Disease Detectives: Zombie Outbreak

Goal: Figure out how the zombie virus was originally transmitted and what hypothesis might explain how it happened.

Status Report: (Read to students)

An increasing number of citizens are disappearing, especially at night. These victims are reappearing as perpetrators. They are slow-moving, very strong. They are impervious to pain/injury and appear to be unaware of their surroundings. We've discovered that after the victims disappear, they reappear without human blood. Without bloodflow, these perpetrators freeze quickly. We believe this is why they are headed south – to warmer temperatures. They are constantly hungry and attacking at an alarming rate.

We're currently trying to figure out how to stop them, but a defensive standoff is not a long-term solution. What we need to figure out is how this virus originally infected the first victims.

Here's what we do know. All of the victims attended a carnival in Vancouver. We've collected interviews, but haven't had time to review them for consistencies.

What we need from you, agents, is a thorough investigation. We need to know the root cause of this virus in order to create a vaccine to stop the growing mass of those infected.

LESSON

Have the students listen to the collected interviews from carnival attendees on the following pages (10 total). With this exercise, the students will be conducting an investigation into what the infected attendees have in common. Did they all have a corn dog? Did they attend the same shows?

Have students create an 11x11 square graph, or use the one included in this lesson.

When listening to the interviews, instruct the students to mark an X to correspond with the infected person and the carnival activity that they participated in that day.

Note: All of the infected victims will have their stories told by someone else (family member/friend), so make sure the student is writing down what the INFECTED person did at the carnival.

	Haunted House	Rides	Corn Dog	Petting Zoo	Pony Rides	Games	Exotic Bird Show	Pig Races	Stunt Show	Mosquito Bites
Henry										
Ben										
Tyler's kids										
Emily's sister										
Corine										
Michael										
Andrew's family										
Jamie's friends										
Whitney's parents										
Nathan										

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Collected Interviews

Lauren

My son Henry is infected. He started acting really strange when we got home from the fair in town. At first he was really sick and we were about to call the doctor, but he started showing aggression so we left him alone. In the morning, he was gone. We went to the fair on Saturday. There was so much to do, but Henry had a hockey game later that night so we only had time to do a few things. I remember that he asked for a corn dog before we went on the ferris wheel. It made him queasy, so we left the ride area. We spent time at the petting zoo, went through the Haunted House, and saw the exotic bird show and the stunt show. Oh, and we tried to see one of the pig races, but it was so busy over there you couldn't really see anything.

Ben

Yeah, man, I went to the fair! My friends and I go every year! We only go for the rides. We like to ride everything until we get sick. And the stunt show is pretty awesome. It's really the only place you can go to eat a turkey leg like a caveman.

Tyler

I took both of my kids to the fair that weekend and both of them have disappeared. I've told the police countless times. We went to the fair, we came home, went to bed, and in the morning they were gone. They left behind a lot of drool and a really bad stench, which is why the police think they have been infected. At the fair we did everything. I watched them on the rides, play with the animals in the petting zoo, ride the ponies in a circle, we saw all of the shows on the agenda, and they even convinced me to let them go through the haunted house. We had corn dogs and cotton candy on the way out as we were slapping away mosquitos. I just don't understand what happened to them.

Emily

My sister is totally a zombie! Well, they say it's some kind of virus, but whatever. She's a zombie. She came after me once we got home from the fair. At first I thought she was joking around, but she had this dead look in her eyes and was grunting a lot. I don't even think she knew it was me she was lurching towards. I barred myself in our interior bathroom, like in a tornado, you know? I actually slept in there. She was gone in the morning. It was so totally creepy. Oh, yeah, the fair? We went around dinner on Saturday. We blew all of our allowance. I had a funnel cake and she had a corn dog and a candied apple before riding all of the rides. We had one of those wristband things that let's you do everything you want. We even went to the exotic bird thing, but didn't stay long. We also went to the pig races, but it was really crowded and the mosquitos were everywhere. Sarah got a closer look than I did, but it was still a waste of time. I was over the animals by then, but Sarah went through the petting zoo while I checked in with our parents.

Corine

My husband and I went to the fair this year, but we stayed away from the mainstream crowd. We mostly went for the food. I was craving a funnel cake, and my husband ate everything in sight. We ended up eating the funnel cake, cotton candy, shaved ice, shaved potato fries, and corn dogs. Healthy, I know. Sometimes you have to live a little. Anyway, we watched the exotic bird show while we ate, and then caught a movie afterwards. The mosquitos were everywhere at the fair. It was kind of gross.

Michael

I took my family to the fair this year, but we all got sick after eating the deep fried butter. The kids rode the ponies around in a circle, but we couldn't even attempt to ride anything. We did go through the haunted house and watched the exotic bird show, but after that we had to leave. We were all fine in the morning, but food poisoning is no joke.

Andrew

My wife and my kids have both disappeared. My father is sick, so I spent the weekend out of town taking care of him. To entertain the kids, I suggested she take them to the fair and let them get all of that energy out. When I came home, the house was ransacked. At the time the police thought it was foul play, but now they have lumped them in with the rest of the people that are infected and missing. I talked to my wife on her way home from the fair. Our boys were passed out in the backseat, and she said they had fun. She said they did the rides before eating. The kids were too young for the haunted house, so she volunteered to do the dunk tank to pacify them. I remember she said they saw the stunt show while they had corn dogs and lemonade in the stands. She told me that they rode those ponies that walk around in a circle, and then went through the petting zoo. They missed the pig race, so she said they spent a lot of time with the animals. She texted me photos the whole time so that I wouldn't miss it. Alex loves animals.

Jamie

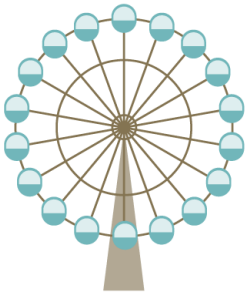
I went with friends to the fair this year, but they were way more into it than I was. I ate a corn dog while they were watching the pig races, and ate cotton candy while they petted all the animals. Why come to the fair just to see dumb animals? After that we rode all of the rides, played a few games, and went through the haunted mansion before calling it a night. The mosquitos were terrible. Oh, and we did sit through the stunt show, but like I said, the mosquitos were swarming. The next day, they were missing.

Whitney

My parents actually went to the fair, but we didn't get to go. My parents had a date night and dropped us off at our grandparents' house. Mom had a pie in one of the contests, so they went for the ceremony. When they got home they called told us they had corn dogs and turkey legs to celebrate her win and watched the stunt show and the bird show. They didn't ride any of the rides though. My mom is paranoid about the safety of those things. Dad did say she screamed her way through the haunted house, which is kind of funny. My sister is really into animals, so they went by the petting zoo and snapped a few photos to show her. Oh, and Dad won us goldfish at one of those games. It served them right that they were covered in mosquito bites. I thought it was unfair that they got to go have fun and we had to spend the night watching loud TV with old people. When they didn't pick us up in the morning we were worried and eventually called the police, but they had less answers than we did. It seems like a lot of people just vanished.

Nathan

I don't know why you want to talk to me. It clearly wasn't anything at the fair that made these people turn into zombies. Everyone knows zombies come from radiation. Plus, I was at the fair and do I look like a zombie to you? What did I do? I rode all of the rides, ate a ton of junk food, and played a few games. Oh, and watched the bird show, or the "exotic" bird show, whatever. I thought I was going to see something cool like a vulture, but it was a bunch of pigeons.



Concepts and Background

Infectious Diseases

Infectious diseases are caused by microbes that spread. We're used to seeing infectious diseases through the common cold, flu, chicken pox, and strep throat. These diseases can be passed from person-to-person (coughing, sneezing, touching), or through another medium (foods, drinking water, animals).

Different types of scientists use different methods to try and determine what is causing people to get sick. There are scientists that study microscopic samples in a lab at a cellular level called pathologists. A physician studies the signs, symptoms, and medical histories of specific patients at an individual level. Epidemiologists study groups of people at the population level.

Health conditions can be discovered by identifying how they are distributed in a population in terms of person, place, and time. These clues help to form a hypothesis for how and why a disease is transmitted.

What we need to figure out is who these people are, where they are sick, and when they got sick. Who, where, and when are the descriptive epidemiology clues of a disease.

Once we are able to figure out how the disease is distributed, we can begin to speculate as to why it is distributed in that way. Why did these people get sick, in this place, at this time? That's when we can start to formulate a hypothesis to explain why some people got sick and others did not.

Definitions

bacterium - a single celled microscopic organism, whose genetic material is not enclosed by a membrane (*E. coli*, Strep throat)

epidemic - a widespread outbreak of an infectious disease where many people are infected at the same time.

epidemiology - the branch of medical science dealing with the incidence, distribution and control of disease in a population.

exposure - the act of coming into contact with a disease-causing microorganism; exposure may or may not lead to infection.

microbe - a microscopic organism, such as a bacterium, a virus or a protozoan. Although most microbes that live in our environment perform functions essential to our survival, a small percentage of them enter our bodies to cause an infectious disease. Infectious diseases emerge, suddenly or gradually, in various environments, and may spread across a region or even the world.

outbreak - the occurrence of a large number of cases of a disease in a short period of time.

pandemic - an epidemic that affects multiple geographic areas at the same time.

pathogen - any disease-producing agent; i.e. virus, bacteria or other microorganisms.

protozoa - simple, unicellular animals comprising some 50,000 organisms.(Malaria)

vaccine - a substance that contains antigenic components , either weakened, dead or synthetic, from an infectious organism which is used to produce active immunity against that organism.

virus - ultramicroscopic infectious agent that replicates itself only within cells of living hosts. (common cold, flu)

Epidemiology: Outbreaks

To study incurable diseases, researchers must take extreme care not to become infected. The highest level of protection is known as BioSafety Level 4, in which laboratory workers wear a one-piece positive pressure suit to safeguard against contact with microbes. Since the suit has its own life-support system, there is no risk that a researcher will breathe in microbes through contaminated air. To prevent microbes from escaping to the outside world, the laboratory is designed to be completely isolated. It has its own ventilation system and can be entered only through a double-door airlock. Anything leaving the laboratory—including researchers—must be sterilized first. When they leave the lab, workers must pass under a sterilizing chemical shower before removing their life-support suits and changing into street clothes.

An outbreak of a disease can affect a handful of people, or thousands of people. Microbes spread through local populations by different routes. Some spread through shared resources, such as air and water. Others spread through food handling, shared needle injections, sexual contact, or disease carriers, such as fleas and rats.

To trace an outbreak to its source and identify the microbe that causes it, epidemiologists often start by interviewing the people stricken with the disease. Their goal is to find common links between these people and the ways the disease has spread.

They also take samples from anything that might contain microbes relating to the outbreak—from blood and local insects to food and water. Steps taken to investigate and control an outbreak may effect new public health measures or focus attention on a previously unknown microbe.

What is an Epidemiologist?

An epidemiologist studies the health of populations to discover what factors lead to disease. From their research epidemiologists communicate to the public information about the cause, spread, or threat of certain diseases.

One succinct way to sum up the task of epidemiologists is to say that they “count things.” Basically, epidemiologists count cases of disease or injury, define the affected population, and then compute rates of disease or injury in that population. Then they compare these rates with those found in other populations and make inferences regarding the patterns of disease to determine whether a problem exists.

There are three types of epidemiologists:

Environmental epidemiology - studies environmental pollutants and/or exposures that might be a danger to individual or public health. The environmental epidemiology field does extensive research regarding pollutants, risk estimations, medical estimates and inspections regarding health consequences of pollutants and pathogens.

Genetic epidemiology - studies genetics and other factors involving how genetic expression affects biological systems. The genetic histories of families and individual patients are used to determine how genetic diseases occur and how they can best be treated or prevented.

Social epidemiology - study how socioeconomic factors affect the health of populations or individuals. Research is done to determine whether certain illnesses occurred because of particular lifestyles, regional environmental factors, or working conditions.

Studying an Outbreak: An Epidemiological Investigation

1. Is it an outbreak? Determine if the disease is common to the area or if it has been reported in the area previously. An outbreak has occured when the number of infections reported is higher than the expected number of infections.

2. Identify the specific nature of the disease. To verify the diagnosis, review clinical findings (symptoms and featurse of the illness) and laboratory results of the peopel who are affected. Visit several of the people who became ill and talk to some of the infected to gain a better understanding of the disease and those affected by it. In addition, you may be able to gather critical information by asking such questions as, what were their exposures before becoming ill? What do they think caused their illness? Do they know anyone else with the disease? Do they have anything in common with others who have the disease? Conversations with patients are very helpful in generating hypotheses about the cause, source, and spread of disease.

3. Define the disease. Create a definition based on the symptoms. This should include a defined method for determining if a person is infected with this disease.

4. Determine the number of people infected. Determine the risk factors: How many people were exposed, in what area, over what period of time? Information about risk factors will tailor your investigation to the specific disease in question.

5. Create a hypothesis based on information on everyone infected along with specimens collected through field work.

6. Test the hypothesis. Analytic epidemiology tests your hypotheses by using a comparison group to quantify relationships between various exposures and the disease.

There are two types of analytic studies: cohort studies and case-control studies.

Cohort studies compare groups of people who have been exposed to suspected risk factors with groups who have not been exposed.

Case-control studies compare people with a disease (case-patients) with a group of people without the disease (controls). The nature of the outbreak determines which of these studies you will use.

7. Control measures should be aimed at specific links in the chain of infection, the agent, the source, or the reservoir.

8. Communicate findings to others who need to know. This usually includes 1) an oral briefing for local health authorities, and 2) a written report.

About CDC

CDC's mission is to keep Americans safe and healthy where they work, live and play. Scientists and disease detectives work around the world to track diseases, research outbreaks, respond to emergencies of all kinds, and use what they learn from this work to develop and advocate public health policies that strengthen America's health and resilience.

CDC scientists and disease detectives are deployed globally because outbreaks that start in remote corners of the world can travel to the US as quickly as a plane can fly. In a pandemic or a health crisis of any kind, time is precious. CDC experts available where and when a problem first occurs can potentially save hundreds, even thousands, from illness, injury or death. Investing and acting globally enables CDC to be better prepared to combat any threat to the health and safety of American citizens, no matter where in the world it might first arise.