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Animal Epidemiology

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FIELD OF STUDY
PROJECT APPROVAL

I hereby recommend that the project prepared under my supervision by

_____,

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Abstract

The purpose for this research paper is to understand the epidemiology of animals. The research that I have done provides an overview of the natural history of diseases with research of four different animals' canine, feline, equine, and bovine. Each species has the ability to possess different types of diseases and I will also describe different ways to prevent them. The sources in this paper was mostly found in books at the Murray State Library, and general websites. The natural history of diseases focuses on who discovered these diseases, and where they come from. This paper will also describe the four main categories of diseases. The diseases described are infectious, non-infectious, bacterial, viral, and fungal diseases. It is very important to know about these four main diseases, and their symptoms because all around the world, there is an epidemic of diseases that severely affect animals. Towards the end of my research paper, I will discuss the epidemiology of animals, and how to prevent diseases from occurring.

Acknowledgements

The completion of this senior project is being dedicated to my hard-working mother for supporting me through my education and always being there for me. I will also like to thank my BIS.437 adviser, Dr. Anna Vaughn-Doom, my previous advisor that taught me everything I need to know about animals throughout the years. I would like to thank the Doctors and Professors at Carmen Pavilion, for teaching me the important concepts about animals.

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Thesis Statement:

Animal epidemiology simply means the study of diseases that carry infectious and non-infectious diseases through animal organ functions. These functions can be disturbed by infection bacterium, viruses, and fungus organisms.

Introduction:

Diseases in animals are very serious disorders that impact the health of an animals and the ability of their organs to function properly. Animal disease is an important issue because animals that are raised for food may become ill and would in turn, affect many industries. Animal illnesses can cause social, economic, and natural harm and can also cause danger to human health.

Some diseases can be transmitted through humans, known as zoonotic. According to the Centers for Disease Control and Prevention, “Every year, tens of thousands of Americans will get sick from diseases spread between animals and people” (CDC, 2017). In the United States zoonotic is very common. It is an easy way to contract a harmful germ from an animal to humans. Animal diseases are recognized as infectious and non-infectious. “Infectious diseases are caused by pathogenic microorganisms, such as bacteria, viruses, parasites or fungi; the diseases can be spread, directly or indirectly, from one person to another” (World Health Organization, 2017).

Non-infectious diseases are a non-communicable disease that does not transmit to other humans, for example, diabetes. Most times when identifying a disease in an animal, the cause could be unknown or not curable. To diagnose a disease a veterinarian would first perform a

physical examination. Some animals may have a background with a history of diseases or infections. After the veterinarian diagnoses the disease, the veterinarian will develop a treatment plan.

Natural History of Diseases

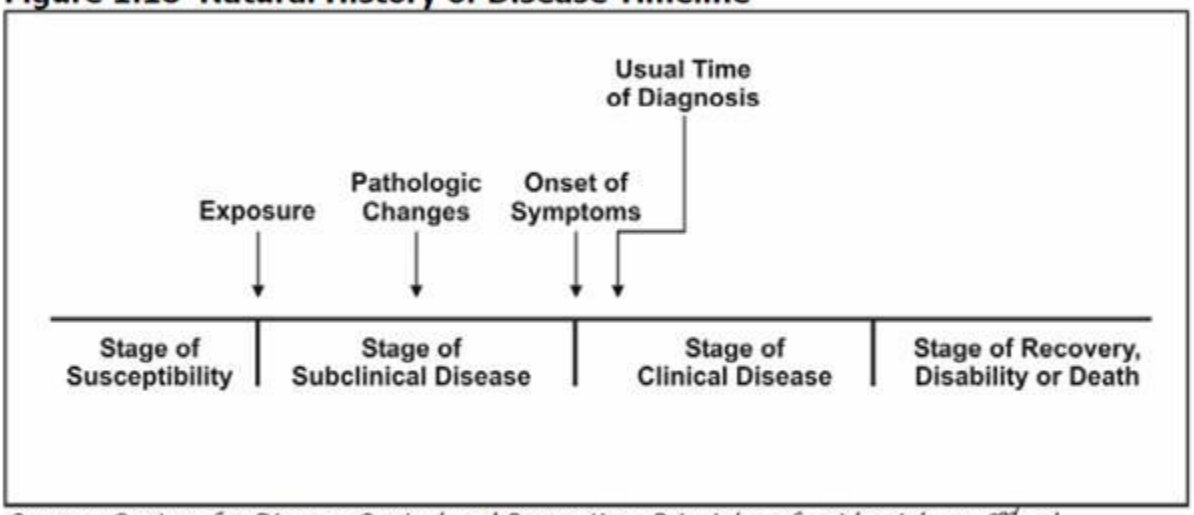
Throughout history, animal epidemiology has been documented from ancient history to current worldwide causes. From the earliest times, diseases have brought a big impact to the populations to either to death or severe illness. Diseases have four different categories; genetic, biological, physical, and chemical. Infectious diseases are caused by a causal agent, which can cause death or cause harm to others. Diseases were discovered by Antoine Van Leeuwenhoek, a scientist that is known to be the first to discover bacteria in water in 1676. Leeuwenhoek was the first scientist to perceive, and describe the single celled organisms. He also indicated bacteria, muscle fibers, small blood vessels and capillaries which are of the most important discoveries in biological history, and is known as The Father of Microbiology. He created glass lenses for microscopes to examine organisms better. “The microscopes Leeuwenhoek built were more like modern magnifying glasses. Leeuwenhoek eventually built over 240 microscopes, some attaining up to 500 times magnification. His excellent eyesight was crucial to his observations, given the small size of the lenses” (Badertscher, 2007).

In 1876, a German physician, Robert Koch was the first to discover that diseases are related with certain microorganisms. Koch is also known for creating Koch postulation of germs and as the founder of bacteriology. He discovered the causal agent of a fatal disease known as Tuberculosis. “Tuberculosis was a disease known to the ancients and Hippocrates and Galen suspected its contagious nature” (Sakula, 1983). Tuberculosis was also discovered in bovine. .

"Animal tuberculosis like human tuberculosis often went undetected due to the frequently insidious nature of the disease and its chronic course, complicating the task of epidemiologists at the time. The analogies between the two diseases resulted in virtually parallel line of research" (Lombard, Pastoret, & Moulin, 2007).

Another well-known scientist is Louis Pasteur. He was a French biologist microbiologist, and chemist; he showed that microorganisms grew in broth, and if you boil the broth it kills the bacteria. "Today Louis Pasteur is known as one of the most important scientists in history. His discoveries led to an understanding of microbes and diseases that has helped to save millions and millions of lives. Pasteur is most remembered by the Pasteur Institute which he established in 1887. Today the Pasteur Institute is one of the world leaders in battling infectious diseases" (Nelson, 2017).

Figure 1.18 Natural History of Disease Timeline



Source: Centers for Disease Control and Prevention. Principles of epidemiology, 2nd ed. Atlanta: U.S. Department of Health and Human Services;1992.

Throughout history diseases existed in the fossil age yet, ancestors were less exposed to diseases than humans today. Alexander the Great, an ancient Greek King, performed programs to

educate Romans on how to study animals and medical writings. See Figure 1.18. The national history of diseases timeline.

Figure 1. Shows the state of susceptibility, exposure, subclinical disease in which pathologic changes takes place, onset of symptoms, followed by usual time of diagnosis, clinical disease, followed by recovery, disability, or death. (CDC, 1992)

Infectious Diseases

Infectious diseases are known to kill humans worldwide every single day. They are caused by germs, germs that are found everywhere such as the water, soil, flat surface and even air. People can get ill by touching, eating, and breathing things that contain germs. Germs can also be transmitted through animals or sexual contact with another human. There are four main categories of germs: bacteria, viruses, protozoa and fungi. A bacterium is "A large group of single-cell microorganisms. Some cause infections and disease in animals and humans. The singular of bacteria is bacterium." (PubMed Health, 2003). Bacteria has three main shapes; a spherical, rod-shaped, and spiral. Not all bacteria are harmful, some are beneficial to humans and animals. According to the website yourgenome.com (2015), "Less than one percent of bacteria will actually make you ill".

Viruses are parasites that thrive and reproduce in the host of the body. They can be found in different body sites, but they are much smaller than bacteria. They are living organisms and they cannot replicate without a host. Different diseases are caused by parasites such as herpes and rabies. Sadly, there is no cure for viruses only vaccination can help prevent the parasites from spreading. Viruses can spread through contaminated food or water, sexual contact, saliva, and much more.

Protozoa "are one-celled animals found worldwide in most habitats. Most species are free living, but all higher animals are infected with one or more species of protozoa" (Yaegar, 1996). They can spread or eat the host cells and reproduce by copying themselves. They are found in moist habitats such as the soil and fresh water.

Fungi is a group of eukaryotic single-cells that decompose or absorbs natural organic material that can grow. They are found as yeast, mildew and mold. They are released from spores, which can be picked up by inhaling air or direct contact. Most fungi are harmless and some can be edible like mushrooms.

Infectious diseases are not all harmful but some can make animals and humans very ill. It is very important to wash your hands always because everyone can get ill from germs.

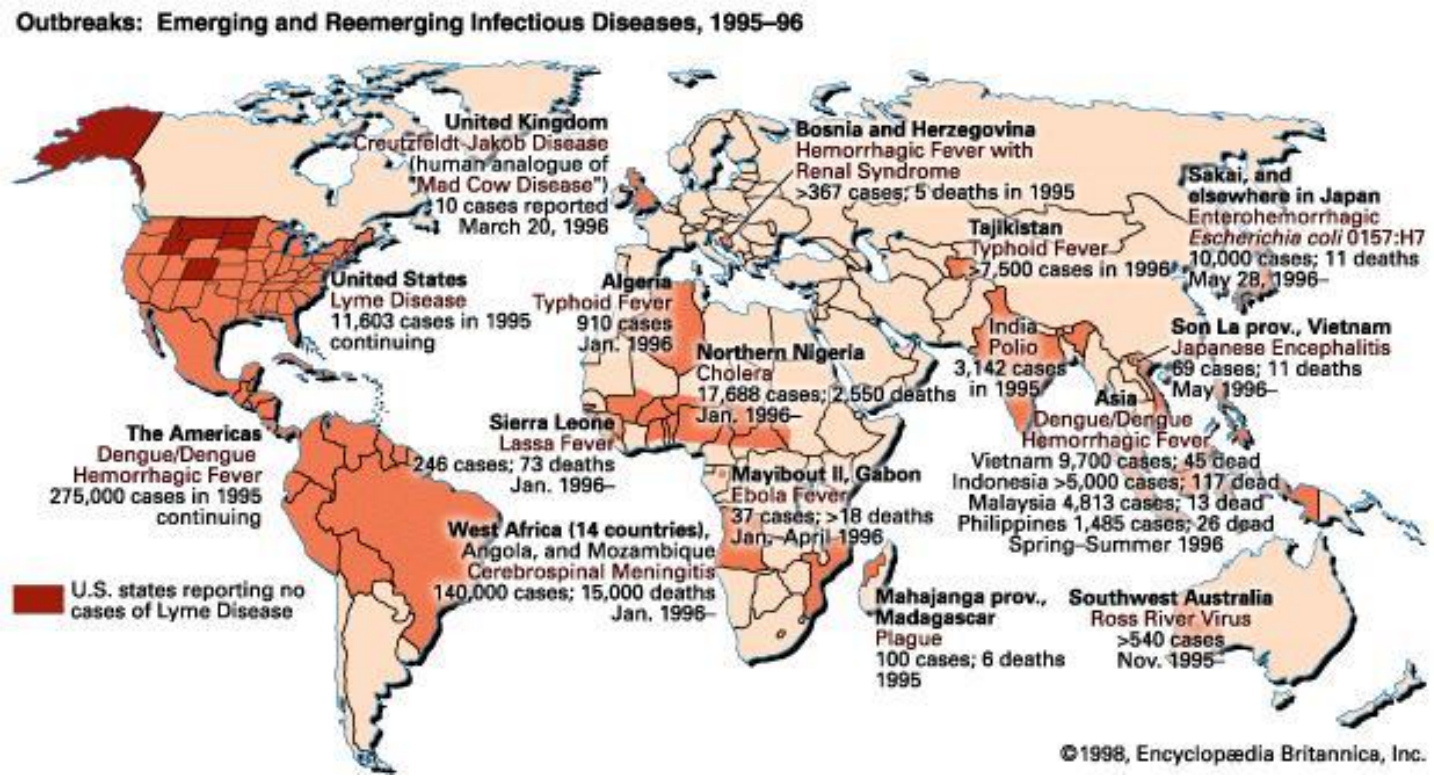


Figure 2. The worldwide infectious diseases that have had outbreaks. (Encyclopedia Britannica, Inc., 1998)

Non-Infectious Diseases

Non-Infectious disease are conditions that are not transmitted through the environment or a spread of infection. Non-infectious diseases are not contagious. This certain disease can be prevented. Most people are born with these conditions and would have to manage how to regulate the symptoms. Common types of non-infectious diseases are diabetes, cancers, and even some allergens. Studies show that people worldwide have higher rates of non-infectious diseases. It can be hereditary, although these diseases are not caused by a genetic disorder. Genetic disorders are caused by errors for example; the change in chromosome numbers or cystic fibrosis. There are many people and animals in the world with a non-infectious disease and that is why it is important to take care of yourself and animals to prevent harmful symptoms.

Bacterial Diseases

Bacterial diseases are caused by bacteria that spreads from person to person. According to OnHealth.com, “A bacterial infection is a proliferation of a harmful strain of bacteria on or inside the body. Bacteria can infect any area of the body. Pneumonia, meningitis, and food poisoning are just a few illnesses that may be caused by harmful bacteria” (Cox, 2016). Bacterial infections are caused by a gram-positive strain. Bacterial infections can be transmitted through sexual contact and foodborne sources. A harmful bacteria can affect every part of a human’s body if not treated. It is important to contact doctors for antibiotics to fight off the infections. It is also important to take the medication as prescribed, or the bacterial infection can get worse.

Viral Diseases

Viral diseases are normal cells that multiply and reproduce inside the body. It is made up from genetic material known as DNA and RNA. Viral infections can be transmitted in numerous ways. The treatment for viral infections can only help if people wait for the immune system to fight off the virus. Antibiotics do not work for viral infections. If medication is given it would be an antiviral drug but some can be toxic to the human cells. The best way to treat viral infections are to have great strength from the immune system. Most people die from viral infections only because diseases like AIDS that do not have a cure. Viral infections can invade anyone such as people, plants, and animals. It is very important to stay on vaccines to prepare the live viruses.

Fungal Diseases

A fungal infection is a group of organisms that feed on organic matter including mushrooms, molds, and yeast. It is common in most environments such as bathrooms, gardens, air, and nails. Most fungal infections are not dangerous, but some can be harmful to human's health. People with weaker immune systems tend to contract more with the infection. People who inhale air or pollen encounter fungal spores. Fungus sheds spores that reproduce in plants, like tiny seeds. Once a person inhales the fungal spores, it triggers the respiratory system. Fungal infections can be difficult to kill but to prevent the infection antifungal medication would be recommended.

Canine Epidemiology

An infectious disease that canines can obtain is rabies. Rabies is a viral disease that is caused by lyssavirus, which includes the rabies virus and an Australian bat Lyssavirus. Lyssavirus is a genus that is from the *Rhabdoviridae* family. Rabies is spread to a domestic animal when it has been bitten or scratched by an infected animal. The general symptoms are extreme behavioral changes, hypersensitivity, and unusual activity such as hiding in dark places. The infection itself lasts from two to eight weeks before any clinical signs are recognized. However, if the rabies virus is transmitted through saliva, the infection can take effect ten days before the symptoms appear.

Rabies can be diagnosed by using a direct fluorescent antibody test known as DFA, which examines the antigens in the brain tissue of that animal. According to the Centers for Disease Control and Prevention to prevent rabies in canines, "First, visit your veterinarian with your pet on a regular basis and keep rabies vaccinations up-to-date, second maintain control of the animal by keeping dogs under direct supervision, and third spay or neuter the animal to help reduce the number of unwanted pets that may not be properly cared for or vaccinated regularly" (CDC, 2011). There is no treatment for canines with the rabies virus, so it is important to consult with a veterinarian on how to handle this virus. If the rabies virus is detected, the canine should be isolated, and prevented from escaping. It is required by law to notify the state to the authorities, and they will determine the steps if necessary.

Another infectious disease for canines is Parvovirus or Parvo. Parvovirus is a highly contagious virus that causes infectious gastrointestinal illness in young canine and puppies.

Unvaccinated puppies younger than four months are at risk of contracting this virus. Causes of the parvovirus can be transmitted two ways. One method is by direct contact through the nostrils, and infected feces. Canine can easily lick or sniff contaminated feces and thus become infected with the virus. A second method is through indirect contact. Parvovirus can live in the environment, human skin, and even through clothing. General symptoms include lethargy, abdominal pains, hypothermia, and many more symptoms. Puppies younger than four months would show more clinical signs, and should be taken to a veterinarian immediately.

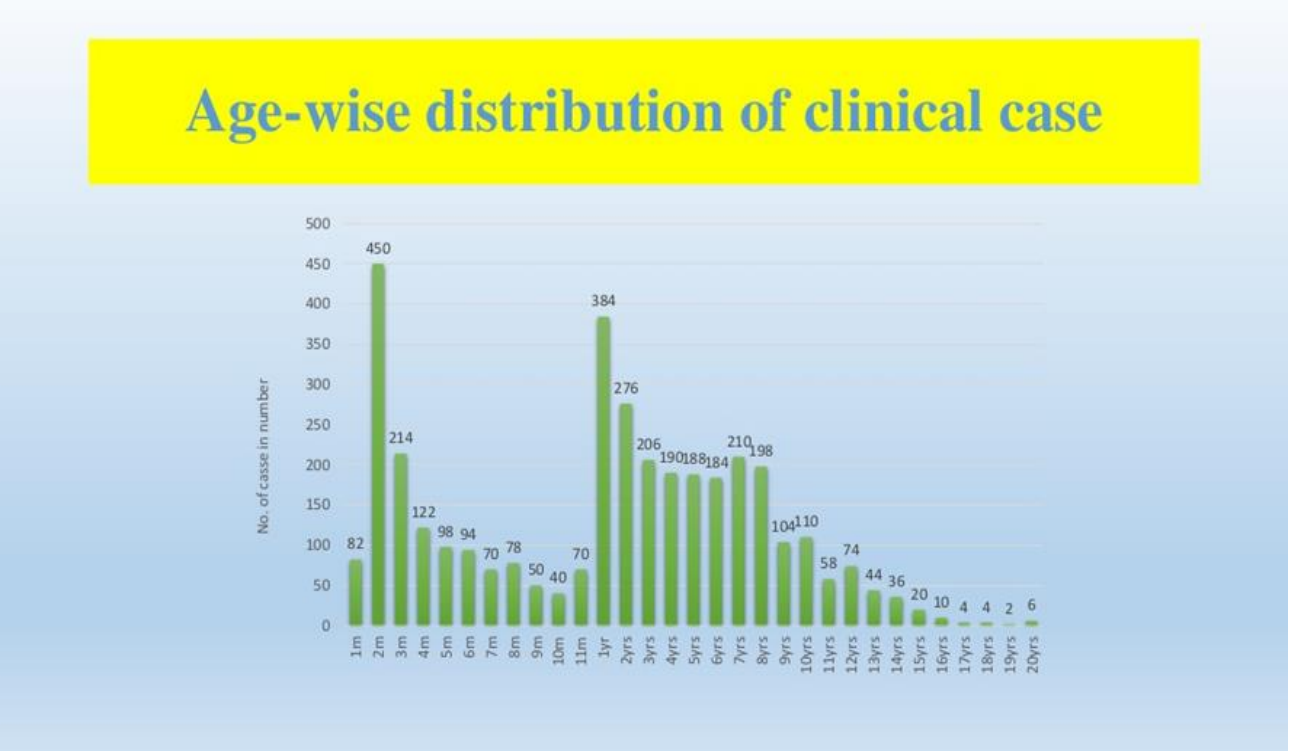


Figure 3. The number of canines cases of the ages they have been affected by this virus. (Yadav, 2016)

Parvovirus can be diagnosed by a clinical laboratory test, the enzyme linked immunosorbent assay known as ELISA. ELISA lab kit uses the canine feces to detect the parvovirus, and is ready with results within 15 minutes. Parvo can be prevented by protecting the canine or puppies from developing this disease. Canines are recommended to be vaccinated with

a combination of vaccines called 5 in 1 which it protects the puppies or canines from distemper, hepatitis, leptospirosis, parvovirus, and parainfluenza. If the animal has been infected with this virus, it should be isolated from other animals. It is important to get vaccines for the patient because this certain virus is highly contagious to other animals. Humans can also catch parvovirus, but only can get this virus through other humans. It is known to be the fifth disease in the world that is common in humans.

A non-infectious disease for canines to be diagnosed with is heart disease. Heart disease known as cardiovascular disease is a range of conditions that affect the heart. One cause of heart disease can be congenital, meaning the canine may be born with a heart defect. Clinical signs and symptoms are difficulty breathing, and coughing more than usual. According to Pet Health Network, “early heart disease is asymptomatic, it is best to take your dog to the veterinarian every year to screen for heart disease” (MacPete, 2016). One method to prevent heart disease in canines is to keep a year-round regimen of heartworm preventatives to protect the animal from getting heartworm disease. The goal to preventing heart disease is early diagnosis and treatment.

Another non-infectious disease that canines can develop is diabetes. According to WebMD, “diabetes in dogs is a complex disease caused by either a lack of the hormone insulin or an inadequate response to insulin” (WebMD, 2005). It can be classified as Type I and Type II, but the most common disease in canine is Type I. Type I is developed by a lack of insulin. Canines that have Type I diabetes require insulin therapy to live daily. The general symptoms include a change in appetite, a sweet or fruity breath odor, and dehydration. The causes of diabetes in canines is unknown, although the levels of causing adds up to heavy obesity, or genetic history. Diabetes treatment is based on different symptoms, and lab results. Every canine responds differently to treatment.

A bacterial disease for canines is Leptospirosis, which it is an infectious disease that is caused from the bacteria Leptospira. This bacteria spreads through the entire body and can affect everything such as the liver, kidneys, and nervous system. The general symptoms for this bacterium are sudden fevers, sore muscles, lack of appetite, and weakness. The cause for Leptospirosis is an organism called Spirochetes. Spirochetes is a long spiral bacterium that resides in muddy areas such as soil, swimming pools, and even in water. Veterinarians must be very cautious when handling an animal that has been diagnosed with Leptospirosis. This certain bacterium is contagious that protective latex gloves should always be worn. Common antibiotics have proven to be the best form of treatment for Leptospirosis. Some animals endure chronic renal failure but most make a full recovery.

An additional common bacterial disease is Lyme disease. Lyme disease also known as Lyme borreliosis, is a bacterial infection transmitted by *lxodes* ticks. Once the tick bites the animal it enters the bloodstream, then the bacteria travels to certain parts of the body, and affects specific organs. General symptoms are fevers, anorexia, depression and lethargy. Veterinarians would diagnose this bacteria through blood tests, however, some canines that are infected may not show definitive results. Clinical treatment involves antibiotics for 14-30 days. According to Common Diseases of Companion Animals, for prevention of Lyme disease is “vaccination of seronegative dogs is recommended in endemic areas” (Summers, 2014).

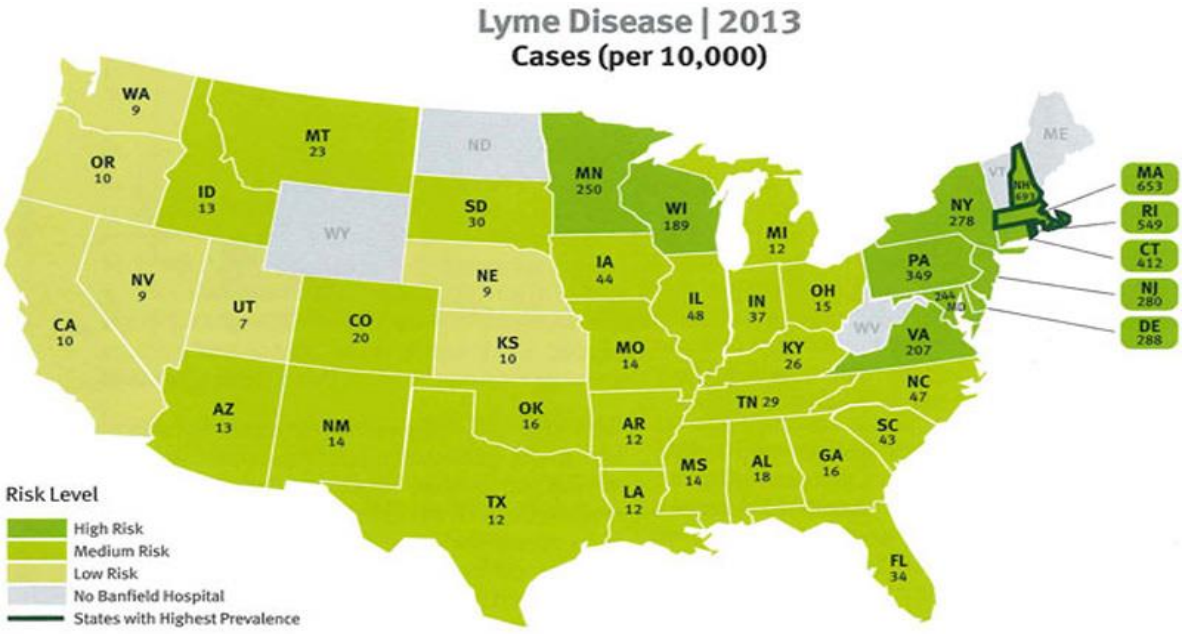


Figure 4. Lyme disease has a higher risk level in some northeastern. It is very important to be cautious about this disease, because it is zoonotic. (Veterinary Practice New, 2014).

A viral disease that canines can contract is Canine Herpesvirus, known as CHV. This certain viral infection causes puppies within one to three weeks of age to die. The herpesvirus can affect many canines, and it can be transmitted through sex. Canine adults can live for years with this viral infection, but puppies cannot. Puppies become infected in many ways. One way is this virus crosses through the placenta, and affects the babies while they are still in the mother's womb. Another way, is where the puppies are exposed to airborne contamination from the nasal cavity of the mother. Not all puppies that are exposed are ill when they are born. A veterinarian would have to diagnose puppies by conducting a test known as a polymerase chain reaction method (PCR), this determines the presence of herpesvirus. Clinical treatment and prevention would begin with an antiviral medication, and supportive care. It causes more problems with young puppies, than adult canines. It is important to keep young puppies with a warm

environment because they cannot regulate their body temperature. If the temperature is low the virus can replicate quickly, and easily.

Another viral disease is Rotavirus. Rotavirus is an intestinal viral infection within the body. It can cause inflammation within the intestines, and dysfunction in the intestinal walls. This virus can affect most canines at some point there in life. Rotavirus is not as serious as most viruses, and most symptoms can cure themselves within 8-10 days. General symptoms are watery diarrhea, nausea, fever, and lack of appetite. Canine contract this virus by encountering other canine's feces, and other infected fluids. Canines who have weaker immune systems tend to have a higher chance of contracting this virus. The clinical treatment and prevention would be a medical treatment plan to relieve the canine's diarrhea, and to be protected against further infections. Antibiotics are usually not considered because they are only helpful for bacterial not viral infections.

A fungal disease that canines can be exposed to is Aspergillosis, it is a fungal infection caused by mold found in the environment such as hay or dust. There are two types of this fungal infections, systemic and through the nasal cavity. Young dolichocephalic and mesencephalic canines are more liable to the nasal cavity for Aspergillosis diseases. Systemic infections are normally seen in German Shepherds. General symptoms for nasal Aspergillosis are sneezing, bleeding from the nose, pain, and a swollen nose. Systemic symptoms are spinal pains, and lameness due to the infection, but may develop slowly within months. Veterinarians diagnose this infection with a CT scan or fungal plaques. Aspergillosis diseases began when canine inhales mold into their nasal cavity, and triggers an allergic reaction. The most fatal Aspergillosis is systemic because it spreads beyond other organs and between the lungs. It is important to treat quickly, if it is discovered.

An additional fungal disease in canine are Blastomycosis, it is a yeast like fungal caused by an organism. It affects large canines and humans through the respiratory tract. It is transmitted by entering through the skin, canines that dig through the dirt and can release the spores in the ground. It is commonly found in soil or decaying wood and is also common in male canines. Canines inhales the fungal spores from being in an environment. General symptoms are fever, weight loss, and anorexia. The veterinarian would diagnose this issue by examining the cells in the lymph nodes of the canine. The patient is treated with antifungal medications. Owners cannot protect their animal through a vaccine, owners would have to be careful on whether the animal is safe in that particular area.

Feline Epidemiology

An infectious disease that affects feline is feline immunodeficiency virus also known as FIV. This certain disease attacks the immune system, and can leave the feline to many more viruses. Felines with this disease can be found worldwide, but the rate of this infection vary greatly. According to Cornell University Vet program (2014), stated that “in the United States, approximately 1.5 to 3 percent of healthy cats are infected with FIV. Rates are significantly higher (15 percent or more) in cats that are sick or at high risk of infection”. Felines can transmit the infection through a deep bite wound, normally from aggressive felines. Feline cannot get the infection from litter boxes or feline bowls. Although they can obtain the infection from birth, or sexual transmission. Clinical signs for this infection are persistent fever with the loss of an appetite, hair loss, and gingivitis. For a proper diagnosis the veterinarian will perform a physical exam they will also conduct a chemical blood count, and a urinalysis test. A feline with this infection has no definitive cure to get rid of FIV. Some felines tend to live a normal life, and have many years to live if managed properly. To prevent this infection, the owner will have to

protect their feline and keep other felines away. If felines are kept outside, it is important to pay close attention to bite wounds from a feline fight.

Another infectious disease that feline can obtain is Toxoplasmosis. It is a parasite disease that is caused by *Toxoplasma gondii*. It is also the most common parasite disease that is seen in warm blooded animals, and even humans. It is caused by ingesting raw meat, and is released into the felines digestive tract system. Human can also consume this parasite from undercooked meat, or drinking contaminated water with this disease. If the human is pregnant, it puts mothers in danger by being close to feline feces. The Centers for Disease Control and Prevention states that, "while the parasite is found throughout the world, more than 60 million people in the United States may be infected with the *Toxoplasma* parasite. Of those who are infected, very few have symptoms because a healthy person's immune system usually keeps the parasite from causing illness" (CDC, 2011). The general symptoms are lethargy, depression, weight loss, and fever. Symptoms are most seen in kittens while being in the mother's womb. Veterinarian would diagnose the parasite with laboratory tests, and measure the levels of antibodies in the blood. Felines can be treated by an antibiotic called Clindamycin. Most felines that has Toxoplasmosis, recover with the treatment. If a human is pregnant it is important, to protect her unborn baby from this parasite.

A bacterial infection that felines can obtain is Pyoderma. It is an infection that is on the surface of the skin, and simply means pus in the skin. It is most common in canines but is less common in felines. It is also caused by being exposed to fleas, or allergic to food. Felines have a higher risk with being consumed to this bacterial infection, and having a fungal infection together. Symptoms for this infection are itchy painful skin lesions, alopecia, and draining sores.

Veterinarians can diagnose this issue by doing a complete physical exam, and skin scraping. Treatment for feline pyoderma is antibiotics to help kill the infection, shampoo and creams.

Streptococcus canis in felines is another bacterial infection. It is a bacterium that is shown in animals that has weaker immune systems. General symptoms are fever, pain, coughing, and arthritis. Treatment for this infection would be antibiotics, and dehydration. Felines that have this bacterial infection are most commonly seen in shelter cats. When a feline is seen with this infection, the clinic or owners should isolate the exposed animal to prevent this infection. To also prevent this infection owners should avoid contact with other pets. Feline can recover from this infection it is important that owners are taking good care of their animals.

A fungal infection that felines can be exposed to is *Malassezia pachydermatis.* It is an abnormal yeast found on skin, and ear canal of a feline. It weakens the immune system in the skin to begin the infection. Most common symptoms for this infection is alopecia, irritation of skin, and scaly skin. The best way to diagnose this fungal infection would be for the veterinarian to complete a physical exam on the skin and a microscopic exam. It can be treated by antifungal medications.

Another fungal infection is Sporptrichosis as known as *Sporothrix schenckii*. Sporoptrichosis is a fungus infection on the skin and is very rare in most cases. It appears to be on timber and in soil. Felines tend to have a greater risk of transmitting the infection. Other feline can spread the infection by a scratch on their skin. There are three types of sporotrichosis, and they are lymphocutaneous, disseminated, and pulmonary. All types have different symptoms to them for example; fever, skin bumps, and dermal lesions. The fungal infection can be diagnosed with a complete blood count. Also, it is important to humans because it is a zoonotic disease. The feline treatment may include being hospitalized, and taking several antifungal

medications. To prevent this infection the patient must go through therapeutic treatment even if the feline shows no sign of symptoms.

Feline Infectious Peritonitis as known as FIP is a viral disease cause by different strains of viruses called feline Coronavirus. It is found more in a household full of felines, but it is contagious and can be transmitted through feces from a feline. Some felines tend to a shed a small amount feces for months and remain healthy. On the other hand, a small percentage of felines can cause the virus to be fatal. Generally, it is uncommon to some felines, but the rate for other felines in shelters is very high. There are two different types of symptoms, they are wet FIP and dry FIP. The wet FIP causes weight loss and the abdominal could be swollen. For the dry FIP, the fluid builds up causes the felines to have a poor appetite and a very high temperature. This certain viral disease is not easy to diagnose a test. ELISA, and other tests can detect the antibiotics but cannot differentiate the strains of the Feline Coronavirus, so there is no cure. Unfortunately, there is no effective treatment or vaccine for this viral disease.

Feline Rhinotracheitis Virus (FRV) is a viral infected disease that comes from the respiratory of a feline. It is caused by a Herpesvirus 1, and is from the *Herpesviridae* family. It is transmitted through direct contact such as sneezing and coughing. Young felines are more likely to obtain this disease, however, old felines are more severely affected. The clinical signs are sneezing, fever, nasal discharge, and depression. Diagnosis can be done from immunofluorescence testing of nasal smears. Treatment and prevention are mainly antibiotics, fluids for dehydration, and nursing care. This viral disease is highly contagious can be also transmitted by hands and clothing from felines to humans. It is very important to wash hands, and stay alert on this disease.

A non-infectious disease for a feline is the urinary system. It is composed to kidneys, bladder, and urethra. According to Common Diseases of Companion Animals, states “the main job of the urinary system is waste removal, although it is also instrumental in red blood cell (RBC) production, the regulation of water and electrolyte balances, and control of blood pressure” (CDC, 2011). It is very important for the filters to function the waste from the blood. When the kidneys do not properly function the waste can build up levels in the blood. It is called Azotemia, it is caused by a variety of factors for example; heart failure, and dehydration to animals. Chronic diseases can damage the kidney and cause it to not function correctly. There are four different stages on handling chronic diseases. On the other hand, acute disease can do major damage to kidneys. These diseases are important concerns to look out for because the urinary system can fail.

Another non-infectious disease felines can consume is asthma. It is a common respiratory disease that affects one percent of adult felines in the world. Clinical signs are wheezing, open mouth breathing, coughing, and gagging up mucus. Felines with asthmas are more like humans with asthmas. Allergens that triggers feline asthmas is pollen, dust, and mildew. Veterinarians would diagnose feline asthmas with doing a blood test, and chest x-rays. Treatment for the patient would be nasal oxygen, or terbutaline IV medication. It is very important that owners keep their felines away from anything that can harm the pet. Felines with asthmas is not curable that is why it is important for feline to be cautious on being exposed to allergens.

Equine Epidemiology

A common infectious disease in an equine is West Nile Virus, known as WNV. It is a mosquito-borne disease that infects horses and other animals. The WNV is a serious infectious disease that horses need vaccine shots for once or twice a year. “Physicians first identified WNV in 1937 in a female resident of Uganda, Africa’s West Nile district. After that, the virus caused several outbreaks in the Eastern Hemisphere and was identified in horses in 1960” (Oke, 2017). The virus is known to infect more than 25,000 horses in the United States. The virus spreads through a mosquito that infects birds. When the bird is infected, it then feeds on and infects the horse with the virus. The clinical signs are fevers, stumbling, and weakness. To diagnose this virus, the veterinarian would run an ELISA test that detects acute infection. There is no treatment for this virus and supportive care from the owner is the best help. To prevent this virus is to minimize the risk of this infection. Throughout time the cases for WNV is tremendously lower. “State veterinarians reported only 377 equine WNV cases in 2013, down from a high of more than 15,000 in 2002” (Oke, 2017). It also includes zoonotic which can be transmitted through humans and make them very ill. Most people do not develop symptoms but 1 out of 5 either infected shows fevers or body aches.

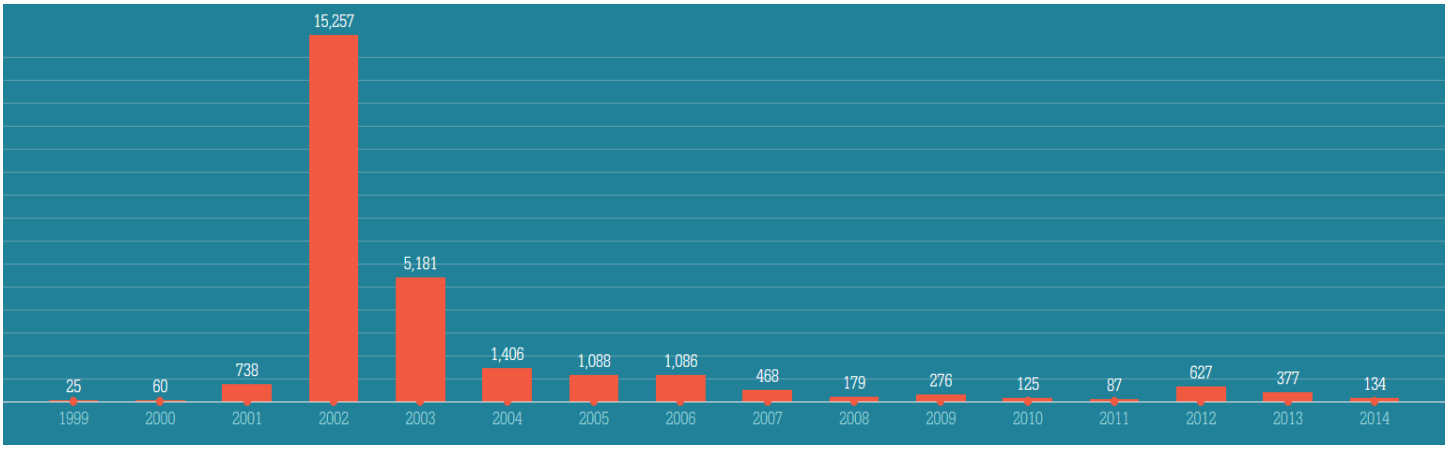


Figure 5. Data for WNV throughout the years and how the number of cases has decreased. (Oke, 2017)

An infectious disease equine can accumulate is Encephalomyelitis, also known as sleeping sickness. This disease affects the nervous system and travels through birds, rodents and mosquitoes. They are caused by at least three different types Eastern, Western, and Venezuelan. The symptoms for this disease are fever, depression, weakness, refusal to eating, and drinking. The disease is spread through a mosquito that infects a rodent or bird and tends to bite on an equine. To diagnose this sleeping sickness disease is to perform an examination on the equine, then collect blood samples to determine the concentration of antibodies. "There is no known treatment for this disease. The only treatments used in horses with neurological signs associated with viral encephalitis are primarily supportive and include anti-inflammatories, anti-convulsions, and fluid therapy" (Allivet, 2013). Prevent this disease includes ensuring the equine is vaccinated, veterinarians strongly recommend vaccinating all equines at least twice a year.

A bacterial disease equine can consume is Strangles. Strangles for equine is a highly contagious disease that affects the respiratory tract. Horses, donkeys and ponies can be affected to this disease, but horse tend to develop more severe signs. Strangles are transmitted through a bacterium know as *Streptococcus equi*. It can be spread through direct contact or sharing water with each other. It can also be transmitted through clothing or hands. It is always important to isolate any horse that has this disease. The symptoms are loss of appetite and yellow draining mucus from nostrils. Treatment for this disease depends on what stage the equine is in. The use of antibiotics will help the equine get better throughout the disease. Vaccines are recommended for this situation. To prevent this disease one needs to reduce other equine from the infected

horses so the disease cannot spread. Since this disease is very contagious it is important to visit a vet for treatment.

Another bacterial disease is Potomac Horse Fever known as PHF. It is a disease that affect equines during hot weather mostly in July and August. The outbreak usually is seen in horses that are kept near a river or streams. It can be transferred through water bugs that are in the bacteria in the environment. The clinical signs are mild fever, laminitis, and mild colic. This certain disease is not contagious from equine to equine, but is it only contagious by swallowing an infected insect. To diagnose, veterinarian would have to do a clinical observation, next would be a complete blood count to measure the antibodies, and analysis test. It is important to act quickly on treating this disease to prevent other disease from becoming present in the future. There are vaccines for Potomac Horse Fever.

A viral disease that equine can get is Equine Influenza also known as horse flu. It is a highly contagious infection that spreads through the upper respiratory tract. It is caused by a strain called influenza virus Type A. The virus Type A is transmitted by inhaling the sheds of another infected horse such as feed buckets an infected horse coughing, and grooming aids. The clinical signs are high fever, nasal discharge, coughing and depression. “The virus has a very short incubation period of only one to three days, and the clinical signs of influenza are obvious three to five days after initial exposure to the virus” (Oke, 2011). To diagnose the virus the owner would have to isolate other groups of healthy horses away to prevent other horses from contacting it. Veterinarians would collect swab samples to obtain the virus. The treatment would be anti-inflammatory medications and supportive care from the owners. It is also important that owners get vaccinations. It is recommended from the American Association of Equine Practitioners (AAEP) to have all horses vaccinated.

Another common viral disease equine can consume is Equine Herpesvirus. It is transmitted by an infected or uninfected horse that comes in direct contact with nose to nose or through a contaminated water bucket, clothing, and blankets. It can be also transmitted through a mother's womb. It is known to cause a respiratory disease in foals. It can also be known to cause single and multiple abortions in mares during pregnancy. When an infected foal is prematurely born it would die very soon after birth. The viral disease can travel in the air of short distances. The most common strain is EHV Type 1 and EHV Type 4, both cause abortion and respiratory diseases. The clinical signs are fever, nasal discharge, and weakness. Veterinarians would diagnose this disease with a PCR test and would take blood samples. It is recommended to isolate other horses from one another. Treatment involves non-steroidal anti-inflammatory medication, and supportive care.

A fungal infection equine can develop is Ringworm. Ringworm is a highly contagious infection of the skin. It can spread from horse to horse, and from horses to humans. There are two types of ringworm, they are *Trichophyton* and *Microsporum* species. It is transmitted by direct contact from an infected that has been groomed or clothing. This infection remains on the skin up to three weeks before clinical signs has been seen. The clinical signs are flaking areas with broken hairs and slight swelling of the skin. The infection would be diagnosed by examining the material under a microscope. To treat the infection a veterinarian would prescribe an anti-fungal wash and cream. If the infection is untreated it will self-cure within 6-15 weeks. It is important that other horses are kept isolated within 2-3 weeks. It is also important to monitor for other infectious or contagious diseases.

Sweet itch is another fungal infection equine can develop and known as summer itch or pruritic. It is an unpleasant sensation that affects thousands of horses, ponies, and donkeys that is

caused by an insect bite. The infection is not contagious but some equine tend to develop this fungal infection by allergic reactions from saliva of an insect called *Culicoides midge. Culicoides midge* are biting flies that is a vector of many diseases, also known to look like mosquitoes. Clinical signs are several itching, bald patches, and open sores. Usually, owners would see the affected areas on the ears, tail, and stomach. Veterinarians treat the infection by applying citronella oil or fly spray regularly every day but there is no cure. To prevent the fungal infection, horses would need to be covered to reduce the bites and use fly control products.

A non-infectious disease that is common is Laminitis. Laminitis is a crippling disease that connected to the hoof wall of the horse's coffin bone. It causes inflammation in the horse's foot. It is caused by the weight of the horse and secondary intestinal bacterial infection. There are two clinical signs an acute and chronic laminitis. The acute generally come on suddenly and are several. When the horse is standing it will lean back on its hind feet to relieve pressure from its front feet. The chronic clinical signs are that equine will have growth rings around the hoof wall, indicating that the horse has suffered from laminitis in the past. It is important to call a veterinarian immediately and follow treatment instructions. It is also important to remove all food always from the horse, so it will not gain more weight. To prevent laminitis, owners should monitor horses' diets daily and carefully.

Another non-infectious disease is Cushing disease also known Pituitary Pars Intermedia Dysfunction (PPID). It is caused by a tumor that develops in the pituitary gland. It is most common in older equines. The clinical signs are long curly hair, delay hair shedding, and change body conformation. Veterinarians would diagnose this concern with a complete physical exam along with blood test. Although there is no cure or definitive treatment for this disease there are many ways to manage and control it. The disease does weaken the horse's immune system.

Bovine Epidemiology

An infectious disease cattle can develop is Campylobacteriosis. The term *Campylobacter* refers as Greek meaning curve rod, because of the curved shape of this bacteria. It is a disease that primarily causes early embryonic death, abortion, and infertility. It is transmitted by infected bulls when they mate with a heifer. The disease does spreads rapidly. The symptoms are abortion, uterine infection, and poor conception rate. Veterinarian would diagnose this disease by running laboratory test. After diagnosing the disease treatment would be given. It is important to isolate other herds from the risk of spreading this disease. It is also important to get all herds vaccinated.

Second infection disease in cattle is Contagious Bovine Pleuropneumonia. It is a highly contagious disease, the outbreak presented in Africa. The disease has been free in the United State since 1892. It is transmitted from animal to animal in respiratory aerosols. The clinical signs are fevers, loss of appetite, and depression. To diagnose this contagious disease veterinarian would perform a nasal test. Treatment would be supportive care and three different medications. To prevent the disease, owners would have to quarantine the animals, and vaccinate others within the herd.

A viral disease cattle can possess is Bluetongue Virus also known as BTV. It is an infectious viral disease that is common across the world. The disease was first discovered in South Africa in 1902. It is a non-contagious disease for other animals, and humans cannot catch this disease. It is caused by a small insect that bites is known to be called biting midges. This disease causes many symptoms such as ulcer, sores, and painful hooves. Owner will need to

contact their veterinarian immediately. Bluetongue disease would need to be monitored by veterinarians, the patient would need effective treatment because there is no cure.

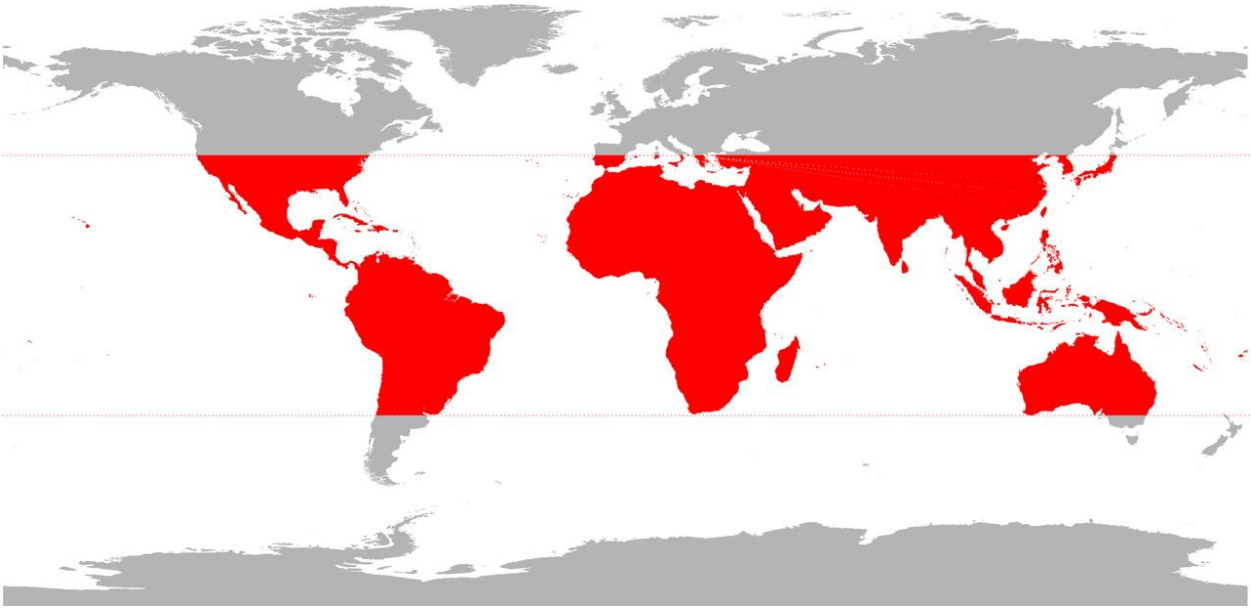


Figure 6. Map of the estimated global range of bluetongue virus prior to 1998. (Wilson, A., & Mellor, P., 2009)

Bovine Respiratory Syncytial Virus is a viral infection that affects the mucosal cell lining in the respiratory tract. It is usually seen in young calves. According to the article, Bovine Respiratory Syncytial Virus Infection stated the, “first isolated in Switzerland in 1970 from an outbreak of respiratory disease involving dairy cattle” (Prieksat and Thompson, 1988). The clinical signs are fever, depression, loss of appetite, and coughing. To diagnose this disease veterinarian would perform laboratory test, it can be a difficult virus to identify. There is no treatment for this disease, there are three ways to help with treatment. The patient would need supportive therapy, anti-inflammatory drugs such as aspirin, and antimicrobials. This virus is so important because it inclines an animal to secondary infections. Most cattle would not have any clinical signs, but it does weaken the immune system.

A bacterial disease cattle can develop is Bovine Tuberculosis. It is transmitted by inhaling aerosols droplets, and breaks through the skin. It is a zoonotic disease, so it is important for humans to be careful. Bovine Tuberculosis can be transmitted through dairy products. It is spread by another infected bovine, it is also spread through airborne particles from the respiratory tract. The early stages for this disease are not visible. However, later stages clinical signs are weakness, lethargy, anorexia and a low fever. The method of testing this disease is a tuberculin skin test. According to the Animal and Plant Health Inspection Service, "Each year, more than 1 million animals receive a skin test, and approximately 11,000 cattle are sampled during slaughter surveillance" (USDA, 2014).

Another bacterial disease is Endometritis. It is an infection of the inner layers of the uterine endometrium. It reduces fertility and milk that combines with the culling rate. The disease is transmitted by poor hygiene, and calving problems. The clinical signs are yellow and white discharge from the vulva, and inflammation of the whole uterus. Veterinarian can diagnose the disease with a complete physical exam and be treated with antibiotics. To prevent the disease cattle would need to improve their hygiene, replace bedding, and maintain the condition score.

A fungal infection cattle can receive is Candidiasis. It is a disease that is caused by species of yeast-like fungus. Mostly is known as *Candida albicans*, it is considered to cause abortions in cattle. This infection has considered to cause mastitis in cattle also, which is an inflammation reaction of the udder tissue. The clinical signs are watery diarrhea, dehydration, and anorexia. To diagnose the infection, veterinarian would do a physical exam and would do a biopsy specimen from the lesions. After testing is done, treatment would be ointment or oral medication.

Another fungal infection cattle's can obtain is Cryptococcosis. It is a fungal disease that affects the nasal cavity and the respiratory tract. It is transmitted by inhaling spores or a wound being contaminated. This fungus is found in manure and soil. It is related with cases of mastitis, which is an infection from the breast tissue. It is also zoonotic, humans can consume the fungus by inhaling the infection as well. It is known to infect the lungs. The clinical signs are anorexia, swelling, and decrease in milk flow. Veterinarian would diagnose the infection with a nasal and skin exudate. Treatment would be medication, and supportive care.

A non-infectious disease that cattle obtain is cancer. Everyone knows cancer is a deadly disease that spreads to other parts of the body. However, cattle can consume eye cancer, also known as ocular neoplasia or squamous cell carcinoma. It is a tumor that sits on the eyes or the eyelids of cattle's. The third eyelid seem to be common for eye cancer. If it is untreated the issue would lead to a larger tumor, and a foul smell. The causes can be in many ways such as lack of pigmentation or the appearance of the third eyelid. "Approximately 70 percent of all eye tumors in cattle are cancerous" (Fears, 2014). The clinical signs of the eye cancer are spreading of lymph nodes to the head and respiratory system, making it difficult to breathe. Veterinarians would treat this disease by surgically removing the affected area or cryosurgery. If the owner decides to not take the cattle to the vet, the cattle would go to a slaughter house if they are in their early stages.

Another non-infectious is white line disease. It is a lesion that affects the fibrous line between the wall and the sole of the hoof. It can be easily damaged and cause a large growth of infection. Clinical signs are pain, bleeding, pus, and lameness. Veterinarian would treat this disease with treatment with antibiotics, if necessary the hoof wall would be removing to allow drainage. To prevent this disease, owners would put cattle on diet, would need supportive care,

and change of the environment. It is important to be concern about this disease because it leaves the tissue unhealthy and damaged.

Concepts of Prevention and Control

There are certain ways to prevent diseases or illnesses. Infectious diseases are the major causes for sicknesses and death in the United States. Tiny organisms travel within seconds from person to person or from animal to animal. The primary way to prevent diseases are for people to wash their hands very well. Diseases can transfer from contaminated hands whenever people have direct contact with animals. It is important for humans to wash their hands when coming from an animal shelter or going into an animal surgical area. Also, to isolate other animals from another. Farmers and veterinarians are responsible for the health of their patients and livestock. However, they should be alert to all clinical signs of diseases, some illnesses do not convert to humans or animals if the animal is not showing any signs or symptoms. Humans and animals should get vaccinated because it reduces the chances of contracting diseases. It is very important to take antibiotics when they are prescribed to the patients.

Humans and animals must be careful when consuming any foods. Many diseases can be zoonotic. “Zoonotic disease, also called zoonosis, any of a group of diseases that can be transmitted to humans by nonhuman vertebrate animals, such as mammals, birds, reptiles, amphibians, and fish. Many domestic and wild animals are sources of zoonotic disease, and there are numerous means of transmission” (Encyclopedia Britannica, 2017). Zoonotic diseases are hard to control because there are five stages of zoonotic diseases. Most human infections come from livestock like chickens, pigs, cattle, and goats. Studies show that viruses have been found

on 2,000 farms in cattle and chickens just in the United States. Humans should be educated to prevent diseases that may result in weight gain, and spreading from one to another and death.

Many people encounter animals at the local shelter, parks, petting zoos, and even on the side of the road. For humans to protect themselves and from spreading diseases, humans should keep their hands clean; germs can spread if humans not washing their hands properly. For owners with pets, should prevent bites from fleas, mosquitoes, and even ticks. These three biting insects are vectors for diseases they can transmit diseases. These insects can also be dangerous and deadly by transmitting different diseases.

Also, humans should handle their food safely. Germs can be transmitted through contaminated food. Many people do not know that bacteria and viruses are known for causing food poisoning. Contaminated food can be caused by anything, not just germs. The main sources are water, air, dust, sewage, and even employees. Contaminated foods can also come from animal waste. During slaughtering for animals, meats can become contaminated in small amounts. Even fruits and vegetables can be contaminated if they are not washed off. It is so important to pay close attention to food this going into the body.

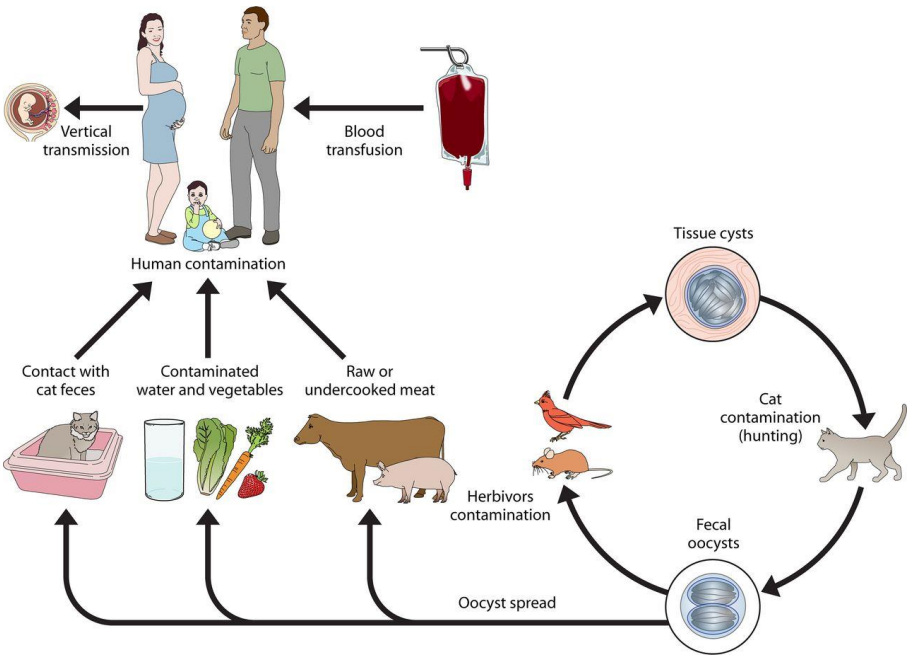


Figure 7. How animal and human can transmit diseases. (Pinterest, 2017)

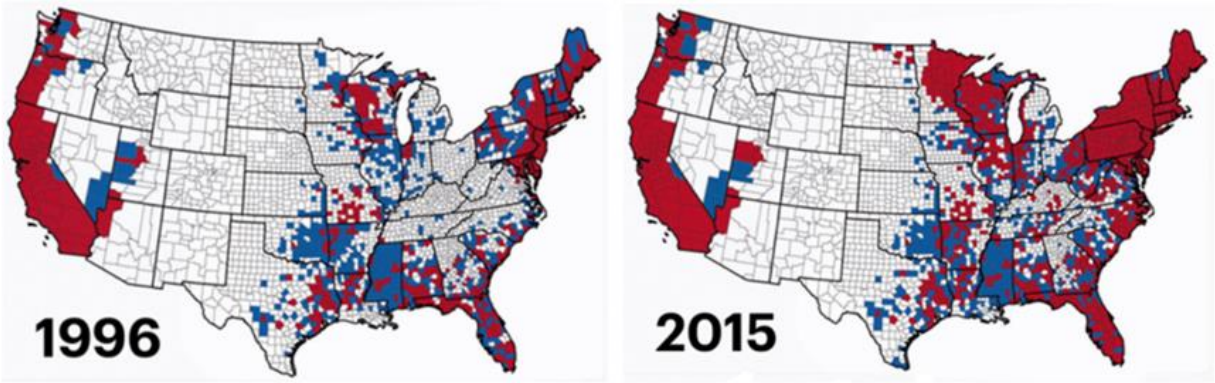


Figure 8. More than 300,000 people has been infected by a certain zoonotic disease in the United States in 20 years. (Asher, 2016)

Health Check-up

Just like humans, animals need their wellness examinations. Physical examination focuses on the patients' health, and illnesses. For animals that are babies, it is recommended to be seen on a monthly basis. Since babies are so easily to get ill, it is important to keep a watch on them. During an examination, a veterinarian will ask the owner questions on their diet, behavior, habits, lifestyle, and their general health. Veterinarians would recommend preventive medication to prevent diseases, vaccination, diet plans, or even dental care.

Veterinarians are there to make sure animals are in the best care. They diagnose illnesses, perform medical surgeries, and give proper care for animals. There are different types of veterinarians. Companion animal veterinarian treat diseases and different condition in mostly felines and canines. Veterinary practitioners that are more advanced in practice will handle avian, equine, exotic, and reptiles. Food animal veterinarians are vets that work with farm animals, which are raised for food sources. Food safety and inspection veterinarians test livestock and animal products, their job is to control also prevent the transmission of diseases among animals and people. Research veterinarians engages on treating and investigating diseases.

Veterinarians have one job, to make sure the patient is healthy. Animals are very smart creatures, they deserve their monthly checkups just like humans.

Conclusion

Diseases have been on earth for many decades. Diseases that can cause sickness in animal, and human. Some disease can be serious or even fatal. For many years, diseases have

made a big impact throughout history. There are millions of diseases that plagues our universe every single day, and many of them are still being discovered. Diseases are known to have four categories; genetic, biological, physical, and chemical.

Animal epidemiology means the study of diseases that carry infectious and non-infectious diseases. Diseases can come in all shapes and sizes. When a disease is discovered it is important to seek treatment as soon as possible. Some diseases can cause other health conditions to the body and make the immune system even weaker. The important diseases are infectious diseases, it is a disorder that is caused by organisms for example; bacteria, viral, and fungus. It can also be highly contagious, and cause serious symptom concerns. Infectious diseases can be direct and indirect; whereas non-infectious diseases are unable to spread. Therefore, it is important to always be alert, because humans and animals can contact an infectious disease even to a healthy body. United States supports treatments of diseases for animal and humans through education and research to prevent these harmful diseases.

Diseases can cause stress, social, and natural harm to humans and animals health. This paper discusses the natural history on how diseases were discovered. Even though scientist and researchers were less exposed by diseases today, it has made a big impact on the world. This research paper also discusses major concerns such as infectious and non-infectious diseases. This paper also includes canine, feline, equine, and bovine epidemiology. Each animal gives ten different diseases, and how a veterinarian would to prevent them. The paper gives concepts on prevention and how to control most diseases. Handling a disease can be a serious matter, but it is up to humans to get vaccinations for their animals so that diseases would not become a pandemic.

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Appendix A

Figure 9. Different animals, and different methods on how they can be healthy. (Animal Health Matters, 2017)

Appendix B

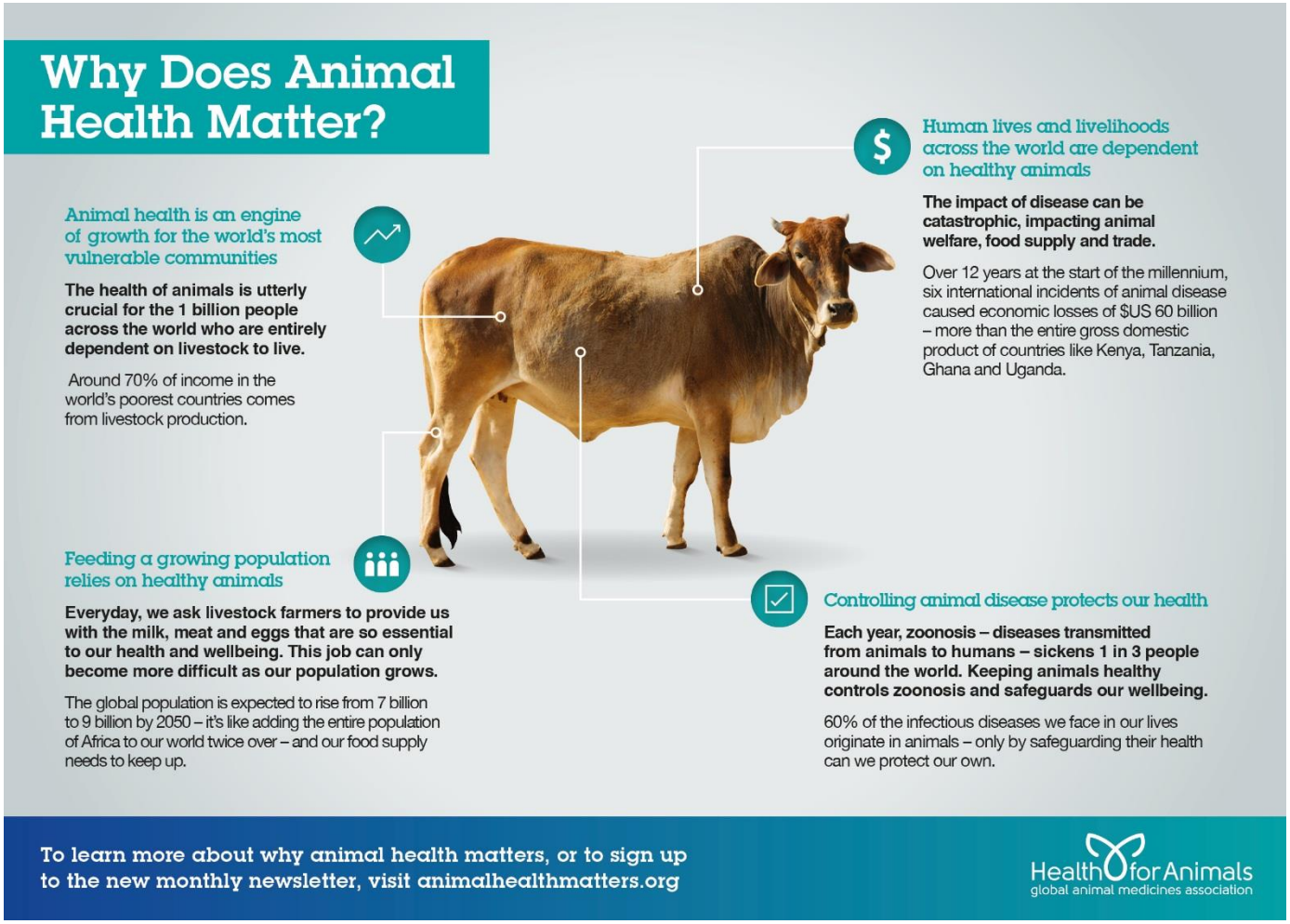

Figure 10. Why does animal health really matter to society? (Animal Health Matters, 2017)

Appendix C

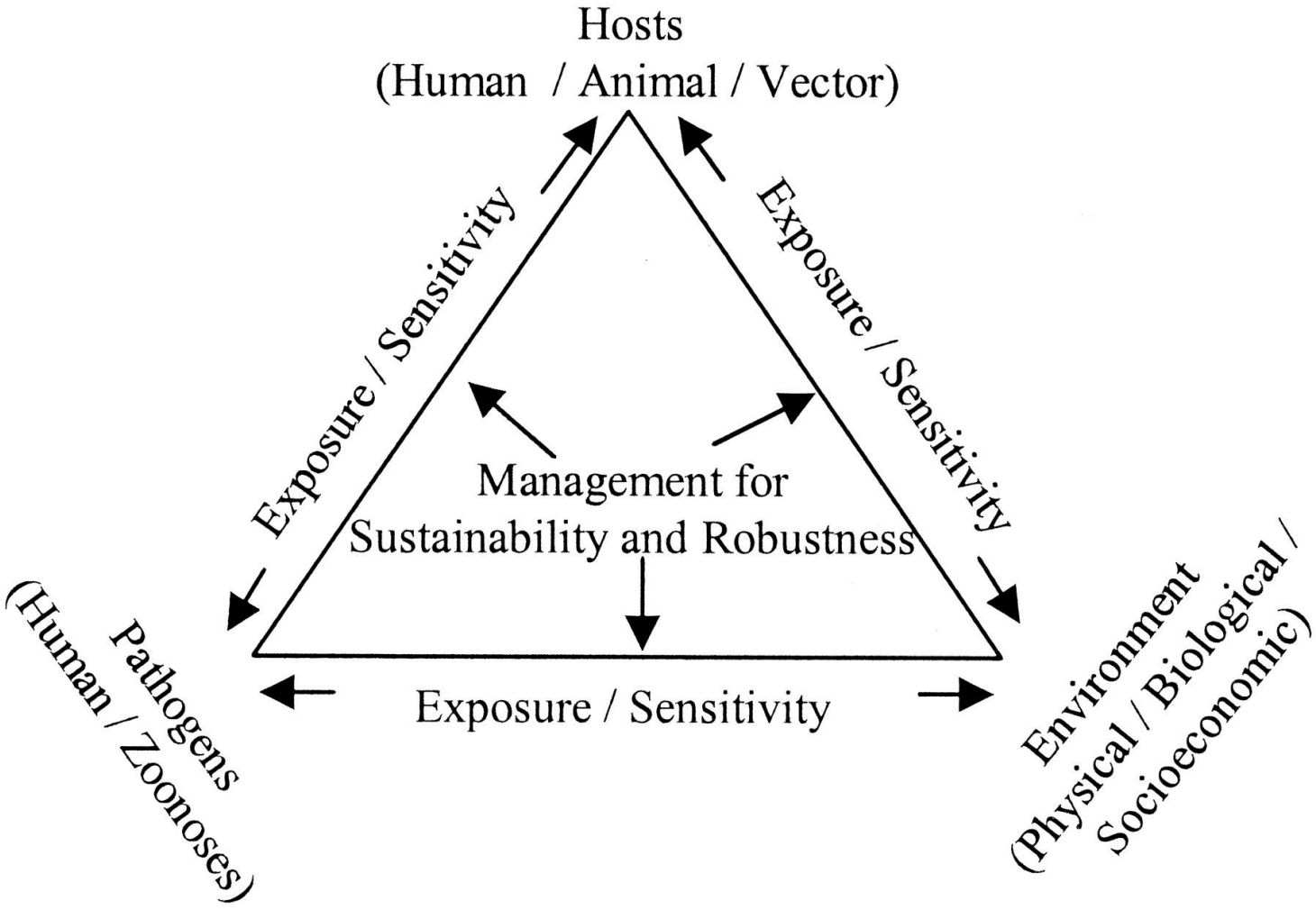

Figure 11. A host-pathogen-vector-environment framework for the assessment of risks to humans from vector-borne diseases under global change. (Sutherst, 2004)