turn, will affect our world. Our economic environment, within this social environment, will determine just what *we can afford to do*. Additionally, our emotional environment may determine *how well we do it*.

All of these environments will affect our health. **Health** is not simply the absence of disease. Health is more than not feeling sick; health is feeling well and being well. Amongst other things, health is being physically fit, having good nutrition, being emotionally secure. Health is many things.



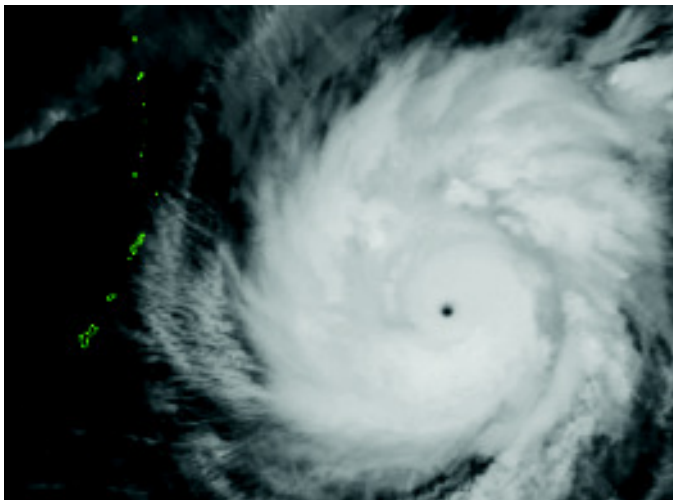
Health is many things, including being physically fit, having good nutrition, and being emotionally secure.



During prolonged droughts, plants, animals, and people may die.



Excessive flooding may contaminate water supplies, cause crop failure and create ideal breeding grounds for mosquitoes.



Large storms can destroy homes and kill the human populations of entire regions.

34. 2. 2. Physical Environment

In ancient times, it was not well known what caused disease. **Germ**s were not known, and many ideas which today seem self-evident, like the importance of hand washing to prevent the spread of illness, were not then appreciated.

Our physical world includes many parts, all of which can directly or indirectly affect our health. Our environment is often conveniently divided into: 1) the *nonliving, or physical factors*, such as moisture, temperature, soil and water; and 2) the *living, or biological factors*. These include organisms that directly effect us, including disease-causing organisms, parasites, and predators.

We depend upon our environment for clean water, food, raw materials, and most of our other needs. Our daily interactions with plants and animals can often involve potential impacts upon our health.

34. 2. 3. Public Health and the Weather

One of the nonliving elements of our physical environment is our climate and weather patterns. The effect of weather on health is most obvious when we consider the extremes — for example drought and flooding. Here in the CNMI, the El Niño events within the massive Pacific Ocean have produced both.

During prolonged droughts, plants, animals, and people may die. Crops fail, wells run dry. Safe water may no longer be available and people begin to drink from polluted streams and wells. Famine and starvation lay whole populations open to sickness and death. A starving body lacks the normal resistance to infection. The effects of most illnesses are much more severe in weak or malnourished individuals.

Excessive flooding may cause exactly the same problems. Water supplies become contaminated, crops are ruined. Massive pools of stagnant water provide ideal breeding grounds for mosquitoes, and these in turn can spread much disease.

Other weather patterns can also affect our health. Large storms can destroy homes and kill the human populations of entire regions. Strong winds flatten crops and homes. Lightning can ignite massive fires. All of these climate and weather elements can and will continue to affect the health of our island populations.

34. 3. POLLUTION

Our physical environment may also become polluted and unhealthy. Toxic materials enter the environment by a number of routes, including releases of liquid, gaseous, or solid toxic wastes (either intentionally or unintentionally), and accidental spills.

Toxins may have short term effects, or they may cause serious longer term health problems. Immediate effects may include illness, serious incidents of toxic poisoning, or even death.

Long term effects may be demonstrated by **carcinogens** and **mutagens**. Carcinogens may cause cancer; mutagens can cause long-term genetic defects. See more on these below.

34. 3. 1. Air Pollution

In many large cities, air pollution has become a way of life. Radios and newspapers announce the day's *Pollution Index*. Persons with allergies or breathing problems, such as asthma, are advised to stay indoors during *high pollution* days.

Even rural areas experience air pollution. The eruption of large volcanoes can send massive clouds of deadly smoke into the atmosphere. The effects of this can be felt over the whole surface of the earth. Some believe that huge volcanoes brought forth the ice age by cooling the earth with their dark clouds. The massive forest fires in Indonesia in 1998 produced so much smoke that the air was visibly polluted thousands of miles away.

Air pollution can also cause disease. Many kinds of cancer have been linked to poisons released into the air. Some of these, like lead, may be controlled by the use of unleaded gasoline for cars.

Air pollution can also change the environment. The example above of global cooling caused by volcanic clouds is one effect. The use of **Chlorinated Fluorocarbons (CFC's)** is another. CFC's are chemicals formerly used in aerosols and currently in many industrial processes. These chemicals are released into the air where they react with other chemicals in the air. Scientists have discovered that these chemicals are depleting the amount of *ozone* in the earth's atmosphere.

Ozone is important in the atmosphere. It absorbs much of the harmful radiation from the sun before it reaches the earth. With less ozone, more ultraviolet radiation reaches the earth's surface. This may result in more skin cancers or other adverse health effects.

Another atmospheric concern, *global warming from the greenhouse effect*, may raise the temperature of the surface of the earth and the oceans. In turn, just a few degrees of global warming can melt huge amounts of ice from the polar icecaps and raise the surface of the oceans. This would lead to flooding and to great changes in coastlines the world over, including our own islands.

The greatest effect would be on small atoll islands. For example consider the case of Majuro, the capitol of our neighboring Micronesian Republic of the Marshall Islands. Its highest point is a bridge which spans only seven feet above sea level. Little effects today may lead to bigger and bigger changes tomorrow.

34. 3. 2. Smoking, Tobacco, and You

"We gave the Indians smallpox, and they gave us tobacco. We used to think they got the worst end of the bargain. Now it looks like a toss-up." Hubert Humphrey III.

[Author's personal notes herein included]. I didn't want to write a column on smoking or tobacco. Everyone else is doing it, and probably better. Why me? What can I add to all that noise? Smokers vs. non-smokers; a lot of talking, and not much listening.

What can I add? Maybe just the facts. As a pediatrician, and as a parent, I certainly have my personal and professional bias. I don't smoke, and I don't want my kids or patients to smoke either. So



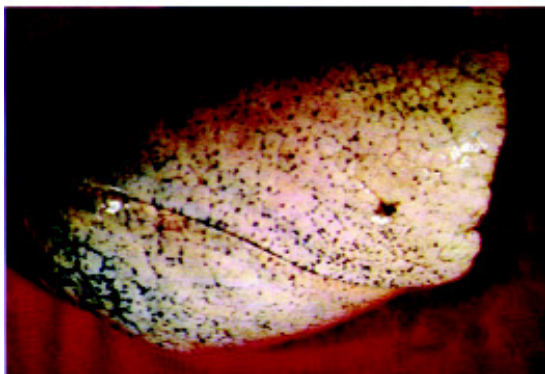
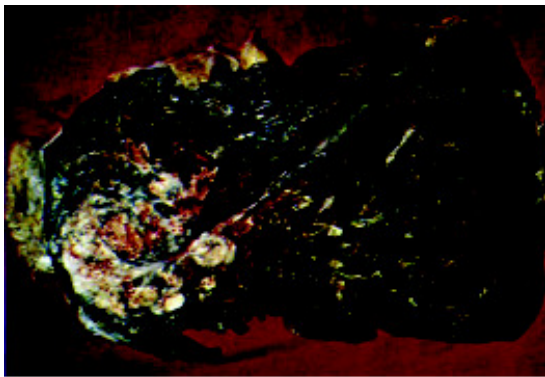
Many kinds of cancer have been linked to poisons released into the air.



"We gave the Indians smallpox, and they gave us tobacco. We used to think they got the worst end of the bargain. Now it looks like a toss-up." Hubert Humphrey III.



The companies want you to think smoking makes you beautiful, or athletic, or successful, or mature. The truth is, smoking makes you dead.



Cigarettes are like an industrial sewer and your lungs become the dump. Compare the smoker's lung on top with the healthy lung on the bottom.

there, that's where I am coming from. But living here in Saipan, so close to Asia, I see smoking like you never see in the US mainland any more. Smoking in visitors, smoking in kids, smoking in restaurants and in cars. Lots of smoking.

So what are the facts? Well, it costs a lot. On the mainland where cigarettes are about \$2 a pack, a pack-a-day habit will add up to over \$7000 in 10 years. It's addictive. Despite all the denials over the years, the tobacco companies have finally admitted that nicotine is one of the most addictive drugs known. It is easy to get started, and terribly hard to stop.

It's gross. Did you know there are over 4000 chemicals in a cigarette? In addition to nicotine (an insecticide) there are some surprises. Like Uranium 235 and Polonium 210, both radioactive, several toxic metals including lead, cadmium, nickel and zinc, and a bunch of solvents and preservatives like formaldehyde (used in embalming), toluene, phenol, benzene and acetone. There is even some hydrazine, used as a rocket fuel! It's like smoking an industrial sewer. And your lungs become the dump.

It's not cool. Most high school seniors in the states see smokers as insecure or immature. In national surveys both boys and girls prefer non-smokers as dates. Twice as many smoke who did not complete high school compared to those who graduate from college.

And it's a sucker play. The big tobacco companies have been using athletes, pretty girls and athletic guys, even cartoon characters, to sell tobacco to young people. Advertising works, and though the sale of tobacco to youth under 18 is illegal in almost every state, the big companies make over \$200 million annually from such sales. It is a big market. Take a close look at the magazines marketed for teens or women (the two biggest target markets). How many ads are there that try to make these links?

The companies want you to think smoking makes you beautiful, or athletic, or successful, or mature. The truth is, smoking makes you dead. Smoking is still the #1 cause of preventable death in the United States. Smoking kills more than 400,000 Americans every year — more than AIDS, car accidents, alcohol, homicides, illegal drugs, suicides, and fires, combined!

So do yourself a favor. Don't start smoking, or if you already smoke, quit. It will save you a bunch of money. It may even save your life.

34. 3. 3. Carcinogens and Mutagens

Although it is now clear that some cancers may be caused, all or in part, by certain viruses, most cancers are caused by environmental factors, including toxic chemicals (including cigarette smoke), and radiation (including ultraviolet light).

It has also been found that many cancers are genetically linked. Often it is not clear to what extent genetic factors or environmental factors are to be blamed—or both. Individuals are not equally susceptible to carcinogens. In some cases, genetic factors may *pre-dispose* an individual to develop cancer when exposed to certain environmental factors.

Cancer is a general name for a group of diseases that cause the uncontrolled growth and division of certain cells. A chemical carcinogen is a substance that can potentially induce cancerous growths.

Other substances may interact with carcinogens to modify their potential effect. These may either enhance the effect, or reduce it. Cancers can even develop some 15 to 40 years after from the time of first exposure to the carcinogen.

Both asbestos and tobacco smoke are known to cause cancer of the lungs. Unfortunately we don't need to look very far to find substances that may be linked to cancer in humans. The mixture of lime and betel nut has been shown to cause mouth cancers. A dental hygienist informed me that the youngest she's seen locally with mouth cancer was a child the age of ten.

PolyChlorinated Biphenyls (PCBs) are organic oils that were formerly used as a coolant and lubricant in the transformers on electric poles, including those in the NMI; PCBs are now recognized as very powerful carcinogens.

Non-chemical agencies can also cause cancers. Included are exposure to nuclear radioactivity, and electromagnetic radiation— including ultraviolet light (UV) and X-rays. Exposure to sunlight can cause skin cancer, especially in those predisposed to such cancer.

As mentioned, the ozone layer of the atmosphere absorbs UV light arriving from the sun, shielding us from UV radiation that can cause cancer. Current fears regarding depletion of the ozone layer center around concerns for an increase in the incidence of skin cancers.

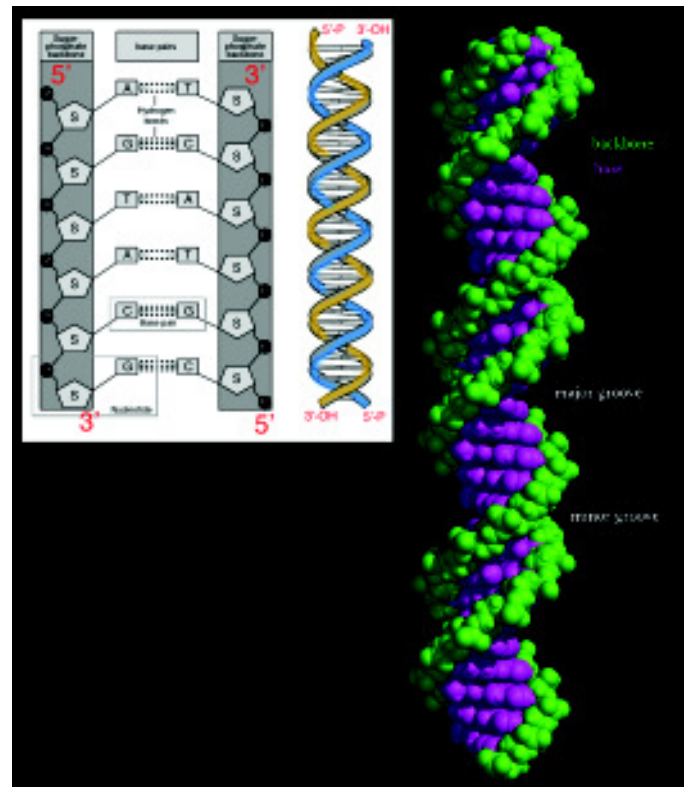
Mutagenic chemicals are substances that cause **mutations** or damage to the DNA molecules that carry genetic information—DNA, in the chromosomes. Mutagens can cause birth defects if our reproductive gametes are affected.

34. 3. 4. Water Pollution

Clean safe water is essential to life. Almost all of the water on the surface of the earth is connected — by rivers, lakes, and oceans. Unfortunately tanker ships leak oil, people dump garbage, nations dump nuclear waste into these inter-connected seas leaving little of it safe to drink. Deep underground wells are the source of clean water for many persons, but this is not available everywhere.

Many diseases are also spread in the water. Cholera and typhoid fever are two such diseases. These illnesses cause massive diarrhea and death. If streams and water supplies are polluted with human waste, then others quickly catch the same diseases by drinking this contaminated water. Having a source of clean, safe water to drink is one of the **World Health Organization's** biggest priorities.

Poisons can also get into the water supply and poison people. Many expensive lawsuits have resulted from industrial pollution of lakes and rivers. The *Love Canal* dump in New Jersey is one such example. Huge copper and gold mines in the US West have left many streams completely sterile, killing every fish and even the plants growing alongside the water. These poisons are potent!



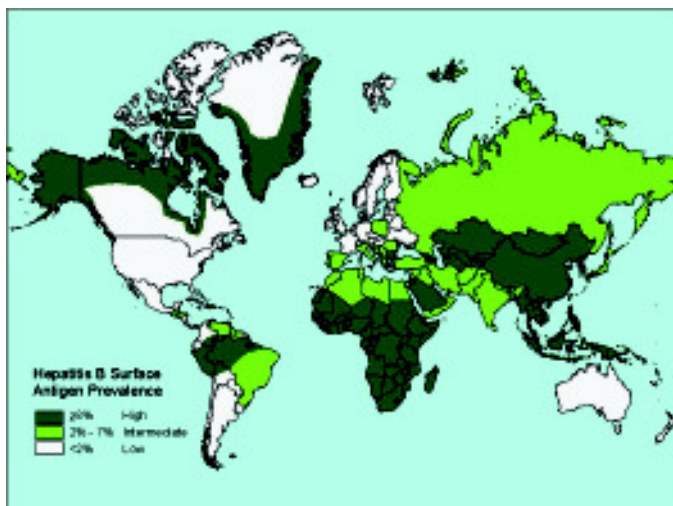
Mutagenic chemicals are substances that cause mutations or damage to the DNA molecules (shown here) that carry genetic information.



Clean safe water is essential to life.



Even small amounts of pollutants or toxins can become dangerous for man.



Hepatitis is a common viral infection throughout the world. This map shows the prevalence of Hepatitis B.

Even small amounts of pollutants or toxins can become dangerous for people. An example is ciguatera poisoning. Tiny reef organisms can manufacture a toxin known as *ciguatoxin*. These tiny organisms are part of the diet of many reef fish, including the reef surgeon fish and many tangs. These are common fish in the Marianas.

The ciguatoxin does not hurt the fish in such small quantities, but it is stored in the fish's body and is not broken down. Over time the fish may build up a fairly large amount of this toxin. This process is called **bioaccumulation**.

The small ciguatoxin-containing fish are in turn eaten by bigger fish, and these by still bigger fish. At times, some of the biggest predators, such as the barracuda or red snapper, may take in enough of these smaller fish that they accumulate a massive amount of ciguatoxin.

This effect, magnifying the amount of toxin in a single fish by moving further up the food chain, is called **bioamplification**. If one of these *bioamplified* fish, full of toxin, is eaten by someone, they can develop symptoms of ciguatera poisoning. The symptoms may be mild, like numbness and tingling. They may, however, be more severe and even fatal.

Pollutants can also be bioamplified. Mercury pollution is common in many lakes in the US Midwest. Fish living in this water accumulate mercury. Bigger fish can accumulate enough mercury to cause serious illness if they are eaten. Fish can not be eaten if they are caught in these polluted lakes. This can also happen in oceans when mercury pollutes the shores of land. Large oceanic predators, like marlin and tuna, can also accumulate enough mercury to be dangerous for human consumption.

Some countries propose using the ocean as a massive garbage dump. Many countries already do so. While the ocean is huge, and hopefully dilutes or destroys many of these substances with time, it cannot do so forever. Some substances, like radioactive waste, will remain hazardous throughout our lifetimes. If these substances get into our food chain, we can become seriously ill.

34. 3. 5. Hepatitis

Hepatitis is a common viral infection throughout the world. The most common form of hepatitis is Hepatitis A. This hepatitis spreads by *fecal-oral* transmission. The virus is eliminated in the feces of an infected person. From here there are many ways it can spread to the mouth of other individuals.

If the infected person does not wash their hands carefully, they may spread the virus onto foods that they prepare. Others eating those foods can get the infection.

If the infected person defecates on the ground, then the soil and water in that place may carry the infection. Persons eating fruits or vegetables grown there, or washed with that water, can get infected. There are places where travelers are advised to avoid all fresh fruits and vegetables because of the contamination of the water and soil.

If a child in diapers has hepatitis, the caregiver changing those diapers can get infected or infect others if they do not frequently wash their hands.

34. 3. 6. Land Pollution

Even the soil can be polluted. Here on Saipan, many chemicals were *dumped* during and after World War II. Even today, dumps containing old electrical transformers (which are filled with highly toxic chemicals) are still being located. For a time, these transformers, some of which have leaked, were even used as decorative borders for parking areas or schools!

34. 3. 7. The Examples of Radiation and Nuclear Wastes

Radiation can pollute islands for many years. Perhaps forever. Islands in the Marshall Islands were used for atomic testing in the 1950's. At the time of this book's writing they are still unsafe for life.

Biomagnification is also important on land. Atmospheric atomic bomb tests release clouds of radioactive compounds into the atmosphere. These clouds may travel for many thousands of miles. One of these compounds is Strontium 90. Strontium 90 (Sr9) remains radioactive for many, many years (its *half-life*, the time it takes for 1/2 of the radioactivity to naturally disappear, or decay, is 2,000 years). Rain eventually falls from these clouds. This rain is now contaminated with Sr90.

Vegetation, especially grass, will soak up this rain. And along with the rain, the grass soaks up Sr90. Later dairy cows eat the grass. Sr90 is a compound that follows calcium, so the Sr90 moves to the bones and milk of the cow.

Still later, further up the food chain, children drinking this milk will absorb the Sr90 into their bones. Remember that Sr90 is radioactive. This results in constant radiation inside the bones of these children (since humans are the *end* of the food chain, the Sr90 has no where else to go. It just stays in the bones, magnified and accumulated over time).

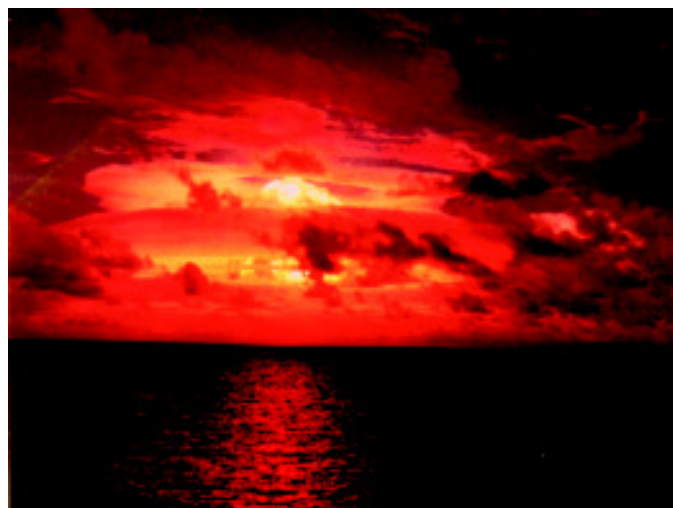
After many years, these children may develop *leukemia* or other forms of cancer known to be caused by exposure to excessive radiation. All because of a bomb, detonated perhaps many thousands of miles away.

Nuclear power plant failures have also released Sr90. When the Chernyoble power plant in Russia failed (melted down actually), children as far away as Finland and Sweden were exposed to contaminated milk. Exposures from plant failures have also occurred in the United States (Three Mile Island, for example).

Nuclear bombs and nuclear power both produce massive amounts of energy. They also produce massive amounts of radioactive trash. Radioactivity can damage or kill all living organisms. The effect may be immediate, like the atomic bombs dropped on Hiroshima and Nagasaki. The damage may be slower, like the high risk of bone and blood cancers in radiologists (including Madame Curie, one of the discoverer's of radiation).



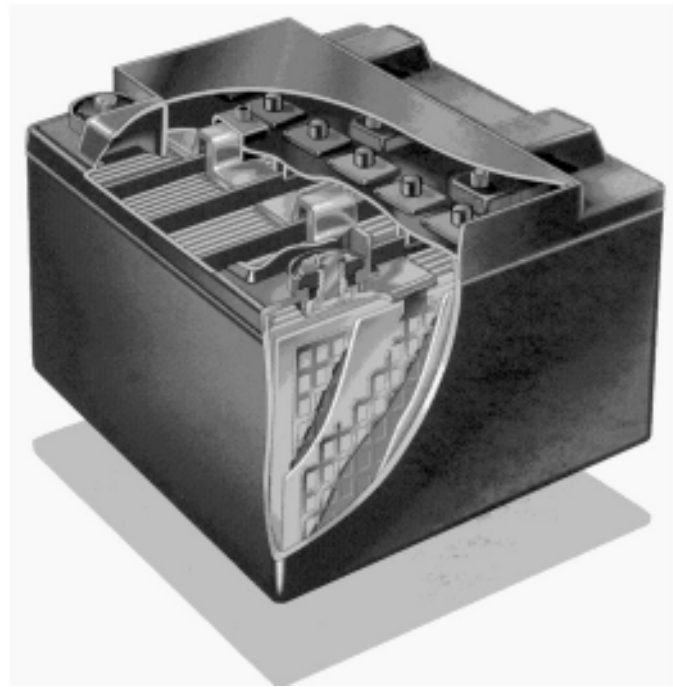
Dumps containing old electrical transformers (which are filled with highly toxic chemicals) are still being found in the CNMI.



Islands in the Marshall Islands were used for atomic testing in the 1950's. At the time of this book's writing they are still unsafe for life.



Radioactive waste may take thousands of years to be safe. A major world problem is finding some way to dispose of this mountain of dangerous trash.



Lead is one of the most important materials in construction of automobile batteries and solar-electric storage batteries.

High level radioactive waste, including plutonium and uranium, no longer has enough radioactivity to be useful for weapons or power. Cooling water and construction materials at nuclear power plants also become radioactive when plants operate. When plants are closed or overhauled, these are removed. They are then referred to as *low level* nuclear wastes.

But neither of these are harmless. Radioactive waste may take thousands of years to be safe. A major world problem is finding some way to dispose of this mountain of dangerous trash.

There is no safe solution. Some countries have proposed burying the waste deep in the ground. Some suggest launching it into space. Still others propose dumping it deep in the ocean. One site proposed was the Marianas Trench. No one knows if the containers holding these wastes can withstand the pressures deep in the ocean, or how long they would last. Once the radioactive waste leaks out, it could enter the water and fish and food we eat.

34. 3. 8. Land Pollution, the Example of Lead

Lead is an extremely toxic, soft and *malleable*, heavy metal. Lead was one of the first metals worked by humans. It is a familiar metal, finding many uses in everyday life. Fishing sinkers and diving weights are made of lead.

Lead is one of the most important materials in the construction of automobile batteries and solar-electric storage batteries. Lead was a common ingredient in house paints. Most paints manufactured in the United States are very low in lead content, however, imported paints may still remain an important route of exposure.

Small children are often poisoned by eating peeling lead-based paint in the home, or chips from ceramic bath tubs. Improperly disposed of automobile batteries may be an important source of exposure to lead. Ceramics, including kitchen plates and porcelain sinks and bathtubs have contained lead. Imported ceramicware may still contain significant amounts of lead. Most solder contains about 60% lead. Pottery can contain lead. There are even some Asian medicines that contain lead.

US federal legislation has drastically reduced the amount of lead in gasoline. In the past, however, gasoline was an important route of lead exposure, from both emissions and skin contact.

Lead pipes were formerly commonly used in houses, and copper pipes were soldered using lead-based solders. Radiator repair shops may also be points of exposure. Lead leached from such pipes can be a serious problem. It is best to let water run for about 30 seconds before drawing drinking water from pipes in unfamiliar areas.

Lead enters the body primarily through ingestion and inhalation. It affects the nervous system and blood cells. Lead poisoning is especially serious for young children. Lead can cause learning disabilities. Even slight amounts of lead can seriously impair the development of the nervous system.

Such impairments may be irreversible. When the mother is exposed to lead, it can pass across the placenta from the mother to the fetus. The US EPA has suggested that lead is probably a human carcinogen.

34. 4. BIOLOGIC ENVIRONMENT

34. 4. 1. Germs and Vectors

When most students think of the biologic environment and its relationship with human illness, they will think of germs and infections caused by living organisms. But this was not always the case.

The Greek physician, Hippocrates, has been given credit as one of the first to realize that illness may result from natural causes, and that these causes could be treated.

This may seem trivial to us now, but to early settlers in the Mariana Islands, including the Spanish colonists, it would not have made much sense. During an epidemic in the 1700's, when over 600 persons died from an unknown cause, the Spanish felt that the only way to survive was to drink holy water. Epidemics were thought to be a result of spiritual, not physical causes, and so the supposed cure was felt to be spiritual as well.

With medical progress, the **germ theory** of illness became understood. Several scientists made key discoveries in the development of the modern germ theory. One was Louis Pasteur. People began to understand the importance of hand washing, of having clean food and water. The importance of a clean physical environment was recognized.

A **contagious** disease, (or *communicable* disease), is an illness caused by an organism that is able to move from an infected person or animal to a well person. Contagious diseases may move through filth, animals, persons (either infected or not infected), drinking water, or food.

A **pathogen** is a disease-causing organism. Pathogens may be bacteria, viruses, fungi, protozoa, or minute animals. The word *germ* is sometimes used to refer to any of these: it is not itself the name of any specific pathogen.

Parasites are organisms that live in and on other organisms (their **hosts**). Parasites derive their main source of food from these hosts.

As mentioned, we are surrounded by a living environment. Other animals share our land and sea, and tiny organisms live all around, and even inside us. Many of these are helpful, and even vital for our health. Microscopic bacteria help us digest our food, create our cheese and yogurt, even our wine.

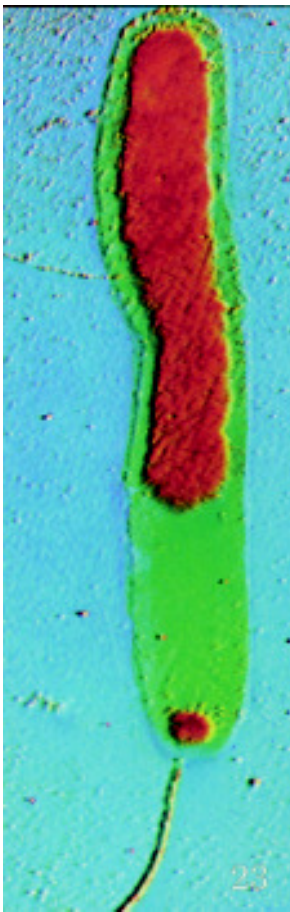
But at times these same kinds of living organisms can cause disease. Earlier we told of the effects of weather and flooding. Large pools of stagnant water provide breeding grounds for many insects, including mosquitoes. The mosquitoes, in turn, can spread much human sickness.



Louis Pasteur's research was instrumental in developing the germ theory of illness.



Parasites, such as this Schistosoma, derive their main source of food from their (human) hosts.



Cholera is prevalent in many parts of the world and is most often spread through contaminated water supplies.



The Panama Canal connecting the Atlantic and Pacific Oceans through Panama was almost stopped by Yellow Fever.

Mosquitoes, in this case, are known as **vectors**. They do not actually cause the disease, but they carry it from person to person. Examples of mosquito-borne diseases are Malaria, Japanese Encephalitis, and Dengue Fever. All of these diseases are found in the Pacific.

Ordinarily, parasites does not kill their hosts. After all, to do so would eliminate their sole sources of support. Many pathogens, however, do cause the death of their hosts. Other organisms play an indirect role in bringing disease-causing organisms into contact with new hosts.

Examples of vectors include insects, rodents, molluscs, cats, dogs, and other mammals. Different kinds of mosquitoes carry different diseases. The mosquito responsible for Dengue Fever is not the same as the one which spreads Japanese Encephalitis. Both kinds of mosquitoes are prevalent on most Pacific islands, including our Mariana Islands.

Mosquitoes need pools of stagnant fresh water in which to breed. These are precisely the conditions likely after a typhoon or tropical storm floods the land.

Many other deadly illnesses are also passed in the water. Cholera is prevalent in many parts of the world. It is most often spread through contaminated water supplies. A large epidemic occurred in Chuuk Lagoon after the 1982-1983 El Niño. It could occur again.

These illnesses are spread by the *fecal-oral* route. Poor sanitation results in contamination of the water by human waste. Other persons drink this water and become infected. The cycle continues until the water supply is purified.

In many parts of the world children go to the bathroom in the dirt. There are no toilets. All of this soil becomes contaminated, and when it rains the germs — hepatitis, cholera, whatever— wash into the streams and rivers where people gather their drinking water.

34. 4. 2. Interrupting Pathogen Life Cycles

Several biologic illnesses result from parasites which live complicated life cycles. Some, like the disease called *toxoplasmosis*, may live parts of their life cycles in cats, or other animals, and another part in humans. Other diseases, like Japanese Encephalitis, may have **reservoirs** in pigs or birds or other animals. Without these reservoirs the illness cannot spread.

Understanding biological life cycles of pathogens, and the routes they take to infect us, can help us to protect ourselves. It can also serve as a guide to successful *community action* to combat these diseases.

The Panama Canal connecting the Atlantic and Pacific Oceans through Panama was almost stopped by a disease, Yellow Fever. Workers trying to build the canal died by the thousands. Finally it was realized that Yellow Fever is spread by the bite of a mosquito.

Panama was full of stagnant pools of water, and full of mosquitoes. When the engineers stopped trying to dig a canal, but instead focused on draining the swamps and controlling the mosquitoes, the canal could finally be completed.

34. 4. 3. Mosquitoes as Vectors

As mentioned, vectors pass disease from one animal to another. The vector may not get sick at all, and the vector may not even be alive! A toy used by a sick child may be the vector which transmits an infection.

Mosquitoes are a common vector for many human and animal diseases. There are hundreds of species of mosquitoes. Each species of mosquito carries only certain diseases. If the right kind of mosquito is absent, then a disease will not spread. Some mosquitoes bite only during the daylight hours, but most are active in the evening and night.

Diseases spread by mosquitoes include Dengue Fever, Japanese Encephalitis, Malaria, and Yellow Fever. Mosquitoes which spread these diseases are common on many Pacific islands.

Often the best way to control the spread of disease is to eliminate the mosquitoes. Most mosquitoes travel less than 100 feet from their home. All containers which hold standing water — coconut shells, cans, trash — should be removed from around houses.

34. 4. 4. Rats as Vectors

Rats and mice are common vectors for many human and animal diseases. Rats and mice have been responsible for many massive plagues throughout history. The **Black Death** in the Middle Ages was carried by rats. Even today, the dreaded Hantavirus is spread by mice in parts of the United States.

Rats and mice can transmit diseases, like the plague, by carrying infected fleas which bite both the rodents as well as people. Persons may also get infected by consuming foods contaminated with urine or feces from rats with disease. Leptospirosis spreads in this way. Persons may also get sick just by breathing dust contaminated with infected droppings. Hantavirus spreads in this manner.

The most effective way to control these diseases is to eliminate the vector. Keeping garbage tightly covered makes homes less tempting for rats. Traps also help. Poisons may cause other environmental problems and should be used with caution, if at all.

34. 5. SOCIAL ENVIRONMENT

34. 5. 1. Societies, Politics, and Health

Our social environment will also have profound health effects. In countries ravaged by war or rebellion, citizens are killed, injured, starved. Emotional scars from injuries or loss can lead to life-long disability.



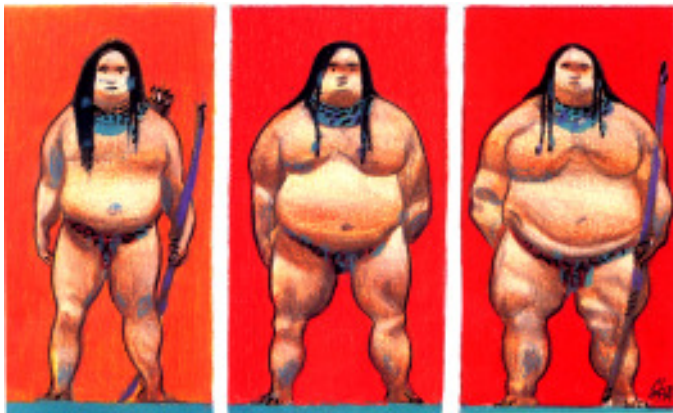
Mosquitoes are a common vector for many human and animal diseases.



The Black Death in the Middle Ages was carried by rats.



Famine may have a social, as well as a physical cause.



The “western lifestyle” of little physical labor, high fat and high sugar foods, cigarette smoking and alcohol, has affected many Pacific islanders and Native Americans.

Countries which explode nuclear bombs or other weapons of mass destruction, a *social* or *political* decision, would affect the environment of the whole globe. Radioactive fallout, or problems of later disposing of nuclear or other toxic wastes, would affect every citizen in some way.

Poor countries do not have the money for spacious one-family dwellings. Crowding encourages the spread of many infections. One of these is **Tuberculosis**. When entire families share a small room, one sick and coughing relative can infect all of the others in the room.

In some societies this is made still worse by beliefs that fresh night air can be dangerous, or that leaving doors open at night will allow evil spirits to enter the house. So all windows and doors are closed to keep out these spirits. This also keeps in the infections.

Famine may have a social, as well as a physical cause. In time of war many persons become refugees and face injury or even death. Food is often scarce and may be reserved for certain military or political groups.

Deforestation, the denuding of the land, can also be a political weapon. In Vietnam, and even here in our islands during World War II, napalm bombs were used to deforest the land and to kill enemy soldiers. In Vietnam, aerielly-sprayed *herbicides* targeting only the cover vegetation were used as well, this on a massive scale. This was done to reduce the cover for the enemy.

Their effects, however, outlasted both wars. Massive erosion of the topsoil occurs when heavy rains fall on land with little or no vegetation to hold the soil. The chemicals used in Vietnam also fell on nontargeted *friendly* soldiers and civilians. Even today, some 30 years later, there are serious concerns about the effect this has had on their health.

34. 5. 2. Health and Lifestyles

Social and government decisions may change social behaviors such as diet, medical care, and lifestyle. All of these will affect health. The introduction of the *western diet* after WWII has affected our island’s public health almost as much as the introduction of smallpox. And with the same results.

Smallpox, along with other diseases such as syphilis and measles, was first introduced to our islands by Spanish explorers. The results were devastating. Our ancestors had no natural immunity to these illnesses, and large numbers became sick and died.

The “*western lifestyle*” of little physical labor, high fat and high sugar foods, cigarette smoking and alcohol, has affected many of our Pacific islanders as well.

There is medical evidence that Pacific islanders have traditionally lived in a *feast or famine* environment, with about equal amounts of both. The lush vegetation was regularly wiped out by typhoons and other natural disasters.

Some individuals were born with a better than average ability to store fat during the times of feast. During famine, these individuals were more likely to survive because of their extra reserves. Over time, it is felt that most Pacific islanders inherited this thrifty ability to save during feasts for the upcoming famines.

With the modern world, this has all changed. Paid wages and indigent-qualifying food stamps have all but eliminated the times of famine. Most of us can eat all the time. And get fat. In addition, the physical labor practice of cultivating crops or fishing by hand is nearly gone. Now we have Spam, beer, cigarettes, and rice. The health result of this massive social environmental change has been astronomical rates of heart disease, hypertension, obesity, and diabetes. Social and political environments have profound effects on the health of individuals.

34. 5. 3. AIDS: A Major Social Health Concern

The World Health Organization recently reported:

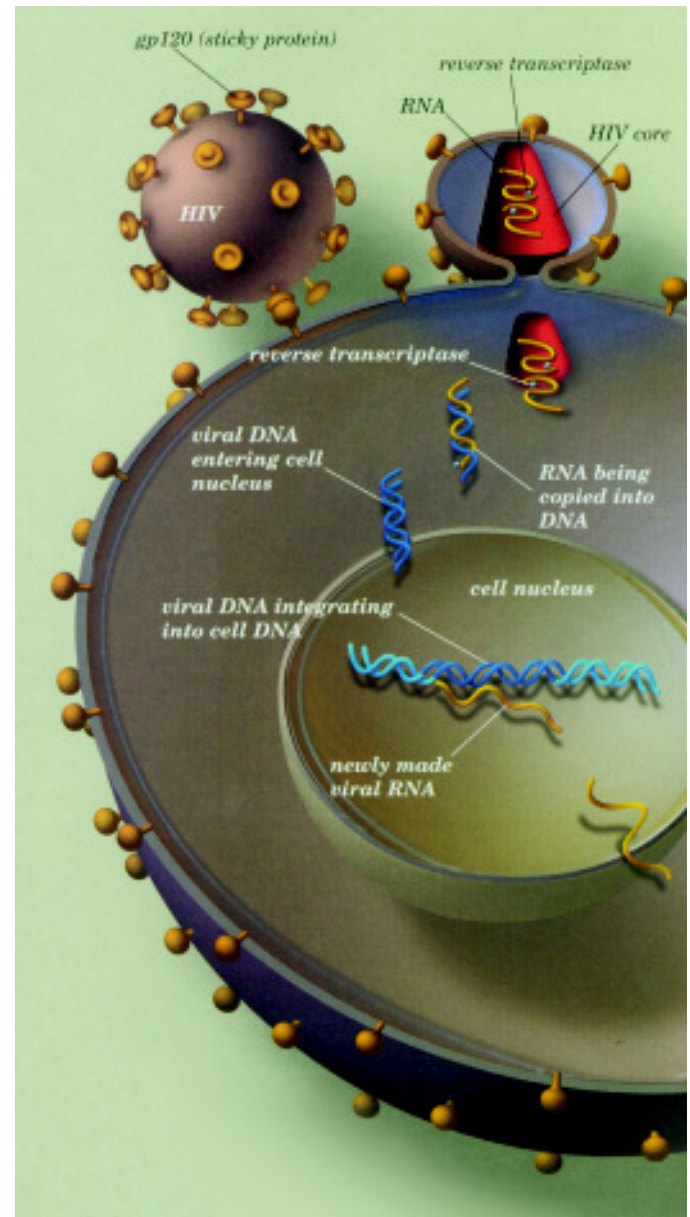
“The more we know about the AIDS epidemic, the worse it appears.... the rates of HIV transmission have been grossly underestimated....”.

AIDS, Acquired Immunodeficiency Syndrome, has been spreading steadily through the human race for the last 35 years. **HIV**, the **Human Immunodeficiency Virus** which causes AIDS, is not a particularly contagious virus. Most infections come from direct sexual contact, or from exposure to infected blood or dirty needles. In children, sadly, much of the infection comes even before birth, from their infected mothers. The world-side numbers are staggering, unbelievable. Maybe that is why so few seem to be concerned at times, the numbers are just so huge that they numb our conscience.

Today, in our world, among persons aged 15-50, one in every 100 are infected with the AIDS virus. That's over 30 million people, and to that you can add another 1 million if you include kids under age 15. In some countries it gets up to one in ten, and in some villages seven out of ten women having babies are HIV positive.

And it's getting worse. Quickly. Every single day another 16,000 persons are newly infected, and over 6,000 die. Of those who die, half are women, and almost a fourth are children.

Think about those numbers a minute. One out of 100. 30 million people. There are some other facts which should make us really wake up here in the Marianas. We are close, really close, to Southeast Asia and there is a lot of AIDS in Africa and Asia. Most people with AIDS don't know they have it. The UN estimates that 9 out of 10 HIV infected people don't know they are infected. Nine out of ten. That's 27 out of those 30 million people, they have this life-threatening infection, and they don't even know they have it. Medicines are available, but what use are medicines when you don't even know you need them? Besides, they don't cure the illness, and they are grossly expensive, way beyond the budgets of most individuals or countries.



The Human Immunodeficiency Virus (HIV) poses one of the greatest global health threats of the 21st century.



Youth violence is the number two killer of American teenagers, and the number one killer of youth living in poverty.

Prevention is available too, by avoiding sexual contact with infected individuals and use of contaminated needles or blood. This sounds easy, but it isn't. I especially worry about our young people. The CNMI has a really high number of teenage pregnancies. It isn't spoken of much, but it is true. And some confidential surveys of high school and college youth indicate that our young people are very sexually active, rarely using protection. Teenagers don't think about prevention; they think about action. These actions could cost them their lives, and the lives of many others they love. It could cost us our children. We need to stop it. Now.

34. 5. 4. Youth and Violence; the Missing Link

Youth violence is the number two killer of American teenagers, and the number one killer of youth living in poverty.

"The biggest danger," according to one writer, "is that we will get used to it." If we start to accept youth violence as somehow *normal* then we stop living as a civilized society. It isn't normal. It's wrong.

As a parent and a pediatrician, I am sickened by the daily news reports of gang wars, murders, drug use and violence. Back in the states, many families I knew had moved from larger cities to smaller ones hoping to get away from this vicious environment. They wanted to give their kids and families a better chance, a better life.

Here in Saipan, we have these problems as well. I remember the talks that Dr. Bill Peck, a retired physician-author now living on Rota, used to give to the new hospital staff. "*Living on an island is not easy,*" he told us. "*Problems here are just the same, only magnified. You can't come here to get away from your problems.*"

The recent report (at the time of this book's writing) of the tragic beating death of a teenager brought it home to me. A friend I met lost his hearing in a beating at a local school. Drug use is common. When I asked a teacher-friend what they were trying to do about this, he responded sadly. "*The school is supposed to be drug free. But if anyone reports these kids they end up with slashed tires or damage to their cars. Or worse. So no one says anything.*"

This is crazy. It reminds me of the book, *Lord of the Flies*, where kids rule and anarchy prevails. But the kids are not in charge. These are our children, and we are morally and legally responsible for them (even when they don't like it).

My parents lived during the two world wars, times when the whole planet seemed likely to explode. They wanted a better life for their children, for me. I have lived during the cold war and the craziness of Vietnam. I too want a better world, a better life, for my children.

This better world is not a place where violence is a way of life. Or a way of death. I don't have the answer to this one. I don't have a baby shot which will only hurt a little.

Kids, and adults, need to learn better and safer ways to handle conflict. *Reach out and hurt someone* doesn't work. All of us — parents, physicians, teachers, legislators — have a big job to do, and it isn't one we can pass on to someone else. These are our kids. They will inherit this world we are creating. Let's make it a good one.

34. 5. 5. Tuberculosis, a 'Consuming' Social Problem

Tuberculosis, "TB," is a common infection, and it has caused human misery for as long as we have records. TB used to be called *consumption*. It consumed its victims slowly; they just faded away. Meg, the beloved sister in "Little Women" died of consumption, with nary a dry eye in the audience. Robert Louis Stevenson faded away in Western Samoa.

The World Health Organization estimates that one-third of the world's population, over two billion people, are infected with tuberculosis. Three million die every year. It is a massive problem.

For a long time, the more affluent countries of the world, Europe and North America, thought this was just a problem of the poor countries. Now large outbreaks of TB have become common in these countries as well.

Here in the CNMI the news has announced epidemic numbers of TB. The new worker screening regulations have tested and discovered many new cases of TB. The frightening possibility is that there are many other cases out there that have not yet been identified.

TB is an unusual infection. Not everyone gets sick. In fact, only the minority actually show symptoms. TB spreads in droplets coughed into the air. Others breathe in these droplets and can become infected.

TB infections are usually detected with a skin test. This test is required before school entrance, and is repeated several times during childhood. It is also required for health-care workers and teachers and a variety of other professions.

If this test is positive it does not mean you have TB. A positive test (redness and swelling) indicates that you have at some time been infected with the TB bacteria. This test stays positive the rest of your life, so it does not indicate if the infection was last month, or 20 years ago.

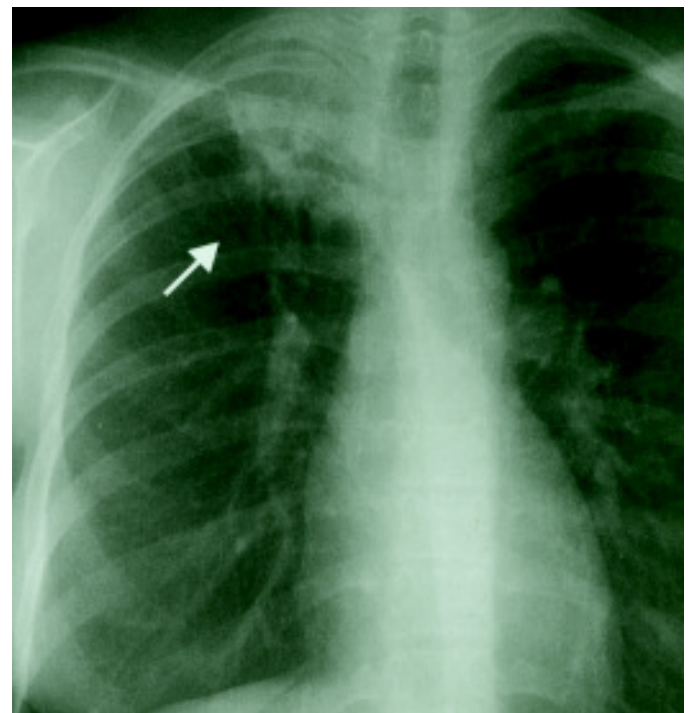
For most individuals, that is as far as it goes. The skin test changes to positive, but they never get sick. Their body effectively walls the infection off. For others, especially children, the infection may not stay walled off. For these it can spread into the lungs or into the rest of the body. It can even kill.

Sometimes this spread can occur many years after the first infection, so a person with a positive skin test is always at risk unless they are treated. For this reason, and to prevent the further spread of the infection, everyone with a newly-positive skin test, or with signs of infection, needs medical treatment.

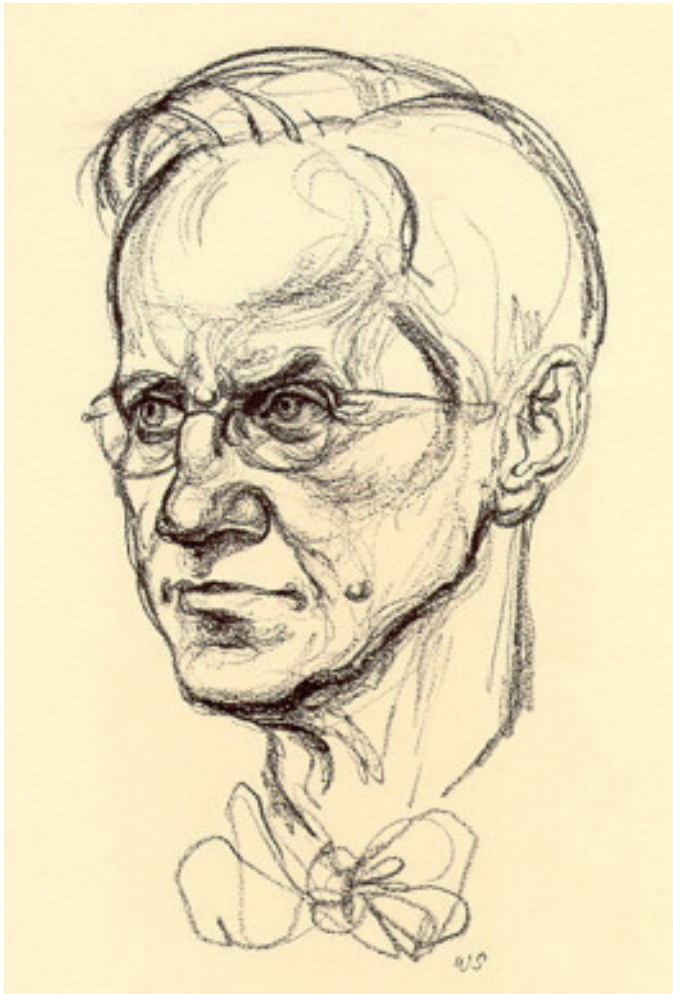
This treatment consists of medication given several times a week for 3 months up to a year or more. It is important to take the medication for the full period. For this reason many centers, including CHC, ask patients to come to the hospital for their medication to be 100% sure it is taken each and every time. Once a person is taking medication they quickly stop spreading the infection to others.



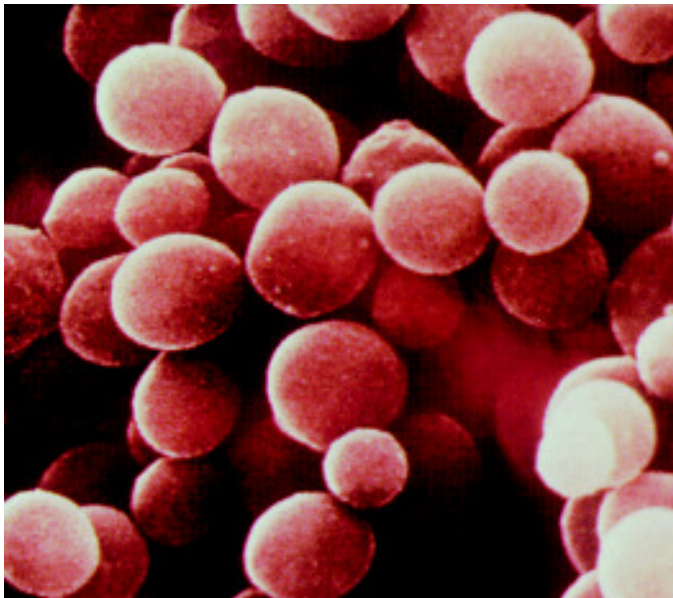
TB infections are usually detected with a skin test. The redness and swelling in this photo indicates a positive test.



For some people, especially children, TB may spread into the lungs or into the rest of the body.



Penicillin was fortuitously discovered in 1928 by Sir Alexander Fleming.



Germs, such as these staphylococcus, have survived millions of years in the same way humans have, by adapting to their changing world.

TB was well-called consumption. It consumes our children, our people, our resources. It is time we all work together to put this killer back in the history books, and get it out of our communities.

34. 5. 6. Antibiotics - Miracle Drugs, or Environmental Disasters?

“...We have met the enemy, and he is us...” Pogo

Antibiotics, the *miracle drugs* of the 20th century, were being looked at in a less-positive light as we approached the year 2000.

There were no antibiotics earlier in that century, and infections we today consider mild, like strep throat, had no known cure. This all changed during World War II when penicillin was developed into large-scale culture and used in medicine. (Note: Penicillin was fortuitously discovered in 1928 by Sir Alexander Fleming when it was isolated from a sample of mold growing in his laboratory.) Suddenly strep, the bacteria causing strep throat and many wound infections in the war, could be treated. It seemed a miracle. Following the war, huge research efforts discovered dozens of other antibiotics, as they came to be called. It looked for a time like infections would become a disease of the past, all you needed to do was take your medicine.

That’s when the germs struck back.

In those early *heady* years of penicillin, no one thought of germs like bacteria and viruses as smart. We were wrong. Germs have survived millions of years in the same way humans have, by adapting to their changing world.

Resistance first developed to the sulfa drugs used in the early 1940’s. By the 1950’s staph, a common germ causing many wound infections, was resistant, but new miracle drugs, effective against these stubborn staph, were developed. But now many strains of staph are resistant to these newer drugs as well. In some areas, most strains of staph are drug-resistant. In some recent cases, people have died with infections which were resistant to all known antibiotics.

Why has all this happened?

The biggest reason, by far, has been the overuse of antibiotics. In the US alone, over 85 million prescriptions for antibiotics are filled every year. In addition, antibiotics used to be added to animal feeds to prevent infections, but, as you might expect, the infections quickly became resistant. Humans eating the food were also eating the antibiotics.

All of this exposure to antibiotics has produced bacteria resistant to just about everything. For a time, it was hoped that new antibiotics would be developed and always stay *one step ahead* of bacterial resistance. That just hasn’t happened. The last entirely new antibiotic in the US was introduced over 30 years ago!

While new drugs are marketed almost every year, these are mostly spin-offs from older medicines. Although newer medicines are still being developed, no one now expects them to be free of bacterial resistance for long.

So what's to be done? At the start of this article, I quoted Walt Kelly and his cartoon character, Pogo — “*We have met the enemy, and he is us*”. All of us, physicians and parents, have a responsibility here. Physicians need to prescribe antibiotics only when they are needed, and use the mildest agent that works, saving the stronger ones (Doctors call these the *gorilla-cillins*) for more serious infections.

Parents, too, need to be aware of this problem and not expect antibiotics for mild illnesses, like colds or the flu, when they are unlikely to be of benefit. We are all in this together, and, to paraphrase the Earth Day slogan — “*When each of us does a little, together we do a lot.*”

34. 6. EFFECTS OF HEALTH ON THE ENVIRONMENT

Up until now we have focused on the ways that different features of the environment, including our social environment can affect our health. But all of this goes both ways.

Healthy populations have more energy and strength (and money) to preserve their environment. Recycling to cut down trash, or using less pesticides to reduce pollution are healthy concepts, but they may not be well received by those *living in marginal circumstances*.

Individuals weakened by famine or illness may not really care where their water comes from. They also may not have the strength to travel to a distant, but safer, place. Citizens living in social-unrest may not have the energy or time to focus on their environment. They are focused on survival.

While it is nice to recycle or to buy vegetables grown with less chemicals, it may not always be possible. These organic vegetables may cost more, but many poor people simply do not have any more to give.

It is hard to focus on *tomorrow* when you are trying to survive *today*. Any water, even dirty water, is better than no water at all. It makes no sense to talk about proper sanitation when there are no toilets or running water to use.

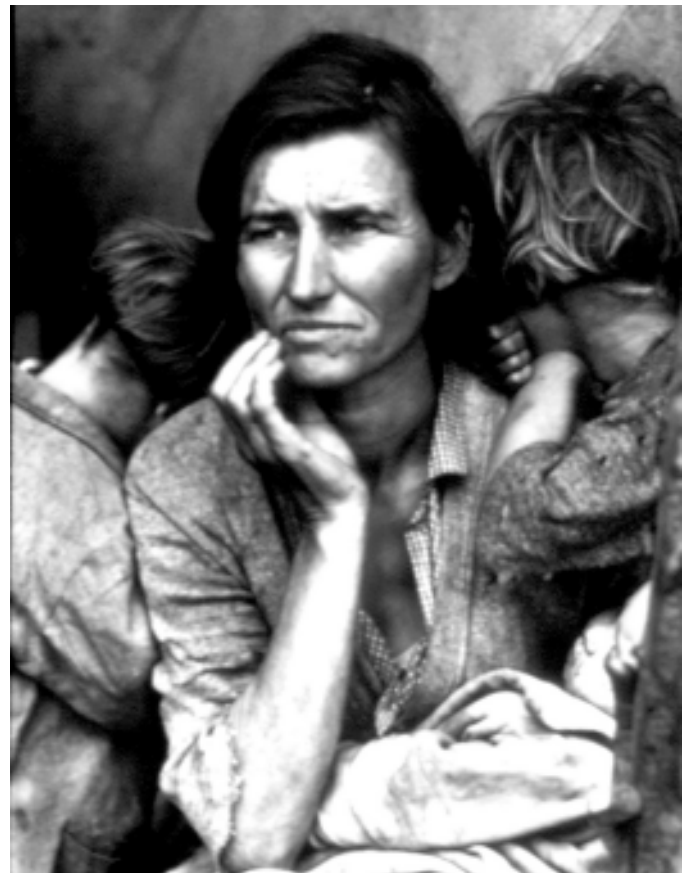
Solutions to these environmental-health concerns are not easy. Nor are they obvious. Take our earlier mentioned example of Tuberculosis. TB, as it is called, is almost epidemic in some countries, for example Haiti. It spreads by droplets coughed into the air.

In Haiti, it is believed that spirits roam at night and will enter any home left open. So all doors and windows are closed tight at night. In Haiti, as in the CNMI, families live together and help support one another. The elderly are valued as participating members of these families.

In Haiti, people are very poor, so many families may live together crowded into one or two rooms. In Haiti, there is little money, so there are no screens on windows to keep out mosquitoes which carry malaria and other disease.



Citizens living in social-unrest may not have the energy or time to focus on their environment. They are focused on survival.



It is hard to focus on tomorrow when you are trying to survive today.

So to stop this TB epidemic, where does one begin? If you try to make families spread out, who pays for all the houses? If you try to make older or sick families move away, where do they go? Who takes care of them? What about the family tradition of staying together?

If you open the windows, how do you change the belief in the night spirits? How do you change the whole mystical belief of a people? And if you do succeed, but do not have money for screens on the windows, are you just substituting one disease (malaria) for another (TB)? Here there are no easy answers, and the same complex problems will arise over and over for other diseases.

William Osler, a famous physician, once advised doctors *“Do not ask what disease a patient has. Rather ask what patient a disease has.”* We do not *catch* a disease. It catches us. And why does it *catch* one person and *saves* another? Understand the patient first — their lifestyle, their culture, their diet, their environment. This will give you the information you need to understand why they got sick, and not someone else. Then you can look at the disease and start to find out what must be done.