



NSF GK-12 Graduate Fellows Program

Award # DGE-0139171

University of North Carolina at Wilmington

Pandemics and Epidemics

Reading Material to Accompany Activity

by

Melissa Ernst, Department of Biological Sciences

Pandemics and Epidemics

Background:

Epidemic:

An outbreak of a disease that affects many people in a confined region

Pandemic:

An outbreak of a disease that affects a large number of people in a number of countries: an “everywhere epidemic”

Transmission:

The transmission of diseases causing epidemics and pandemics include (and are not limited to) physical contact, share of common breathing spaces, transfer of body fluids, transfer from one organism to another (ex: insect to human), etc.

Famous epidemics:

Bubonic Plague-

- In 1330, an outbreak occurred in China
- The following year it reached England
- Carried by fleas infesting rats
- Plague died out every winter and returned every spring
- 5 years later, 25 million were dead (1/3 Europe’s population)
- Total death toll- 137 million

*The last bubonic plague occurred in 1997 in Zambia, Africa

Information on Bubonic Plague:

http://home.nycap.rr.com/useless/bubonic_plague/

Smallpox epidemic of the 1770’s-

- Killed 30% of Native American population in the NW
- Coincided with first contact with the Europeans
- Disease eradicated from most countries in 1980

Transmission:

Smallpox passes through the air in droplets discharged from the nose and mouth. It spreads from the lungs of an infected person into the lungs of a susceptible person. Smallpox can survive years on the clothing and bedding used by smallpox victims.

-Smallpox and the Cherokee:

<http://www.merceronline.com/Native/native03.htm>

-Intentional exposure of smallpox during French War:

<http://bt.rti.org/His1763.html>



“Incident Summary: *During the French and Indian War (1754-1767), Sir Jeffrey Amherst, commander of British forces in North America suggested deliberate use of smallpox to “reduce” the Native American tribes hostile to the British. In June 1763, Amherst wrote to Colonel Henry Bouquet, commander of British forces in Pennsylvania, suggesting it “be contrived to send the smallpox among those disaffected tribes of Indians” threatening Fort Pitt. Bouquet had been notified by Captain Simon Ecuver of a smallpox outbreak inside Fort Pitt in early June. On June 24th, Ecuver noted that two blankets and a handkerchief from the fort hospital had been given to the Indians outside the fort and Ecuver further wrote, “I hope it will have the desired effect.” By the following spring, a smallpox epidemic spread among Native American tribes in the Ohio River valley.*

Clinical Notes: *Whether the infected blankets contributed to the subsequent epidemics is uncertain. Smallpox epidemics had been occurring among naive tribes of Native Americans for 200 years prior to this incident and other contacts between colonists and Native Americans may have contributed to the epidemics. In addition, transmission of smallpox by fomites (blankets, handkerchiefs) is inefficient compared with respiratory droplets transmission.”*

Influenza of 1918-1919

- Occurred after WWI
- Originated in US
- In 1 year, 20 million cases reported, accounting for 1 million deaths

Chronicle:

- Start: March 11, 1918 Camp Funston, Kansas
 - 12 p.m.- 107 sick
 - Day 2- 522 sick
 - Week one- found on isolated islands including Alcatraz
 - Week one- every state in US affected
 - April- French troops infected
 - Mid-April- cases reported in China and Japan
 - May- cases reported in Africa and South America
 - Disease peaked after 2 weeks in any given city
 - 18 months later the epidemic ceased

<http://www.pbs.org/wgbh/amex/influenza/timeline/index.html>

- In Philadelphia, 158 out of every 1,000 died. Baltimore- 148 out of 1,000 died. Washington, D.C.- 109 out of 1,000 died.
- Death toll in US- 850,000
- Worldwide death toll- 25 million

-Refer to graphs included for data presentation

-There is a movie available through PBS entitled “Influenza 1918”

Influenza facts:



- Commonly called the "flu" - is one of the oldest and most common diseases known to man
- First described by Hippocrates in 412 BC
- An acute respiratory illness caused by influenza viruses A and B
- Comes in seasonal epidemics

Symptoms:

fever (often higher in children), cough, sore throat, runny or stuffy nose, headache, muscle aches, and often extreme fatigue. Most people recover completely within 1-2 weeks. However, compared with other viral respiratory infections like common colds, influenza causes more severe complications such as pneumonia, particularly in children, elderly people and other vulnerable groups

Influenza article with links:

<http://www.stanford.edu/group/virus/uda/>

Polio Epidemic-

- Longest recorded epidemic from 1942-1953
- In 1952, 57,600 Americans were living with the disease
- Has been eradicated from several countries while remaining highly active in others

-A map of 2002 polio cases is included at end of document

<http://www.polioeradication.org/all/global/default.asp>

-Background on Polio:

Poliomyelitis is a virus, which is an infectious acellular organism with a protein coat and a single type of nucleic acid. It uses the nutrients of other cells and is only capable of reproducing within living host cells. Viruses are microscopic organisms and can only be seen by electron microscopes. They are incapable of moving by themselves and must be carried to the body by air currents then by body fluids to the cells they then take over.

The virus has a marked tendency to cause debilitating or fatal illness by affecting the nervous system.

<http://www.uthscsa.edu/mission/fall94/polio.htm>

Ebola-

- One of the most virulent viral diseases known to humankind, causing death in 50-90% of all clinically ill cases. The disease has its origins in the jungles of Africa and Asia.
- Transmitted by direct contact with the blood, secretions, organs or semen of infected persons
- Has also occurred by handling ill or dead infected chimpanzees



-Characterized by the sudden onset of fever, weakness, muscle pain, headache and sore throat. This is followed by vomiting, diarrhea, rash, limited kidney and liver functions, and both internal and external bleeding
-Was first identified in a western equatorial province of Sudan and in a nearby region of Zaire in 1976

Ebola Epidemic of 2001-

- Appeared in a village in Africa
- Quickly spread to 3 neighboring villages
- 14 dead
- 2000 Uganda outbreaks:

<http://www.uct.ac.za/microbiology/ugandaebola.htm>

-Ebola simulation program:

<http://www.shodor.org/master/biomed/epidemo/sir/runsir.html>

<http://www.who.int/emc/diseases/ebola/ebolapic.html>

Origin of pandemics:

<http://www.who.int/emc-documents/influenza/docs/index.htm/sec9.htm>



The Birmingham Cholera Epidemic of 1873

The following article is taken from *Cholera Epidemic of 1873 in the United States. The Introduction of Epidemic Cholera Through the Agency of the Mercantile Marine: Suggestions of Measures of Prevention*. Washington: Government Printing Office, 1875. (pp. 109-114). Included in this work is a section on the cholera epidemic which ravaged and nearly destroyed the young city of Birmingham, Alabama in 1873, together with a [full-page map](#) which has been described as "one of the earliest published maps of this city." The author of the article, Mortimer H. Jordan (1844-1889) was secretary of the Jefferson County Medical Society of Birmingham, Alabama in 1873 (during the epidemic) and later president of the Jefferson County Medical Society (1881-1883).

JEFFERSON COUNTY

CHOLERA AT BIRMINGHAM, ALA., IN 1873

BY M.H. JORDAN., Member of the Board of Health

In reporting a history of the recent epidemic of cholera as it prevailed at Birmingham, I will not discuss any theories nor indulge in any idle speculation, but will contain myself strictly to a simple, concise, narrative of events.

Our little city was terribly scourged for long weeks; our citizens became panic-stricken; many left, almost depopulating the town, and leaving the sick and indigent principally in the care of clergymen and physicians. The latter class, however, did not escape the disease, but two of their number lay for many days and nights upon the brink of the river, and it was only by the intervention of an all-wise Providence and the assiduous care of their attendants, that they recovered.

Birmingham is located in Jones Valley, near the center of Jefferson County, with the Red Mountains lying a short distance to the south and east, and what is known as Reservoir Ridge to the north and west. The stone near the surface is blue limestone, covered with a stiff clay soil, such as is usually found in the hilly portions of Central Alabama. The bed of the valley is formed by the old Silurian limestone, which doubtless was brought the surface through the super-incumbent strata, and is found throughout the entire valley, almost on edge, dripping, as we recede from the valley, to the northeast and southwest. From this fact we are led to conclude that the only water that appears on the surface or is found in wells in this valley must be surface-water, for the strata of limestone are not water-bearing, and only afford such supply of water as may have filtered throughout the strata of earth overlying the edges of this formation during the winter months, which finds a ready outlet in a southwest direction along the line of upheaval. This water find numerous outlets at various points in the valley, as is shown by the location of the springs, to be seen on the accompanying [map](#) all of which, with others northeast and southwest of Birmingham, are situated on the line of upheaval. Birmingham is a railroad center, having about three thousand inhabitants, a large number of whom live in houses closely crowded together, and in defiance of sanitary laws. Each day four railway trains pass through this town, making direct connection with Nashville, Chattanooga, and Louisville, in the north, and Montgomery, Mobile, and New Orleans, in the south. In addition, from six to eight freight-trains each day receive and discharge freight. The mineral interests in the neighboring mountains attract to the town many strangers, and during the summer months the transient population is quite large.

The ground upon which the city is located is undulating, with many elevations and depressions, in some places affording line natural drainage; in other it is low and marshy, and remains damp throughout the entire year.

The inhabitants of Birmingham were in 1873 supplied with water from two sources. A most admirable system of water-supply had been instituted, but the work had only advanced sufficiently to supply a small



portion of the city. This supply was obtained from a large creek northeast of the city, distant nearly two miles, and separated from Jones Valley by a high ridge over one mile from the center of the city.

The inhabitants who could not yet reach this water supply, made use of several public wells and springs within the city limits, or were obliged to haul it from springs at the foot of Red Mountains. The public wells and springs referred to were in low, damp places, and so situated that they received the washes from a large surface of ground; and it was only at such points that water could be obtained. For that portion of the city north of the railroad, ([see map](#)) being built over the greatest dip of the limestone rock, water could not be obtained. South of the railroad, where the rock-bed is nearer the surface, water is obtained from private wells. But one house in the city was supplied with a water-cistern.

In the eastern portion of the city there is a pond, (marked A,) from which flows a small branch, which takes a westerly direction, crosses Twentieth street through a culvert, and continues in the same direction to the corner of Seventeenth street and Second avenue, where it unites with two other small branches from the south side of the railroad, (marked B and C.) At their junction these streams spread out and form a low, marshy ravine, overgrown a portion of the year with tall grasses, which continues in the same direction beyond the limits of the corporation. On the northern side of this ravine, (marked E) from Eleventh to Fourteenth street, which pass along a hill-side, a number of shanties and negro cabins, low, dirty, and ill ventilated, were located, which were known as "Baconsides" ([see map](#)). By each rain-fall the filth of all kinds which covered the ground around these cabins was washed into the ravine, and it was from a low spring and a number of barrels sunk in the marshy bottom of this ravine that the inhabitants of Baconsides and many of the white residents of Birmingham obtained their drinking water.

Until the alarm of cholera was sounded upon the streets, no effort was made by the city authorities to clean the streets and alleys, to drain and disinfect cess-pools, and wet places, nor had cleanliness been demanded in privies and stables. The first case of cholera that occurred in Birmingham in 1873 was in the person of a Mr. Y., who was taken sick on the 12th day of June and died after an illness of twenty-four hours. He was an able-bodied man, who had been in the city about six weeks, and had been perfectly healthy until the arrival of his bed and bed-clothing, which had been shipped to him from Huntsville, and which were received and used by him three days before he was taken with the disease; and it was subsequently determined that these articles had been used in the portion of the city of Huntsville that was infected with the disease. Y. Was taken with cholera at the point marked 1 on the map. His physicians had no suspicions that he had cholera at that time, although his symptoms greatly resembled it, as there had been no cases of the disease in this section of the state. No care was taken to disinfect the discharges, which were thrown on the ground in the rear of the house, on the slope of the hill, immediately above the branch marked D. No other cases occurred until June 17, when a young girl named, Hughes and her sister were taken with cholera within a few hours of each other, and both died within twenty-four hours. The home of these children ([see map 2](#)) was in a miserable little hovel near the edge of a small branch (marked F) which runs through several acres of low, marshy ground. It was determined that the different members of this family had been constantly at the house of Y., the first case, during his illness. The discharges from these patient were not disinfected, but were thrown into the branch, which flows down to the same marshy ground from which the inhabitants of "Baconsides" obtained their drinking water. June 19, a man named Bennett, who was a shoemaker, and lived at the point marked 4 on the map, was taken with cholera, and died after an illness of eighteen hours. This man had been absent from home for several weeks and returned, suffering with an acute diarrhea, from Chattanooga the night previous to his attack. The discharges in this case were disinfected, and the bed and bed-clothing were burned. Under the house in which this man died was a damp, filthy cellar, which had been nearly full of water in the early spring. June 20 a comrade of Bennett, who had waited upon him in his illness and had carried out the discharges, was taken with cholera, and died in twelve hours. The excreta were disinfected and buried. June 21, a sister-in-law of Bennett, who was constantly with him until his death, was taken with cholera at her house, (marked 6) and died in twenty hours. The discharges of this patient were not disinfected, but were thrown into the branch in rear of the house. June 22, a negro boy was found in a low, dirty shanty close by the line of the Alabama and Chattanooga Railroad, (marked 7,) in a state of collapse, and he died in a few hours. In the evening of the same day a negro named Edwards was taken with the disease at his home on the banks of the ravine marked C. The disease was fully developed, but reaction was established and he recovered. June 23, a negro named Eubank was taken with the disease at the residence of a gentlemen, (marked 9.) He had copious rice-water discharges, cold skin, profuse perspiration, small, frequent pulse, and cramps in the extremities; he responded to the treatment and recovered. Great care was taken to disinfect and bury the



excreta. He was kept as much isolated as possible, and no other case was developed on the premises or in the immediate neighborhood. On the same day several cases of cholera occurred at Baconsides, all of which terminated fatally within twenty hours. No disinfectants were used; the excreta were thrown upon the ground; the epidemic was inaugurated, and deaths occurred in every household. At first all of the Negroes in this portion of the city who took the disease invariably died within a few hours; but when the violence of the epidemic began to subside, many recovered. Along the banks of the branch marked C upon the map are a number of cabins, in one of which Edwards, the case of June 22, had the disease, and in one of these cabins, on the 24th, Minerva, a negro girl who had nursed Edwards and carried out his dejections, was attacked, and died within ten hours. Before this girl's body was buried, two other cases occurred in the same cabin, which rapidly proved fatal. The discharges in these cases were disinfected and buried, and by order of the board of health the beds and bed-clothing were burned. The occupants of all the cabins upon the line of this branch suffered so severely with the disease that they were abandoned. June 27, Hughes, the father of the two girls who died upon the 17th, was taken with cholera, and died on the following day; the third death in the same house, out of a family of five individuals. July 1, cholera was declared epidemic over the entire city of Birmingham, and it is now impossible to give step by step the progress of the disease, for the spread of the disease was so rapid and its virulence so great that the physicians could take no time to record cases. July 2, Mr. M., who was a clerk in the city, but who slept at his home at Elyton, distant two miles, was attacked with cholera, and died within ten hours. The excreta of this case were disinfected with carbolic acid and buried. No other case of the disease occurred in the village. July 4, an excursion party of about two hundred citizens of Birmingham visited Blount Springs, some thirty-odd miles north, on the line of the South and North Alabama Railroad. They spent the day in eating, drinking, dancing, &c., and returned to Birmingham about 8 o'clock in the evening. Before daylight the next day seven of their number had died of cholera. July 7, a Mrs. H. Had slight symptoms of diarrhea, and concluded to go to the house of her father-in-law, who lived on the top of Thodes Mountain, distant about eight miles. The next day she was taken with cholera, and died in twenty-four hours. Her mother-in-law, who nursed her carefully until her death, was taken with cholera July 10, and died in twelve hours. The discharges from these cases were received upon cloths, which were washed out, and the water thrown upon the grass in the back-yard, but after the arrival of a physician they were disinfected and buried, and the bed and bed-clothing were burned. No other cases of cholera were developed in this family, although several members of it suffered from diarrhea. July 9, was called to see Lee Anderson, the carriage-driver of Colonel T., who lived in an elevated portion of the city, in which there had been to this time no cholera, and found him with the symptoms of the disease strongly defined. This man had remained well until he had visited some of his friends at Baconsides. His system responded to the remedies exhibited, and late in the evening he had fully reacted, but the next morning at an early hour was found fully collapsed. It was discovered that during the night he had several times left his bed and had gone to the cistern on the premises for drink, and that he had several dejections in the yard, which were not disinfected. He died in a few hours. July 10, Colonel T., his wife, and several members of his family were taken with diarrhea, which, with the exception of Mrs. T., yielded readily to the remedies used. This lady, however, fearing that the medicine might injure her sucking child, concluded to dose herself with Simmons's liver regulator, a proprietary medicine much in vogue throughout the Southwest; and the next day an attack of cholera was fully developed. She however reacted, and for several days seemed convalescent; her dejections contained bile; the secretion of urine was re-established, but on the fifth day she sank and died. This lady had been exposed to the disease by assisting in washing and dressing the body of a Mrs. K., who had died of cholera a few days previously in another portion of the city. The premises of Colonel T. was one of the few in the city which were provided with cisterns of rain-water, and the generous owner, thinking that cistern-water was the safest for drinking purposes, allowed free access to his water-supply to all in his neighborhood. In this portion of the city no cases of the disease had occurred until after the negro Anderson's visit to Baconsides; but after his death the persons who used this cistern-water, and the immediate neighborhood of Colonel T.'s property, suffered as severely, if not worse, than any other portion of the city.

The most popular hotel in the city, located close to the line of the railroads, around which the disease prevailed, escaped the disease. This house is built upon pillars several feet above the surface of the ground, allowing free ventilation. The drainage was admirable, the water-supply good, and the proprietor spared neither time nor expense in keeping his premises clean and disinfected.

It was observed during the course of the epidemic that wind from the south and east, or that blowing from Baconsides to the more populous portions of the city, increased the violence of the disease and the rate of



mortality, while when it came from the north and west there was a decided moderation in the severity of the symptoms.

Every shower of rain apparently aggravated disease. These showers were unaccompanied with thunder, of short duration, and the subsequent heat was intense. It having been stated by some physicians of local repute in the State that the disease which prevailed at Birmingham was not epidemic cholera, it is proper to state that the exhibition of the disease, both in its introduction, its mode of communicability, and in all its symptoms, closely and fully followed the history of cholera as it is laid down by authorities.

The active treatment of the premonitory diarrhea was most successfully instituted, and the general expression of the profession of this city is that in not a single instance where this stage of the disease was treated, and where the patient followed fully the orders given, did the disease advance to its second stage; and so marked was this immunity that it is desired to add to the testimony on record, that by proper precautions, and the observance of hygienic laws, cholera attendants may enjoy the most perfect security from the disease.

The treatment adopted was the opium and mercurial. When the stomach seemed so inactive that nothing made any impression upon it, an emetic of mustard, salt, ginger, and pepper, suspended in hot water, in many cases produced a warm glow over the surface of the body in a few moments. For the relief of cramps which would not yield to ordinary remedies, a number of dry cups applied from the neck to the sacrum, over the spine, in every case in which they were used furnished the desired relief. The use of iced water ad libitum was found injurious; in many instances the unrestrained gratification of the thirst was followed by a fatal relapse. Ice and ice-water in small quantities and at short intervals was found most useful. Many of the cases were complicated with uraemia, and the majority of these died, although they were carefully treated. Diuretics produced no good results. No condition in life, sex, or age escaped. The sucking babe and those of extreme age suffered alike from its ravages.

Before closing this paper, justice demands that we should briefly allude to the heroic and self sacrificing conduct, during this epidemic, of that unfortunate class who are known as "women of the town." These poor creatures, though outcasts from society, anathematized by the church, despised by women and maltreated by men, when the pestilence swept over the city, came forth from their homes to nurse the sick and close the eyes of the dead. It was passing strange that they would receive no pay, expected no thanks; they only went where their presence was needed, and never remained longer than they could do good. While we abhor the degradation of these unfortunates, their magnanimous behavior during these fearful days has drawn forth our sympathy and gratitude.

In closing this brief record we desire to state that, in the experience of our observations, facts will not justify us in believing that any local conditions of the soil, or peculiarity of climate, or moisture of the atmosphere, or masses of decomposing debris, either animal or vegetable, can in or of themselves produce the specific poison of cholera, "but they are the hot-beds in and on which the cholera excretions having been placed, the poison is reproduced with fatal rapidity."

Birmingham, Ala., August, 1874.

Reference: <http://www.uab.edu/reynolds/cholera.html>

