

Michael A. Nevins, MD

PLAGUES, POX and EBOLA

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Strangely enough, the idea for this talk came from an instructor in a course I took here last year about the painter Edward Hopper. It was taught by George Mamunes and his wife Lee and when George learned of my interest in medical history, he gave me a copy of a book he'd written several years ago called *So has a Daisy vanished*. It's about Emily Dickinson's tuberculosis -- which I never knew she had -- but in his book George Mamunes discussed how the poet envisioned an early death and how her worry about an inherited predisposition to TB influenced both her work and her life choices. Apparently "The Belle of Amherst" died of tuberculosis at age 55 in 1886 and George found several sources which supported both her diagnosis and his thesis.

Well because tuberculosis used to be called "the White Plague", I thought it might be interesting to contrast it with the "Black Plague" -- or what more often was known as "The Black Death" -- which decimated Europe during the 14th century. Then I thought why limit the discussion to black and white plagues? Why not include other epidemics as well -- to consider how mass illness effected human behavior throughout history -- and especially now in West Africa and even here, there's a disturbing sense of déjà vu. Indeed, perhaps the past can serve as a frame of reference for today.

Few of us usually give much thought to infectious diseases. At birth we enter a sterile environment and within seconds of opening our eyes antibiotics are dropped in. We drink pure water and pasteurized milk, bathe or shower every day and are urged to wash our hands frequently. Doctors

prescribe antibiotics – perhaps too often – and most of us dutifully renew our Flu shots every year. Public Health usually is left to the professionals, but this summer came the news about Ebola virus and part of that story has been that the professionals weren't up to the task – the WHO has been underfunded and unprepared for such a disaster. We've heard how some local behavior has been heroic and some horrendous – and as we'll soon see, in certain respects things haven't changed all that much from the past.

Ebola aside, most years, except on cruise ships or during flu season, we don't worry about epidemics -- and the question is should we? Have we grown too complacent? Most senior citizens remember summer polio scares but can you imagine what life must have been like long before anyone knew about germ theory – no less antisepsis and antibiotics? Throughout most of human history people lived in fear of disease. Every decision had to be made under the shadow of death: a farm family needed many children lest they became short-handed; to appoint a godparent was more than an honorific -- it was a practical kind of insurance – just in case. Medical science depended on received wisdom rather than based on clinical observation or on experimentation. Some people believed that epidemics were divine punishment. Others thought they were due to some celestial event -- a passing comet, an earthquake. Perhaps it was a curse by witches or gypsies or Jews. Poisoned wells? The Evil Eye? Satan? And when things got really serious, human reactions included panic, prayer, penance, hedonism, stoicism, scapegoating, animal or human sacrifice.

In his classic book *Rats, Lice and History* (1934) Hans Zinsser made the case that plagues always have and will continue to reinvent them selves while science scrambles to keep up. He focused on epidemic typhus but to Zinsser, infectious disease wasn't an abstraction – it was ever present and

effected human history in one way or another. He wrote in an engaging style – for example, this:

Infectious disease is one of the few genuine adventures left in the world. The dragons are all dead, and the lance grows rusty in the chimney corner....Our own continent is a stage route of gas stations and the Indians own oil wells. Africa is a playground for animal photographers or museum administrators and their wives who go there partly to have their pictures taken with one foot on a dead lion.

Zinsser went on to say that Infectious disease is one of the “great tragedies of living things – the struggle for existence between different forms of life.” *The only genuine sporting activity left is our war against these ferocious little fellow creatures, which lurk in the dark corners and stalk us in the bodies of rats, mice and all kinds of domestic animals; which fly and crawl with the insects, and waylay us in our food and drink -- and even in our love.*

When Pizzaro in Peru and Cortez in Mexico defeated the Aztecs and Incas during the early 16th century, it was less with their horses and guns than with their germs. Small pox wiped out millions of natives, whole villages were depopulated and the survivors meekly submitted to the superior white man’s god. In North America the conquistadors infected natives not only with small pox but with typhus, measles, scarlet fever, diphtheria and all the other European bugs – frequently 90% of the population were wiped out from this form of germ warfare. But the natives returned the favor and the conquerors brought back syphilis to the Old World – it was an American form of “Montezuma’s revenge” which quickly ravaged Europe, as we’ll discuss shortly.

Until the early 20th century there was a perception, both among the general population and among physicians themselves that although they could comfort, they really couldn't cure serious illness. It wasn't until the 1870s and 80s that within a single decade the causes of leprosy, anthrax, gonorrhea, TB, rabies and malaria all were found to be caused by microorganisms most of which, after proper staining, could be seen with a simple microscope. As Pasteur wrote, "It is in the power of man to rid humanity of every parasitic disease." But physicians were slow to accept these findings and it took nearly another century before antibiotics finally wiped out most of the bad bugs and vaccines built immunity against many viruses. So now let's consider some of the most important epidemic diseases.

PLAGUE: The term "plague was used from the 14th-15th centuries to mean a devastating affliction or calamity. The name was derived from the Latin *plaga* – meaning a sudden blow or wound. The Biblical Ten Plagues were calamities more than infections (with the possible exception of boils) and in Hebrew the word for plagues was *makot* , again, literally meaning a "blow." In *1 Chronicles* it was written that as a punishment for King David ordering of all things a census (?), God caused a severe plague which destroyed 70,000 people in one day. There was no explanation for what was so bad about conducting a census, but at least the Old Testament understood the concept of contagion – for example, lepers were kept outside the main camp lest they infect others.

The first pandemic that we know much about broke out in North Africa in 430 BC and then spread by ship to Athens. Without warning, healthy people developed fever, headache, chest and stomach symptoms and died very quickly. Athenian life was profoundly effected; people were demoralized and the army was paralyzed. In his history of the

Peloponnesian Wars, Thucydides described how corpses were left unburied, religious ceremonies abandoned and lawlessness prevailed.

Men now coolly ventured on what they had formerly done in a corner, and did just as they pleased... They resolved to spend quickly and enjoy themselves... Perseverance in what men called honour was popular with none... It was settled that present enjoyment and all that contributed to it was both honorable and useful. Fear of gods or law of men, there was none to restrain them. ..It was only reasonable to enjoy life a little”

Or as Isaiah said, “Live today for tomorrow we may die.” The same pattern of behavior occurred in most subsequent plagues, About a millennium after the so-called Plague of Athens, the Roman Empire was headed by Emperor Justinian and based in Constantinople (Byzantium). Then in 541 AD the capital was devastated by what a Greek historian described as “a pestilence by which the whole human race came near to being annihilated.” Well not quite, but some 40% of the population died; Emperor Justinian himself was stricken but recovered – and many historians attributed the fall of the Roman Empire to this epidemic of plague.

Now lets fast forward about another 800 years to the 1340s when plague returned to Europe and wiped out between 30 and 70% of the population – some 25 million people! It was popularly known as the Black Death because of the horrible necrotic skin lesions and starting in 1601 it was called Bubonic Plague because of the characteristic “buboes” which were swollen lymph nodes in the neck, armpits, groin or internally, some the size of grapefruits. Now we know that the culprits were rats which served as hosts for fleas which, in turn, carried a bacterium with a lethal punch (endotoxin) -- but nobody knew any of that for another 500 years.

The Black Death began in Asia, travelled westward and over about five years spread all over Europe and the Middle East. Some scholars believe it was carried by invading Mongol horsemen, but back then most people thought that it was God's doing – in fact, people's attention was directed upward rather than down at their feet. Starting in Venice as early as 1377, incoming ships were quarantined for forty days at a Lazaretto on an off shore island before they could unload and this was a semi-effective means of controlling transmission from what they knew not. Unlike other familiar diseases, plague killed quicker – Europe's population was drastically reduced and it took a century or more to recover. Of course this effected the economy because there were fewer workers – the good news for the survivors was that job opportunities and salaries increased. There was redistribution of wealth and for the first time governments began establishing policies which emphasized public good, even if they impinged on individual rights.

Although doctors had no answers, they pretended they did and profited. Gravediggers also prospered. There were acts of charity but also instances of cruelty and lawlessness. Thousands of the pious marched in penitential parades from city to city, some flagellated themselves; others burned Jews – sometimes prophylactically when plague was nearby – and in some places there were mass dancing manias. Some people said that extreme rest was therapeutic – just smell flowers and listen to soothing music. Those who could fled, abandoning homes and possessions. The dictum was “flee early, flee far, return late.” Cities built walls and locked the gates; vigilantes armed with pitchforks patrolled the roads to keep out strangers. Sometimes those caught escaping from quarantined cities were shot. Everyone avoided the sick – often ill servants or even family members were forced out; laws were abandoned and sexual morality loosened.

Cities were full of corpses; bodies placed at the curb to be carted away.

When churches ran out of graves they dug huge trenches and corpses were dumped in without ceremony, squashed down and covered with lime. If graves were too shallow, dogs would dig them up and gnaw on the bodies – and in the worst of times corpses were piled up along the seashore to wash away. As one person recalled, “There were none who wept for any death, for everyone expected to die.” During the Middle Ages, people wore charms and amulets and masks with strange bird-like beaks that were stuffed with aromatics. But was that any weirder looking than the biohazard gear that Ebola workers currently wear?

Every plague had its chronicler. I’ve already mentioned that in the time of Justinian it was Thucydides. During the Black Death in 14th century Florence it was Boccaccio. In his famous work the *Decameron* ten people fearing for their lives who were camped out in church decided to pass the time by each telling one story every day for 10 days – the result was 100 tales, the *Decameron*. Later writers whom I’ll mention included the likes of Daniel DeFoe and Albert Camus. But the most famous description of all was contained in the beloved nursery rhyme *Ring Around the Rosie*:

*Ring around the Rosie,
A pocketful of posies,
Ashes, Ashes,
We all fall down.*

Presumably the ring around the rosie referred to the plague’s typical red rash; pockets full of posies -- the practice of carrying sweet-smelling flowers in pockets both to keep away the disease and the stench; ashes were the results of cremation and “we all fall down” needs no explanation.

The most detailed account of The Great London Plague of 1665 was a journal written by Daniel DeFoe, the author of *Robinson Crusoe*. It was

supposed to have been a daily journal of his own experiences, but at the time of the Great Plague DeFoe was only a small child. In fact, he wrote his memoir some fifty years later knowing that it would be a guaranteed best-seller at a time when Londoners feared that still another epidemic was coming their way. In it he described a mass exodus of some 200,000 wealthy people out of the city. They included the medical elite -- but the departing Royal College of Physicians was kind enough to leave for those remaining behind a manual called "Certain Necessary Directions for the Prevention and Cure of the Plague" -- and, presumably, good luck! Among their suggestions was for shut-ins to think pleasant thoughts of gold and silver rather than to brood about death. Tobacco was thought to be protective so schoolboys were forced to smoke -- and those who disobeyed were flogged.

During the London Plague, for the first time statistics ("Bills of Mortality") were kept about the numbers who'd died each week and, in time, these tallies evolved to our present-day death certificates. Defoe described how church bells tolled incessantly, how the stench was overwhelming, how fires burned everywhere to clear the air. Madmen roamed the streets predicting doom. There were campaigns to exterminate all cats and dogs but this was counterproductive because cats and dogs killed rats which carried the fleas -- but what did they know? So the rats were ignored, anyway there were just too many of them. Along with their families, sick people were locked in their houses which were marked by a red-cross. Windows and keyholes were plugged to keep the evil miasma (bad air) from escaping. Municipalities and churches provided medical supplies and food which were passed through a window by special couriers. Many people objected to being taxed to pay for those who were locked in the pest houses -- after all, it was their problem. As Samuel Pepys wrote in his diary, "the plague makes us cruel as dogs to one another."

The last great pandemics in Europe came in Marseilles in 1720 and in Moscow in 1771. In 1894 there was a pandemic limited to China -- whereas The Black Death had killed about 25 million people over five years, about one third of Europe's population, the Chinese pandemic "only" killed about 13 million out of a much larger population. In 1924 there was a mild rat-related outbreak in Los Angeles and even today there are reports of sporadic cases carried by infected bats in desert areas in the American West. Also, in recent years it's reemerging in Asia and Africa where several thousand new cases are reported to WHO every year. However, the modern strain of the bacterium is less virulent and less infectious than in the past.

In 1894 the organism which caused bubonic plague was discovered almost simultaneously but separately by two scientists both working in Hong Kong. One (Shiba Kitasato) was a Japanese student of Koch while the other was a Swiss student of Pasteur. And in time the germ would be named after one of them Dr. Alexander Yersin as *Yersinia pestis* (it used to be called *Pasteurella pestis*) who discovered that although it was carried by rats it was transmitted by fleas. There were two major bacterial variants – the most common form was bubonic plague, the less common but more lethal form (100% mortality) called pneumonic plague. It was the only type that could be transmitted directly from human to human via droplets of sputum -- people died so quickly that they didn't have time to develop buboes. The bubonic form required a bite from the insect vector and let's not forget that mosquitoes and other insects also transmit malaria, yellow fever, dengue, West Nile Fever, Lyme Disease and many other diseases. DDT wasn't discovered until World War II and soon was being widely used in agriculture. Many insects developed resistance and in 1962 Rachel Carson's book "Silent Spring" emphasized the potential harm of indiscriminate spraying on the environment.

THE WHITE PLAGUE

As I've said, tuberculosis often was called "the white plague" long before anyone knew about the tubercle bacillus. TB wasn't transmitted by fleas but human to human through droplets spread by coughing or sneezing. Before milk was pasteurized there also was a form called bovine tuberculosis. For centuries the disease was known as consumption or phthisis until in 1882 Robert Koch discovered the tubercle bacillus which is officially called mycobacterium tuberculosis. There are other kinds of mycobacterial diseases, e.g. leprosy, but although even now roughly one third of the world population are infected, only about one tenth of them develop clinical disease.

The name White Plague referred to the fact that patients characteristically appeared pale and the term consumption was used because they literally were wasted by the disease. Unlike black plague, the white plague was a chronic disorder which seemed to attack just one person at a time. The symptoms could be subtle or entirely absent -- perhaps only a pallid complexion or flushed face, night sweats, a persistent cough, specks of blood on the pillowcase. It could last for years, even decades, and conventional wisdom was that there was a hereditary predisposition that was provoked by such things as bad air, early marriage, strong liquor, tight lacing, too much or too little exercise, lack of sleep, ill-fated love, self-abuse, winter winds, living in cellars, vampires. Last month an article in the NYTimes cited recent DNA evidence suggesting that TB originated in Africa less than 6,000 years ago and was carried across the Atlantic to South America by infected seals where it crossed over into humans.

Between the 13th and 18th centuries, it was believed that scrofula, the form of TB which involved swollen lymph nodes, could be cured by the king's "Royal Touch" especially when such standard treatments as the blood of a weasel or a dove's dung had failed. French kings were enthusiastic touchers (as we discussed in another context last week) but during the 17th

century Charles II of England was the champion – he was said to have touched more than 90,000 sufferers during his long reign. Unfortunately, then they didn't keep records of the outcomes back then and no one had ever heard of double-blind studies.

In his book about Emily Dickinson, George Mamunes told how when Frederic Chopin was diagnosed with the disease in 1838 he was sent to Majorca for the mild climate. The French didn't believe that TB was contagious but the locals thought differently -- so when they discovered that he was consumptive they wanted nothing to do with him. Chopin tried to hire a carriage to Palma where he could board a ship home, but no one would carry him – so he had to travel by wheel barrow. Then, as his companion George Sand wrote, “We boarded the only steamship that comes to the island and which is used to transfer pigs to Barcelona. There was no other way to move out of this wretched country. At the time of leaving the inn in Barcelona, the innkeeper wanted us to pay for Chopin's bed under the pretext that it was infected and that the police had ordered burning it.” When I tried to confirm this story, I found that it differed considerably from the conventional narrative of Chopin's life, but even if the Chopin story is inaccurate, its true that differences of opinion about cause and susceptibility persisted -- even some four decades later when Koch's animal experiments confirmed that the disease was contagious, even he believed that what he called “the seed” wouldn't cause disease unless the “soil” was receptive – in other words that certain people – like Emily Dickinson -- were predisposed – and perhaps they are.

Of course, novels and operas were filled with gaunt, coughing, slowly dying consumptives. There were all the characters on Thomas Mann's *Magic Mountain* and Little Eva in *Uncle Tom's Cabin* and perhaps Jane Eyre. TB wasn't perceived as repulsive or immoral; in fact, somehow it was ennobling, its victims were long suffering – like Violetta in *La Traviata* and

Mimi in La Boheme. Some believed that consumption heightened the senses and spurred creativity. Among the literati thought to have TB were the likes of Kafka, Keats, Shelley, Browning -- Jane Austen, Robert Louis Stevenson, D.H. Lawrence, Edgar Allen Poe --Thoreau, Whittier, Chekhov, Moliere, Balzac. And those were just the writers

Lacking any effective treatment, during the 1830s consumptives went to sea as sailors or whalers or voyagers. During the 1860s they went west to farm, or pan for gold, or to live a strenuous outdoor life. During the 1870s the emphasis shifted – at least for those with advanced disease. The sanatorium movement began in Europe based on the principle that TB could be treated by rest, fresh air and plenty of sunshine and resorts flourished in the mountains of Switzerland and the pine forests of Finland. Life in the sanatoria was tightly regulated by the medical staff and the chief administrator was called the Superintendent -- that was an apt term because he closely supervised every aspect of life within his domain. Patients were virtual prisoners, they were there to follow orders. Nevertheless there was an illicit underground culture -- breaking rules, covert sexual alliances -- read *The Magic Mountain* for details about the culture of death that prevailed in sanatoria. Dr. Edward Trudeau claimed to have cured his own tuberculosis by living outdoors and in 1894 opened his own sanatorium in Saranac Lake. Wealthy patients flocked there from all over, lived in so-called “cure cottages” and sat outside in specially designed Adirondack chairs for hours every day and in all seasons.

In this country during the 19th and early 20th centuries, TB was responsible for about one in five deaths - rich and poor, in city or farm, young and old -- nearly half died, more than 100,000 every year – not all at once but one at a time -- and it remained the leading cause of death until early in the 20th century. When it was finally proven to be contagious, the government became actively involved in prevention – there were mandatory chest X-

rays, child-labor laws, pasteurization of milk, etc. Also it was necessary for all people, not only patients, to take responsibility for their general behavior – for example: not spitting in public places and being frugal and disciplined. In truth, the slow decline of TB probably owed more to public health measures, housing reform and slum clearance than to medical interventions at least until 1945 TB with the discovery and availability of streptomycin and other effective antibiotics.

In 1906 New Jersey passed legislation which permitted counties to establish their own isolation hospitals and sanatoria and for many years I worked at one of them -- Bergen Pines County Hospital in Paramus. During the 1920s and 30s about 80% of the patients who were treated there had TB. They stayed an average of about 200 days although chest specialists advised three or four years for best results. However, few patients could tolerate the program and many signed out before they were considered “cured.” Although the healing properties of sunlight had been proclaimed for thousands of years, with the advent of electricity, seemingly nature could be improved upon by using high power ultraviolet lamps. At Bergen Pines dozens of patients lay on parallel litters, their bare bodies exposed to the bright light while wearing goggles to protect their eyes. These were so-called “sun-starved” children from inner cities who had positive skin tests but no symptoms yet. They were admitted to a special unit called the “Preventorium” where every day they received “heliotherapy” lying under sun lamps in order to boost their resistance. Afterward they no longer looked pale but I wonder how many of them later developed skin cancer. There was no follow-up.

Nowadays the sanatoria either have been closed or converted for other purposes, but there still are about 15,000 new cases of TB in this country each year and although its treatable, new resistant strains have emerged which effect immune deficient patients, especially those with AIDS. And

epidemics continue in third-world countries, such as Nepal and rural Russia, where TB still kills about two million people a year.

Now let's shift our attention from black and white plagues to what in England sometimes was called "the red plague" -- or more commonly "the Pox." The word pox refers to the characteristic pustular rash which often left disfiguring scars -- you may remember that George Washington's face was said to be pockmarked although you wouldn't know it from looking at Gilbert Stuart's portraits. So was Joseph Stalin's face. I bet you didn't know that Abraham Lincoln developed a mild case of small pox, probably from his son, and was quarantined for three weeks just after delivering the Gettysburg Address. The designation SMALL Pox was first used in the 15th century to distinguish it from the equally worrisome GREAT Pox -- or syphilis -- about which I'll speak next. A more familiar term for the disease during the 18th century was "variola" which was derived from a Latin word meaning "spotted" or "pimple" and, indeed, the rash looked much like chicken pox.

In fact the story of immunization goes much further back. Inhalation or injection into the skin of fresh small pox material seems to have been practiced in China and India as early as the 10th century. It was common knowledge that survivors of small pox didn't have recurrences and inoculation of pus from a sick person could prevent a healthy person from contracting a serious case. The procedure known as "variolation" was introduced into the Western world because of a remarkable woman, Lady Mary Wortley Montagu. She was brilliant and beautiful and almost died at age 26 from a severe case of smallpox which left her badly disfigured. In 1717 her husband, who was hardly her match in cleverness, was appointed England's ambassador to Turkey and as soon as she arrived in Istanbul, Lady Montagu learned the language and became a fixture in court society. She was surprised to learn that the locals had no fear of small pox for there

was an ancient custom of injecting children with pus from people with mild disease and, although they developed symptoms, none died or was scarred. So Lady Montagu had her three year old son inoculated and when she returned to England in 1718, she did the same for her daughter. She was quite a gal and soon her influential friends at court followed suit.

Three years later, in 1721, an epidemic broke out in Boston when a ship from the West Indies landed carrying several crew members with small pox -- and within a few months about half of the city's 12,000 citizens became ill. The slave of Rev. Cotton Mather, the famous burner of witches, told his master about a method of inoculation used by African natives. Mather sent a letter to Boston's medical society -- all twelve of them -- but they denied that anything could be learned from heathens. However there was one willing doctor -- Zabdiel Boylston who tried the method on his own family. There nearly was a riot, a grenade was thrown through Cotton Mather's window, but before long many people voluntarily lined up to be variolated. They all developed mild symptoms but usually recovered and within a few weeks Boston was described as "one large hospital." Boylston was accused of being an illiterate fool, a murderer and worse -- but he kept careful records and reported that only 6 of 242 of his patients died, about 2%, compared to 14% mortality for those untreated.

Some fifty years later, during the Revolutionary War there was still another outbreak in Boston and those infected were sent to pest houses. If they refused, their yards were fenced in and red warning flags hung outside. Again there was a rush to inoculate. Abigail Adams wrote to her husband in Philadelphia that "all the little folks are very sick and puke every morning but after that they are comfortable." General Washington feared that the epidemic might be deadlier than British swords and risked having his soldiers variolated even though they'd be temporarily out of action. Unaware, the British didn't take advantage. During the years of the

Revolution about 130,000 people (including native Americans) died of small pox compared to about 25,000 due to military casualties – five times more from the pox than from the war. Soon variolation became wide spread. In West Nyack in 1793, a local resident Tunis Smith wrote in his diary, “I was Nocolated for the small Pocks by Dr. Abm. Cornelison.” But before long use of live smallpox pus was replaced by another method. Many of you are familiar with the story of how Dr. Edward Jenner in 1796 found a young dairymaid who’d caught cowpox from a cow called Blossom. He inoculated material from fresh lesions on her hands into the 8 year old son of his gardener and the boy then developed mild fever and rash. But about 2 months later when he was reinnoculated with pus from a fresh smallpox lesion, no disease ensued. He was immune. The rest is history – and our upper arms may show evidence of it.

Skipping ahead about a century, in 1900 smallpox broke out in New York’s tenements. There were more than a thousand cases and over 400 deaths and Health Commissioner Ernst Lederle was sent to Europe to learn new methods of prevention and treatment. When he returned he set up an emergency force of 200 vaccinators who, accompanied by policemen, vaccinated more than 800,000 people within six months. Lederle fell out of political favor with Tammany but found business opportunity on a farm in Pearl River where he began manufacturing vaccines, then vitamins and much later antibiotics which we’ll discuss next month when we consider Rockland County’s medical history. The last reported naturally occurring case of smallpox in this country was in 1949, and the last in the world was in Somalia in 1977. After the disease was eradicated here, routine vaccination was stopped in 1972, but enough vaccine was stockpiled to cover everyone in case of a future emergency.

GREAT POX. Although there are skeptics, there’s a plausible theory that syphilis, once called the Great Pox, was introduced into Europe by

members of Columbus's crew who contracted it from natives on Haiti. The Admiral himself may have been a victim and some think that he died of it. When they returned home in 1493, with "more sickness than gold," some sailors became mercenaries in the French army of Charles VII when they invaded Naples. The Italians surrendered without a fight but got more than they bargained for. After their surrender, there was general carousing -- and then the French army dispersed to spread their spirochetes throughout Europe. Very quickly there was a devastating outbreak of the Great Pox.

There was paranoia and xenophobia about who was to blame: of course the Italians called it French Disease while the French called it Neapolitan Disease -- and as the calamity spread, the Spanish blamed the Dutch, the Russians blamed the Poles, Tahitians the British, Japanese the Chinese, the Vatican blamed the Jews and the Turks called it "The Christian Disease." Syphilis was the name of a shepherd who was the hero of a popular poem written in 1530 by the Italian physician Fracastoro. In it Syphilis was smitten with the disease after he had defied the Gods. Doctors used to refer to syphilis as *Lues* -- derived from the Latin word for plague and the spirochete that we now know as its cause is called *Treponema pallidum*.

The symptoms were dramatic-- rash, ulcerations, deformities, excruciating pain, boils and buboes, even death. During the 15th and 16th centuries the symptoms of syphilis were far worse than what later centuries came to know, or what had occurred before. One theory is that a relatively benign bacteria which caused a non-venereal disease called yaws mutated to a highly virulent form which Columbus's men brought home. Probable sufferers among the musical, artistic and literary worlds included the likes of Schubert, Schuman, Donizetti, Maupassant, Flaubert, van Gogh, Gauguin, Goya, Wilde, Heine, Beethoven, Joyce, Nietzsche. And then there were the bad guys: Hitler, Mussolini, Lenin, Ivan the Terrible, Al Capone.

Doctors called syphilis “The Great Imitator” because it could simulate almost anything and because the worst effects of tertiary syphilis might not appear for twenty or thirty years, some have called it “the hidden plague.” Naturally its victims were subject to other sexually transmitted diseases as well. For example, in his famous diary James Boswell proudly described having seventeen instances of “the clap” – gonorrhea -- and it seems likely that such a sociable fellow, also might have contracted syphilis in someone’s bed and not known about.

It’s unclear why the virulence of certain germs change over time. Syphilis and leprosy which were horrible in their time seemed to lose steam long before there were effective treatments available. On the other hand, as we’ve already seen, plague could go underground for long periods and then burst forth seemingly for no accountable reason. The first treatments for syphilis employed mercury which wasn’t particularly effective but at least you knew you’d been treated because your teeth and hair would fall out. Then in 1905 Paul Ehrlich discovered what he called Salvarsan or “606” or “the magic bullet” (arsphenamine.) It was less toxic than mercury and was about all there was until penicillin came along during World War II – and that changed everything.

CHOLERA

If Plague dominated the 14th through 17th centuries and small pox and yellow fever the 18th, the bacterial superstar of the 19th century was Cholera – some called it “the blue terror.” Although TB peaked about the same time and killed more people, was a chronic disease while cholera could lay out a healthy person within hours. The word cholera is derived from the Greek word for bile. Cholera was spread by swallowing fecal matter on unwashed hands, uncooked fruits or vegetables or contaminated raw fish. Its onset was spectacular – vomiting, diarrhea, dehydration and death – people who were well in the morning often were gone before night. It couldn’t be

romanticized like with the lingering debility of tuberculosis, but sometimes cholera was used as a literary backdrop such as in Thomas Mann's novella *Death in Venice* - or at the end of Garcia Marquez's *Love in the Time of Cholera*" (1985) when the long separated lovers are reunited late in life and cruise down the river as the only passengers on a ship supposedly infected with cholera – they'd bribed the captain to fly the yellow flag of cholera so no one else would come on board to disturb them. They couldn't land at any port – and as the book and the movie end they sail on together – infected with love.

Before the 19th century there'd never been a large epidemic outside of the Far East, but beginning in India in 1817, it spread westward. English doctors who were aware that patients became severely dehydrated, in 1833, for the first time in history, began injecting large volumes of saline solution directly into veins – sometimes with dramatic but only temporary results. The English public distrusted doctors who they believed were killing patients in order to study their bodies and there were "cholera riots" in several English cities. There also were riots against government restrictions in Russia and Germany where quarantine methods did no good because it wasn't transmitted from person to person like with pulmonary plague or small pox. Cholera appeared cyclically during the 1830s and 40s and then again in 1866, each new outbreak less severe than before, and then it finally disappeared for good – except, of course, in the Third World.

The most dramatic medical breakthrough came in 1854 when there was a ferocious epidemic in the SoHo section of London. Within the first three days 127 people died and within two weeks fatalities reached 500 – all within a few blocks. A neighborhood doctor by the name of John Snow didn't accept conventional wisdom that cholera was related to bad air – or miasma – he suspected that it was due to bad water. Like a medical Sherlock Holmes, John Snow questioned all the locals and carefully

mapped where each victim lived or worked – and every case could be traced to a single pump. What became famous as “The Broad Street Pump,” provided drinking water for the whole neighborhood and was located just three feet from an overflowing cesspool. Dr. Snow was an unknown who hadn’t attended the best schools, so medical authorities were slow to accept his idea – but it couldn’t be denied that the epidemic was snuffed out as soon as the pump’s handle was removed.

John Snow’s investigations helped lead to improved water supplies and today he’s credited as being “the father of epidemiology.” When he examined water from the pump under his microscope, Dr. Snow described white particles but couldn’t explain them. Cholera epidemics in England led to what became known as the Sanitary Movement led by a lawyer by the name of Edwin Chadwick. His idea was scientifically flawed because it was based on Galen’s ancient theory of polluted air (miasma) from decaying organic matter -- but the result was positive since it combatted the filth that accompanied the Industrial Revolution with its urbanization and overcrowding. Cholera epidemics profoundly altered social conditions so that by the mid 19th century sanitation had become a matter of public interest which eventually led to city planning (Paris), sewers and plumbing, parks and open spaces. The end result was better health -- sanitation being far more important than scientific advances.

It wasn’t until 1883 when Robert Koch, directing a German commission in Egypt and again the next year in Calcutta, isolated the bacteria which he called *Vibrio comma*. Everyone is vulnerable to cholera but the malnourished more so and although today cholera is easily treated with hydration and antibiotics, there continue to be several million cases worldwide each year, with more than 100,000 deaths, mostly in Africa and India. There hasn’t been an active case in this country for nearly a century, but you’ll recall there was an outbreak in Haiti in 2010 after the earthquake.

TYPHOID was another common cause of lethal diarrhea or enteric fever. During the Civil War it was the leading cause of death because of unsanitary food preparation. No rat fleas or mosquitoes were necessary for transmission -- it was said that during the war “beans killed more than bullets.” Everyone has heard of “Typhoid Mary.” Her real name was Mary Mallon and she was an Irish cook for wealthy people in the New York City area. She frequently changed jobs -- and names -- and wherever Mary went, sickness (not sheep) was sure to follow -- and some people died from it. Although Mary had no symptoms, she was a carrier -- presumably the reservoir was her gall bladder and she passed the germs per rectum. She rarely washed her hands while cooking thinking that it wasn’t necessary. Although she was told to stop cooking or to have her gall bladder removed she did neither and kept right on. In 1907 she was forcibly quarantined on North Brother Island in the East River (near Riker’s Island.) But after three years Health Commissioner Lederle took pity and released her with the warning to find another profession. Once again Mary assumed aliases and for six more years kept on doing what she knew best -- and with the same result. She was tracked down again, sent back to the island where, after a total of 26 years in isolation, she died in 1932. She was a celebrity in her unique way, and to some people she was a symbol of governmental undermining of individual liberties -- an uneasy dynamic which even today we see being acted out in West Africa.

TYPHUS sounds like Typhoid doesn’t it? In fact, it should be the other way around -- typhoid sounds like typhus because the suffix “oid” in typhoid means “like” -- like typhus -- but the two diseases are NOT at all alike -- they present differently and they’re due to different bugs. Earlier I mentioned Hans Zinsser’s book *Rats, Lice and History* which he called a “biography” of typhus. Typhus is caused by a Rickettsia which, like plague,

is carried by rats -- but here it's not infected fleas that transmit the germ to man but wingless mites or lice that don't fly but crawl -- and bite. Body lice are prevalent in crowded, filthy places like prisons and concentration camps -- Anne Frank died of typhus at Bergen Belsen and immediately after the war ended, survivors of Theresienstadt were almost wiped out by it. In 1892 there was an epidemic which was traced to a single ship bearing Russian immigrants after a rough 28 day crossing. No one knew the cause except that it was brought in by those dirty Jewish immigrants so they all were rounded up and quarantined, most of them sent to Riverside Hospital on the same dismal North Brother Island where Typhoid Mary soon would be incarcerated.

Typhoid, typhus, cholera, yellow fever, small pox all stirred nativist fears about the nation's ethnic makeup and about the limitations of scientific medicine. Public health reforms began with increased scrutiny of the mental and physical health of arriving immigrants -- keeping the sick out. Of far less concern was the effect of quarantine on those kept in enforced isolation. In 1947 a novel called *The Plague*, written by Albert Camus, described how forced quarantine during an epidemic of bubonic plague tore at the social fabric of a North African community. And now life is imitating fiction in West Africa. Airlines have canceled flights in and out, borders are closed, economies damaged, supplies dwindling and hysteria taking hold.

I haven't even mentioned the famous 1918 flu pandemic which was due to a subtype of the influenza virus (H1N1) which reemerged in 1976 as "Swine Flu"-- because its reservoir was in pigs; and then a few years later was followed by "Bird Flu" or Avian Flu (H5N1.) Soon we should all be getting our annual flu shots -- and what of some of the others that still endanger us? You may have heard that measles is making a comeback. A vaccine developed in 1966 virtually eliminated it -- in fact, in 2000 measles was

declared to have been eliminated in this country. But now 10% of parents choose to delay or altogether skip their children's immunization shots because of misinformation about possible side effects, especially autism with the MMR vaccine against measles, mumps and rubella. So now measles is back and so far this year there've been 16 outbreaks in this country with more than 560 cases, all related to non-vaccination. There've been no deaths yet but measles can be lethal if there's no immunity – ask the American Indians. In the undeveloped world the WHO estimates 14 deaths every *hour* in small children! There's no validity to the hysteria about autism which began in 1998 based on what turned out to be fraudulent claims of twelve cases reported to be due to the combined measles, mumps and rubella MMR vaccine. Numerous large epidemiological studies have failed to show any association but too many people believe what they want to believe.

Polio crested in the early 1950s, then declined dramatically when polio vaccines were available. But polio is not dead yet. Last year there were 24 reported cases in seven countries and so far this year that number has risen five fold to 117. When the Taliban forbade polio vaccinations and murdered dozens of health workers in Pakistan, the virus spread to neighboring Afghanistan and now India also is threatened. The Taliban claims that it's all a western plot to undermine Pakistan and parents are reminded that American intelligence faked a vaccination program in the search for Osama bin Laden. Should we worry? It's been suggested that failure to eradicate every case will cause the polio virus to proliferate wildly so that within a decade the whole world would be at risk again. A few weeks ago the NYT reported that fighting between Pakistan's army and the Taliban has disrupted the vaccination war against polio and

We first learned about Ebola virus in 1976 – a few years before that there was the related Marburg virus and something called Lassa fever. The first

signs of fever, weakness and vomiting resemble malaria, or cholera or typhoid, but after several days there may be generalized bleeding and the mortality rate sometimes approaches 90%. The first cases this year broke out in West Africa, possibly after one person was bitten by an infected bat, and by now more than 4,000 people have been infected with about half of them dying. Many natives, fearing that aid workers from groups like Doctors Without Borders were spreading the disease, prevented health teams entry into villages and resisted efforts at quarantine. There's been major economic and political fall-out in the five effected countries. When aid workers show up in rural areas, they're totally covered in weird looking biohazard suits and lecture the villagers about what little can be done in the bush – such as hand-washing and not handling the dead and dying because the disease is spread by touching blood, urine, sweat or saliva. By now the few hospitals and crude aid stations have been overwhelmed and are having trouble retaining or recruiting workers.

At the onset several doctors and many nurses and health workers got infected and some died -- two American missionaries were flown home and received an experimental serum which contained four kinds of monoclonal antibodies but its not clear whether or not this actually helped. Its been suggested that certain drugs commonly used for cardiovascular diseases (statins, ACE & ARB inhibitors) may prevent endothelial damage caused by the virus which lead to bleeding and organ failure but, again, it's too soon to know whether they really work. It's unlikely that this outbreak will be an encore of what happened to the Aztecs and Incas and North American Indians because it doesn't spread by casual exposure and it's not air-born or carried by insects. But like with any virus, Ebola could mutate which could change everything. WHO predicts that the outbreak will get worse over the next six months before it can be brought under control – and they estimate that more than 20,000 people may get infected. In fact, the actual number of cases may be much higher than what's been reported so far.

The incubation period is 21 days and it would take two cycles – or 42 days – with no new cases before it can be said that the outbreak is over.

A particularly scary op-ed article appeared in last week's NYTimes by Dr. Michael Osterholm (Univ. Minnesota, Sept. 12) titled "What We're Afraid to Say About Ebola." In the first sentence he says that what's happening now in West Africa has "the potential to alter history as much as any plague has ever done." He suggests that there are two possible scenarios that should keep us up at night. The first is that the virus could spread from remote villages to dense cities where isolation would be impossible and it quickly would be out of control. The second is that mutation may alter the virus's transmission from only by direct contact with body fluids to air borne – then, like with pneumonic plague or small pox or influenza just breathing may cause infection. That would be a catastrophe and this doctor says that the risk is real. He suggests a massive world-wide effort, far more than what's happened so far – to establish coordinated administration and committing huge increases in supplies and personnel. He concluded, "If we wait for vaccines and new drugs to arrive to end the Ebola epidemic, instead of taking major action now, we risk the disease reaching from West Africa to our own backyards. How does that make you feel?"

While Ebola is this year's big worry, in 2003 SARS (severe acute resp. syndrome) appeared in dozens of Asian countries and killed more than 700 people. Then in 2012 Middle East Respiratory Syndrome (MERS) appeared in twenty countries with about one third of more than 700 cases dying. SARS and MERS are due to coronaviruses which may be transmitted to man by infected bats and can be spread through the air human to human. In 1984 when AIDS was found to be due to HIV (human immunodeficiency virus) it was suggested that crossover from chimpanzees to man may have occurred in the early 20th century.

This summer there've been other headlines besides Ebola. The last naturally occurring case of anthrax in this country was in 1976, but this July the NYTimes (7/1/14) reported that about 75 lab workers at the CDC were accidentally exposed to anthrax spores. There's a very small risk for a similar accident with other infectious agents but this summer there were reports of lax safety standards at other labs. In 1978 a laboratory mishap spread virus to a ventilation system where it infected and killed a man and earlier this year, several vials of live small pox virus were found in an abandoned storage room at the NIH. There continues to be debate about what to do with the last two known vials of small pox vaccine in the world? Should they be destroyed or saved to make vaccine?-- just in case. The most common cause of acute gastroenteritis in this country is norovirus. The CDC estimates that each year it causes about 20 million illnesses, not just on cruise ships, and contributes to more than 50,000 hospitalizations and more than 500 deaths. Touching surfaces or objects contaminated with norovirus then putting fingers to the mouth is all that it takes. A recent study found that within two to four hours after office workers touched a contaminated doorknob, the virus could be detected in about 50%. By contrast, there were only about 20,000 confirmed cases of Lyme Disease last year, all contained within 13 states – but although we all check for ticks after we walk in the woods, how many of us worry about touching doorknobs?

And let's not forget that the old "white plague" tuberculosis is still around. In 2012 about 2 billion people in the world were infected with nearly 9 million active cases and about 1.3 million deaths, second only to AIDS, at 1.6 million, as the leading cause of death among infectious diseases. Moreover, multi drug-resistant TB is on the rise with around 500,000 new cases worldwide each year -- In the United States, out of about 10,000 cases of TB in 2012, only 83 were drug-resistant – a very small number but that could rise. Responsibility for TB control is divided among more than

2,600 state and local agencies which is a recipe for inefficiency and cut-backs in funds for preventive programs. Most cases involve poor migrant workers, prisoners and AIDS patients and the homeless – none of whom have political lobbies arguing for them. Early in the 20th century health departments locked up patients with TB whose behavior posed a public health threat. Even after antibiotics were available, involuntary confinement was practiced and authorities still occasionally incarcerate patients who for whatever the reason won't take their medications. Usually it takes about two weeks after treatment is started before patients no longer are contagious.

Epidemics of plague and cholera may be past history, but if bacteria or viruses mutate, they can develop renewed virulence or change their behavior. Everyone knows that the influenza virus is constantly changing so each year vaccine manufacturers have to scramble to keep up. And of course, with airplane travel bad bugs from distant lands can cross the earth in hours -- rather than taking months in sailing ships. An outbreak anywhere, is a risk everywhere, so there's no place for complacency. I'm sure you've all heard Santayana's caveat that he who does not learn from the past is destined to relive it. So in the context of this talk, we might say that he who does not learn from the PEST (sorry, I couldn't resist) – or, from plagues and pox – may suffer the consequences.