

EDUCATING THE PUBLIC ABOUT ZOO NOSES THROUGH THE RILEY COUNTY
EXTENSION AGENCY: A FIELD EXPERIENCE REPORT

by

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Abstract

This report presents a detailed field experience undertaken for 240 hours with the Riley County Extension Agency. The mission of the agency is to make research from land-grant universities understandable and available to the public, who can then use the research to improve their homes, families, farms, businesses and communities.

In 2009, a case of H3N2 influenza, a strain of “swine flu” was contracted by a child at the Riley County Fair. Because of that case, the Riley County Extension Agency has taken a particular interest in educating the public about infectious disease and zoonoses at the annual fair. Because the public comes into contact with many different species of livestock, the fair presents a unique opportunity to educate the public about zoonotic diseases of all domestic animals in a setting that encourages their interest.

The experience of being in front of the public, representing the Riley County Extension Agency to the general public, refined my ability to make information relatable at many different education levels. Developing the display has not only deepened my understanding of zoonotic disease and food-borne illness but also strengthened my knowledge about how to educate both children and adults.

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Chapter 1 - Introduction

In 2009, a case of H3N2 influenza, a strain of “swine flu” was contracted by a child at the Riley County Fair.⁵³ Because of that case, the Riley County Extension Agency supported a project that would educate the public about infectious disease and zoonoses. Because the public comes into contact with many different species of livestock that they may not have daily interaction with, the fair presents a unique opportunity to educate the public about zoonotic diseases of all domestic animals in a setting that encourages their interest.

The project was designed to present the information in a manner that would reach as large of an audience as possible. Swine flu may have been the initiating factor but was not the keystone of the project. Although the focus was on diseases possibly contracted at the fair, information about zoonotic diseases from household pets and food-borne illnesses was included.

The objective of this project was to create an information stand in order increase public awareness of zoonotic diseases, especially those that they may occur as a result of participating in the 2013 Riley County Fair, July 25th-29th 2013, Manhattan, KS.

Diseases Included in the Information

The following diseases were included in the information either viewed on the interactive information board and/or offered as handouts:

Rabies

Rabies is a virus that can infect all mammals. Humans are infected when an infected animal bites them and transfers contaminated saliva to nerve or muscle cells at the site of the inoculation.^{22, 38} Animals show two forms of symptoms: (1) Furious: may attack without provocation, and act vicious or unusually aggressive (2) Dumb: depressed animals that are typically scared of humans are no longer fearful.⁴⁷ Human symptoms are anxiety, fever and headache initially. Signs progress to excitableness and sensitivity to light and sound, followed by delirium and seizures. Eventually signs of paralysis, aerophobia and hydrophobia, coma, and death occur.⁴⁸ According to the Centers for Disease Control and Prevention, “*To date less than 10 documented cases of human survival from clinical rabies have been reported and only two*

have not had a history of pre- or postexposure prophylaxis.” In Kansas, skunks are the main reservoir, although most cases in the US are from infected bats.⁵⁷ Raccoons are also an important source of human rabies infections, especially in the eastern US.^{22,57} Worldwide most human cases result from infected dogs.⁴⁸

It is possible for anyone to become infected with rabies. Children may be at a greater risk due to their natural curiosity with wild animals. Household pets are more likely to have contact with wild animals, which increases the risk of human exposure.²²

Rabies is a serious and potentially deadly disease. It can be easily prevented through proper vaccination of pets, appropriate handling of wildlife and prompt medical care of animal bites. Rabies is considered a medical urgency, not a medical emergency.²²

Orf

Also known as Contagious Ecthyma and Sore Mouth, Orf is a virus found in sheep and goats. Humans become infected when they have skin contact with an infected animal or equipment that animal has had contact with. Symptoms in sheep/goats include blisters and crusty scabs typically found on lips, muzzle and in the mouth. Most human infections result in sores that may be painful, most commonly on their hands. People cannot infect other people.¹⁴

Activities that increase the risk of contracting Orf include: bottle feeding, tube feeding, or shearing sheep/goats, petting infected sheep/goats, handling infected equipment, working with sheep/goats when you have an open cut or skin sore and being bitten by an infected sheep/goats. Sheep and goat producers who vaccinate for Orf should take protective measures when vaccinating, because the vaccine contains live virus and may infect the worker.¹⁴

Although sheep and goat producers are most likely to be exposed to the Orf virus, anyone can become infected. Good hygiene can minimize risk and proper treatment of sores can help prevent secondary bacterial infections.¹⁴

Cryptosporidium

Cryptosporidium, or Crypto for short, is a parasite of mammals, birds, and reptiles. Transmission from these species to people occurs through the accidental ingestion of contaminated soil or water.¹¹ The different genotypes of cryptosporidium are fairly host specific. *Cryptosporidium parvum* was originally thought to be the only species able to infect humans.

Over the years, other species have been found in people, particular immunocompromised individuals. Because of the host-specificity of each genotype, the source of a human infection may be derived from the genotype. *Cryptosporidium parvum* and *C. hominis* account for greater than 90% of human cases around the world.³⁵

Infected animals may be symptomatic or have mild diarrhea.³¹ Human cases have watery diarrhea, stomach cramps, dehydration, nausea, vomiting, fever, and weight loss. Human cases may be asymptomatic. In immunocompromised people, even if symptoms disappear, cryptosporidium is often not curable and the symptoms may recrudesce if the immune status worsens. Besides infected animals, another common source of cryptosporidium is chlorinated pools and water parks, because chlorine won't kill this parasite. Natural recreational water, such as ponds and creeks, is another significant source.¹¹

Cryptosporidium parasites are found in every region of the United States and throughout the world. In the US, sources contaminated with *Cryptosporidium* include recreational water, undercooked food, and equipment used to handle or to manage the waste of infected animals. Travelers to developing countries may be at greater risk for infection because of poor water and food sanitation. Daycare workers, cattle producers, hikers and travelers are at an increased risk.¹¹

Once infected, people with decreased immunity are most at risk for severe disease. Therefore those with decreased immunity should avoid recreational water, animal feces and contact with individuals with suspected or confirmed *Cryptosporidium*. For the general population, practicing good hygiene will minimize exposure and spread of *Cryptosporidium*.¹¹

Tularemia

Tularemia is caused by the bacterium *Francisella tularensis*. Over one-hundred (100) species have been found to be infected; rabbits, hares, and rodents are especially sensitive. The disease is rare in horses, pigs and cattle. Transmission occurs through tick and deer fly bites, skin contact with infected animals, ingestion of contaminated water, and inhalation of contaminated dusts or aerosols.³⁶

Both animal and human cases result in five (5) forms; the form that occurs is related to how the bacteria enter the body. Ulceroglandular is the most common form. A skin ulcer

appears at the site where the organism entered the body and results in swelling of regional lymph glands, usually in the armpit or groin. The glandular form is similar to ulceroglandular form but without an ulcer. The oculoglandular form appears as irritation and inflammation of eye and swelling of lymph glands in front of the ear. Oropharyngeal form results in a sore throat, mouth ulcers, tonsillitis, and swelling of lymph glands in the neck. The pneumonic form is the most serious. Symptoms include cough, chest pain, and difficulty breathing. All human cases are accompanied by a high fever.²⁷

The majority of cases are reported in the Midwest, particularly Kansas, Missouri, Arkansas and Oklahoma. Cases have been reported in nearly all states. The risk of contracting tularemia can be minimized by using insect repellents, drinking treated water, removing attached ticks promptly, properly handling animal carcasses and by not mowing over animal carcasses.²⁷

Prevention of Tularemia is vital because it can be life-threatening. Because it is a relatively rare disease the symptoms can be mistaken for other more common illnesses. Potentially infected individuals should report any likely exposures, such as tick and deer fly bites, or contact with sick or dead animals to their healthcare provider.²⁷ Based on the potential to pose a severe threat to both human and animal health, *Francisella tularensis* is a CDC tier 1 select agent.⁴⁹

Anthrax

Anthrax, is caused by the bacterium *Bacillus anthracis* and infects herbivores (domestic animals include sheep/cattle/goats; wildlife can be affected.) This disease was used in bioterrorism attacks in 2001, but is also rarely found in animals in the United States.¹ Human infections occur due to contact with infected animals or contaminated soil or consumption of meat from an infected animal.⁶

Both humans and animals demonstrate three (3) types of anthrax. The cutaneous type begins as a raised itchy bump that resembles an insect bite. Within 1-2 days it develops into a vesicle and then a painless ulcer with a characteristic black necrotic area in the center. Lymph glands in the adjacent area may swell. The inhalation type initially resembles a common cold with signs being a sore throat, mild fever, muscle aches and malaise. Progression to severe breathing problems and shock and death can occur. The final type is the gastrointestinal type,

resulting in acute inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting, fever are followed by abdominal pain, vomiting of blood, and severe diarrhea.¹

Travelers and those with occupational exposure to animals (veterinarians, producers, and laboratory professionals) are at greatest risk of contracting Anthrax. Anthrax is most common in agricultural regions of: Central and South America, Sub-Saharan Africa, Central and southwestern Asia, Southern and eastern Europe and the Caribbean. Exposure to travelers may occur through what they eat and handle and the souvenirs they bring home.⁶

Although Anthrax was once a very hot topic, risk of exposure in the United States is minimal. Travelers should be aware of the risks when traveling and how to prevent exposure. Based on the potential to pose a severe threat to both human and animal health, *Bacillus anthracis* is a CDC tier 1 select agent.⁴⁹

Lyme Disease

Borrelia burgdorferi is a bacterium that causes Lyme Disease, the most commonly reported vector-borne illness in the US.³⁹ It is uncommon in Kansas.¹⁸

Many animals can be infected including dogs, horses, and cattle. Various wildlife including deer, mice, chipmunks, gray squirrels, opossums and raccoons are also carriers. Humans become infected through a bite by an infected tick. Although dogs and cats can get infected, there is no evidence they can spread it to their owners. However, pets can bring infected ticks into the household.¹⁸

Animals commonly show signs of fever, shifting leg lameness, swollen joints, lethargy, depression, and anorexia. Humans initially see a “Bull’s Eye Rash” at site of the tick bite. Next the rash spreads and headaches, neck stiffness, joint pain and swelling, dizziness, heart palpitations, and Bell’s (Facial) palsy may occur. Life-long arthritis may develop.¹⁸

95% of cases are reported in thirteen states: Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, and Wisconsin.¹⁸ Adults and children that spend time outdoors in tall grass and woods in these states are most at risk. Wearing long pants, utilizing trails, applying DEET or permethrin, and removing attached ticks within 24 hours can decrease the risk of exposure.¹⁸

In 2012, Lyme Disease was the Center of Disease Control and Prevention’s 7th most common Nationally Notifiable Disease. However this disease is heavily concentrated in the

northeast and upper Midwest and does not occur nationwide. Prompt removal of ticks can minimize the risk of becoming infected with *Borrelia burgdorferi*.¹⁸

Leptospirosis

Leptospirosis, or Lepto, is caused by a spirochete bacterium *Leptospira spp.* Current classification schemes include pathogenic and non-pathogenic serovars which can occur in the same species. There are currently over 200 total serovars and 17 species that contain pathogenic serovars.^{40, 52}

Rodents and other wild animals, dogs, pigs, cattle and horses may become infected with this bacterium through contact with infected urine or soil or water that has been contaminated with infected urine. Animals may have no symptoms (common with host-adapted serovars) or have fever, vomiting, abdominal pain, diarrhea, anorexia, weakness, stiffness, and severe muscle pain (common with cross-species infecting serovars) In cattle, acute cases occur primarily in calves and manifest as fever, anorexia, conjunctivitis and diarrhea. Adults may experience abortions, decreased fertility or decreased milk yields. Horses often have subclinical infection or ocular diseases. Swine typically have reproductive signs including late term abortions, infertility, stillbirths, and increased neonatal mortality. Piglets may show more severe clinical signs including fever, anorexia, hemoglobinuria, jaundice and signs of meningitis. Leptospirosis in dogs results in highly variable signs and severity. The disease may be asymptomatic or mild and non-specific. In some dogs, severe and fatal disease occurs with signs of kidney disease, abortions, diarrhea, dyspnea, and jaundice. Hemorrhagic syndromes may occur.⁴⁰

Transmission to humans occurs through skin (especially if cut or scratched) or mucus membrane contact with urine from an infected animal or contaminated soil or water. Human cases can result in high fever, headache, chills, muscle aches, vomiting, yellow skin/eyes, red eyes, abdominal pain, diarrhea, and rash. In some cases, after initial symptoms have disappeared, a person may become ill again resulting in kidney or liver failure or meningitis. This is also known as Weil's disease.⁸

Leptospirosis is an occupational hazard for many people who work outdoors or with animals, such as farmers, sewer workers, slaughterhouse workers, and veterinarians. Those who kayak and raft may be at an increased risk. Leptospirosis a recreational hazard for campers. Incidence among urban children also appears to be increasing.⁸

Because of the potential of serious disease, it is important to notify healthcare providers of any possible exposures. Vaccinating pets will help minimize the risk of *Leptospira spp.* exposure, but is not 100% effective due to the many different serovars.⁸

Salmonella

Salmonellosis is caused by the *Salmonella* spp. bacterium. There are many different serotypes of Salmonella. The main three that cause disease are *Salmonella* Typhimurium, *Salmonella* Newport, and *Salmonella* Enteritidis and these account for about half of all reported cases. The most common source of human infections is poultry.

Most animals may carry *Salmonella*, including birds and reptiles. Infection occurs most commonly by eating food contaminated with animal feces (foodborne illness).²⁴ *Salmonella* is the second most common cause of foodborne illness.¹⁰ It may also be transmitted by handling reptiles or birds and through contact with infected animals. Animals often show no signs or simply mild diarrhea. Depression, anorexia, nervous system signs, pneumonia and death can occur, especially in young or immunocompromised animals. Human infections may result in diarrhea, fever and abdominal cramps. Severe diarrhea could result in dehydration, hospitalization and possibly death. Rarely, reactive arthritis develops.²⁴

It is possible for anyone to become infected with Salmonella. The best way to prevent Salmonella is through proper food handling. Wash vegetables, cook poultry and other meats thoroughly and do not eat raw eggs. Care must be taken to avoid cross contamination of foods consumed without cooking by raw meat and eggs. Because reptiles are common carriers of Salmonella, wash hands after handling these animals and do not allow children to put them in their mouths.^{10, 24}

Plague

The plague is infamous for killing millions of people in Europe during the Middle Ages.⁴⁶ Plague is caused by the bacterium *Yersinia pestis* and is carried by rodents. Humans are infected after being bitten by an infected rodent flea or by handling an infected animal. Infection can also result from inhaling infectious droplets. Human plague infections still occur in the western US, but significantly more cases occur in parts of Africa and Asia.²⁰

Animal disease takes on three (3) forms. The bubonic plague is the first form and is characterized by the sudden onset of fever, headache, chills, weakness, and one or more swollen, painful lymph nodes (called buboes). The septicemic plague results in fever, chills, extreme weakness, abdominal pain, shock, and possibly bleeding into the skin and other organs. Skin and other tissues may turn black and die, especially on fingers, toes, and the nose. Symptoms of the pneumonic plague include fever, headache, and weakness. Rapidly developing pneumonia with shortness of breath, chest pain, cough, and sometimes bloody or watery mucous can occur. The pneumonia may cause respiratory failure and shock.³⁴ Human infections may result in the same three forms. Pneumonic plague is the most serious form of the disease and is the only form of plague that can be spread from person to person (by infectious droplets).²⁰

Although Plague is rare in the United States when it occurs it can be a life-threatening disease. Those in the Northern New Mexico, northern Arizona, and southern Colorado areas or California, southern Oregon, and far western Nevada areas are at greatest risk and should take preventative measures. This includes decreasing rodent habitats around the home, using repellent if outdoors in an area of high exposure risk, and flea control for pets.²⁰

Roundworms

Roundworm infections, also known as Toxocariasis, are caused by the parasite *Toxocara canis* or *T. cati*. Dogs and cats are the carriers. Humans become infected by ingestion of *Toxocara* eggs, often through contaminated soil. Humans are at highest risk from 3-4 week old puppies because at this age puppies produce large amounts of eggs. Puppies/Kittens infected before birth may fail to thrive or to gain weight. A pendulous abdomen is often observed. At 4-6 months of age, animals with large worm burdens may vomit worms.⁵⁴ Most infected humans have no symptoms, but those that do result in two possible forms related to the aberrant migration of the larvae. Ocular toxocariasis symptoms include vision loss, eye inflammation or damage to the retina. Typically, only one eye is affected. Vision loss may be permanent. In visceral toxocariasis symptoms, individuals may have fever, fatigue, coughing, wheezing, or abdominal pain.²⁵

It is possible for anyone to become infected with *Toxocara* spp. Those that are around puppies are at a greater risk because dogs shed large numbers of organisms early in their life.

Children are more likely to become infected because they tend to put things in their mouths and do not frequently wash their hands thoroughly.²⁵

Although most human infections are asymptomatic, the complications associated with toxocariasis are severe and potentially permanent. Hand washing, especially after handling young animals, supervising children around animals, and teaching children about proper hygiene will greatly minimize risk.²⁵

Baylisascaris

Raccoons infected with *Baylisascaris*, raccoon roundworms, have been found in a number of states, especially in the mid-Atlantic, northeastern, and mid-western states and parts of California. A human can become infected with this parasite by ingesting *Baylisascaris* eggs, often through contaminated soil. While raccoons may show minimal to no signs, human symptoms include nausea, fatigue, liver enlargement, loss of coordination, lack of focus, loss of muscle control, blindness, and coma. These signs depend on where the larvae migrate, such as to the spinal cord and central nervous system (Neural Larva Migrans,) the eye (Ocular Larva Migrans) and/or other organs (Visceral Larva Migrans).²

Baylisascaris is a rare disease but can be contracted by anyone handling raccoons or managing raccoon feces. Because of the serious nature of the disease, prevention should be a top priority. Limiting contact with raccoons and their feces is the simplest way to prevent *Baylisascaris* infection. Another important preventative measure is good hygiene, especially hand washing after outdoor activity or contact with animals. Children should be taught not to put objects in their mouth and should be stopped from eating dirt.²

Toxoplasmosis

Toxoplasmosis, or Toxo for short, is caused by the parasite *Toxoplasma gondii* and is carried by cats. Humans are more likely to be infected with *Toxoplasma* from undercooked meat than from their pet cats' fecal material.¹²

The only known definitive hosts for *Toxoplasma gondii* are cats. Unsporulated oocysts are shed in the cat's feces. In 1-5 days, oocysts will sporulate in the environment and become infective. Intermediate hosts in nature (including birds and rodents) become infected after ingesting sporulated oocysts. After ingestion sporulated oocysts become tachyzoites which

localize in neural and muscle tissue and develop into tissue cyst bradyzoites. Cats become infected after consuming infected intermediate hosts or direct ingestion of sporulated oocysts. Food animals, including sheep and pork, may also become infected with tissue cysts after ingestion of sporulated oocysts in the environment. Cattle are fairly resistant. Humans can then become infected through food animal tissue bradyzoites or from the sporulated oocysts found in the environment.^{12,56}

Most cats are not life-long shedders; they typically only shed the parasite for a few weeks following infection. Cats typically show no symptoms.⁵⁵ Very few healthy people have symptoms. Flu-like signs, vision problems, and damage to the brain, eyes and other organs can occur. Pregnant women should take precautions as they can pass the parasite to their unborn child, who may be born with serious eye /brain damage or, more commonly, may develop serious symptoms later in life. Once infected, there is very little chance a woman who becomes pregnant later in life will pass it to her child. The danger occurs when a women gets infected while pregnant.²⁶

It is possible for anyone to become infected with *Toxoplasma gondii*. An individual can greatly minimize his/her risk of exposure by eating fully-cooked meat and cleaning out a cat's litter box daily before oocysts sporulate. Pregnant women should be extra cautious.²⁶

Avian Flu

Avian Flu, Avian Influenza A Virus, and Bird Flu are all names for a strain of poultry flu that has recently been a hot media topic. Avian influenza is a virus contracted by both production and pet birds. Humans can be infected with some strains of avian influenza and most human cases have occurred following direct or close contact with infected poultry, although infection through contaminated environments is also possible. Human to human transmission following infection is very rare.⁷

There are two forms: a Low-Pathogenic form and a High-Pathogenic form. The majority of cases in domestic poultry are the Low-Pathogenic form, in which infected birds often do not have symptoms or have mild respiratory disease. The High-Pathogenic form has a high mortality rate and some birds may have diarrhea, breathing difficulties, and swollen heads.⁵¹ Humans may be infected with either a low-pathogenic or a high-pathogenic strain. Low-Pathogenic Avian Flu infections result in mild sore throat, cough, muscle aches and pneumonia.

High-Pathogenic Avian Flu has a wide range of signs, from typical flu symptoms to eye irritation, to severe respiratory illness. Nausea, vomiting, and neurologic signs may occur. Death is possible.⁷

The main risk factor for human infection has been direct contact with infected poultry. A few cases have resulted from consumption of uncooked poultry products. Prevention of Avian Flu is best achieved by avoiding exposure and through biosecurity in poultry operations, as the vast majority of human cases are through contact with either alive or dead infected poultry.^{7, 51}

Swine Flu

Swine Flu, or Swine Variant Influenza Virus, is a pig virus that can rarely be transmitted to humans. Most human cases have occurred following direct contact with infected swine. Swine Flu cannot be transmitted through properly handled and cooked pork and other pig products.²⁸ Infected pigs may be coughing, sneezing, have high fevers, difficulty breathing, discharge from the nose, and anorexia.²⁸ Symptoms in humans are similar to seasonal flu, including fever, lethargy, a lack of appetite and coughing. Individuals may have a sore throat, runny nose, eye irritation, nausea, vomiting and diarrhea.¹⁶

Cases of influenza in pigs commonly occur in the mid-western USA (and occasionally in other states), Mexico, Canada, South America, Europe, Kenya, and various parts of Asia.³² This may be due to the geographical distribution of various hog industry sectors in the USA, rather than specific geographical features.

Because most cases have occurred through contact with infected swine, the primary way to prevent exposure to swine flu is with proper hygiene, limiting exposure, and biosecurity in swine operations.²⁸

West Nile Virus

West Nile Virus, caused by a *Flavivirus*, infects birds, horses, and humans. Transmission cycles between birds, the definitive host in which the parasite can replicate, and mosquitoes, the vector or intermediate species. The virus can be transferred through a mosquito bite to humans and horses which are incidental, dead-end hosts. The virus cannot be spread from these species to other species or individuals.²⁹

Most people are infected from June through September.⁴² Most birds have no symptoms, although some birds, especially crows and jays, may get sick and die. Horses may develop neurologic signs such as weakness, hind limb paralysis, muscle twitching, impaired vision, incoordination, head pressing, circling and coma. These are often accompanied by anorexia and depression. Other animals may be infected but rarely show signs.²⁹ One case-review found a 40% mortality rate in horses.^{30,33} According to the Centers for Disease Control and Prevention, most human infections are asymptomatic. Some people develop flu-like symptoms and recover completely. Less than 1% of people develop serious neurologic signs such as encephalitis or meningitis. Of this 1%, 1 out of 10 will die.²⁹

Because most human infections are asymptomatic or mild, infected individuals may not realize they have a West Nile viral infection. Mosquito control is the best method to prevent infection in both humans and animals. Mosquito bites can also be prevented through wearing long sleeves and long pants when in mosquito infested areas and by using a mosquito repellent product, such as DEET or picaridin.²⁹

Cat Scratch Disease

Cat Scratch Disease or Bartonella is caused by the bacterium *Bartonella henselae*. About 40% of cats carry this zoonotic bacteria on their skin, nails and in their mouth at some point in their lives. The bacterium is transmitted to humans through a cat bite or scratch. Cats do not have symptoms. Infected humans will have a mild infection at the injury. Lymph nodes may become swollen. Sometimes fever, headache, fatigue and poor appetite occur.⁹ Rare complications include Bacillary Angiomatosis and Parinaud's Oculoglandular Syndrome. Bacillary Angiomatosis most commonly occurs in immunocompromised people. Signs include lesions in the skin, bone or other organs.⁸ Parinaud's Oculoglandular Syndrome results in inflammation of the eye and enlarged lymph nodes.⁴³

Anyone who has contact with a cat is at risk. The disease occurs most frequently in children under 15 possibly due to decreased cat handling skills. Prevention of Cat Scratch Disease is best achieved through supervision of children with cats and any scratch or bite should be promptly washed with soap and water.⁹

Rocky Mountain Spotted Fever

Rocky Mountain Spotted Fever is caused by the bacteria *Rickettsia rickettsia* and infects dogs and small mammals (including rodents). Humans are infected through a tick bite.⁵⁰ Tick vectors are the primary reservoir host and besides transstadial and transovarial transmission, rodents are the main source for ticks. A large number of vertebrates and invertebrates can be hosts, although in natural transmission dogs and humans are considered incidental hosts.⁵⁸

Small mammals typically have no signs. Dogs often have only mild signs, such as fever, swollen lymph nodes, coughing, diarrhea, vomiting, joint or muscle pain. Severe signs can occur including red eyes, vision problems, bleeding from the nose, and blood in the urine or stool. The nervous system may become involved and resulting signs include behavior changes, head tremors, difficulty standing or walking. Severe cases can result in damage to the heart, shock and death.⁴¹

Rocky Mountain Spotted Fever is named for its two most common clinical signs: rash and fever. Most people with Rocky Mountain Spotted Fever have petechial hemorrhage (rash) during the course of illness. Some people do not develop the rash until late in the disease process, after treatment should have already begun. Approximately 10% of patients never develop a rash. Other signs include sudden onset of fever and headache and may have any of the following: fever, rash, headache, nausea, vomiting, abdominal pain, muscle pain, lack of appetite and red eyes. Rocky Mountain Spotted Fever can be fatal in the first eight days of symptoms without proper treatment.²³

Rocky Mountain Spotted Fever can be found coast-to-coast in the continental US. Case incidence is highest among males and people over 40 years old. Those who reside near wooded or high grass areas may be at increased risk. Children under 10 years old, the immunocompromised and people with delayed treatment are at an increased risk of fatal outcome from Rocky Mountain Spotted Fever.²³

Tick attachment prevention and removal are important in minimizing the risk of Rocky Mountain Spotted Fever. Individuals should limit their exposure to tick-infested habitats and, if in the woods or tall grass, should walk on trails. Protective clothing may prevent ticks from reaching the skin and attaching. Peak tick activity is in late summer and fall, so preventative measures are most important in this season.²³

Giardia

Giardiasis is the most frequently diagnosed intestinal parasitic disease in the US. The disease is caused *Giardia spp.* parasites and may infect dogs, cats, cattle, and other animal species. The only known *Giardia spp.* to cause disease in humans is *Giardia duodenalis*.³⁷ Scientists have molecularly characterized *Giardia* isolates into different genetic assemblages and found some assemblages only infect certain animals or humans. Only two known assemblages affect both animals and humans.^{15, 44} Therefore people are considered the greatest reservoir for human infections.³⁷

Transmission is through ingestion of the parasite, often through contaminated soil or water. Animals may show no symptoms to mild diarrhea. Some people have no signs. Acute cases in people may have diarrhea, gas, greasy stools, stomach or abdominal cramps, upset stomach or nausea/vomiting, and dehydration. Less common signs include pruritus, hives, and swelling of the eyes and joints. Giardiasis can cause weight loss and failure to absorb fat, lactose, and Vitamins A and B12. In children, severe cases may delay physical and mental growth, slow development and cause malnutrition.¹⁵

Giardia spp. are found world-wide. Anyone may become infected. However, those at greatest risk are travelers, people in child care settings, backpackers or campers who drink untreated water from lakes or rivers. *Giardia* is best prevented through sanitation and hygiene.¹⁵

Psittacosis

Psittacosis is caused by *Chlamydia psittaci*, a bacterium. The bacteria are transferred from birds to humans through inhaling dried secretions from infected birds. Although all birds are susceptible, pet birds and poultry are most frequently involved in transmission to humans.²¹ Sick birds may show signs of shivering, sleepiness, weight loss, diarrhea and breathing difficulties.³ In people signs include fever, chills, headache, muscle aches, and a dry cough. Pneumonia may occur.²¹

Those at greatest risk include bird owners, pet shop employees, and those involved in the poultry production industry. Preventive measures include feeding birds properly, avoiding overcrowding, and adequate ventilation systems.³

Psittacosis is a reportable disease in most states.²¹

Chapter 2 - Project Overview

The majority of the project was designing and creating the source of information to be displayed to the public at the Riley County Fair. Considerations that went into the production of the display included attractiveness, encouraging interactions, efficient demonstration of a large amount of material and education of all ages. The information was presented in a language that transversed various ages and educational status. The final display consisted of five parts: an interactive informational board, a children's game, two posters and handouts. The goal of presenting information in such a diverse manner was to reach a large as possible audience.

Interactive Informational Board

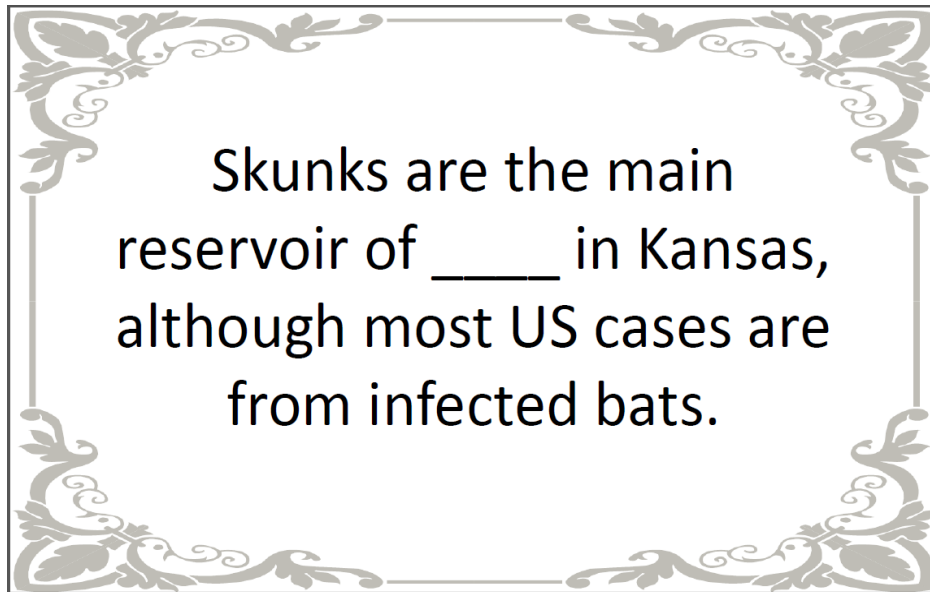
The purpose for the interactive informational board was to present a large amount of information in an engaging way. The interactive informational board had eighteen (18) cards, each describing a zoonotic disease. The front of the card had a statement or a fill-in-the-blank sentence designed to engage the audience and encourage them to think. Some of the card fronts were purposefully educational, such as the statement for rabies: Skunks are the main reservoir of _____ in Kansas, although most US cases are from infected bats.^{22, 57} Other card fronts displayed fun facts, such as the statement for Cat Scratch Disease: About 40% of cats carry this zoonotic bacterium at some point in their lives.⁹

The back of the card included the various names the specific disease may be called and whether it was a virus, bacteria, fungus, or parasite. How a person could get infected was also listed. Animal symptoms and human symptoms were also included. Finally, an "other fun facts" category was included in diseases where additional information was needed or interesting.

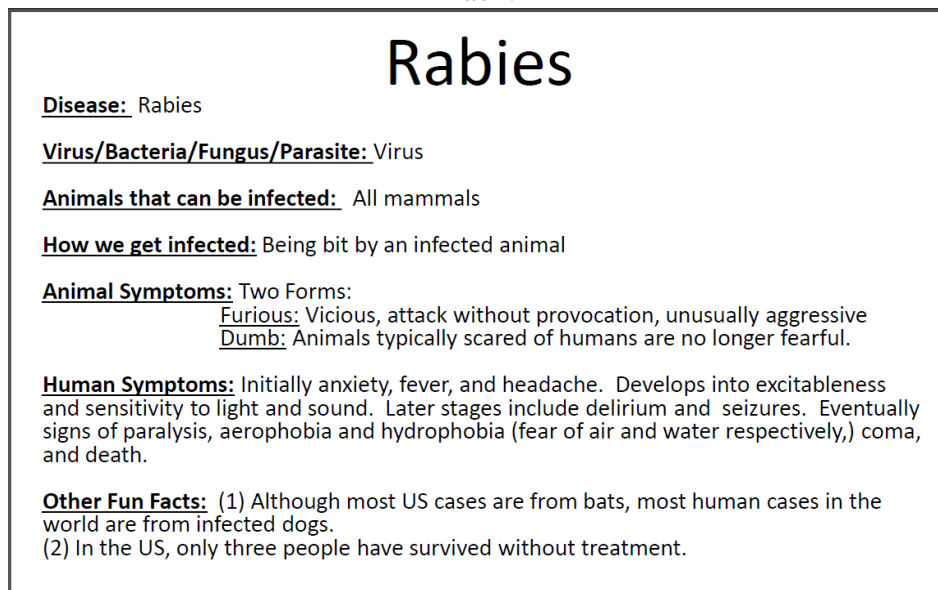
An example of one of the cards is displayed below:

Figure 2.1 Example of Interactive Informational Board Card

Front:



Back:



Children's Discovery Wheel

The purpose of the Children's Discovery Wheel was to educate children on basic zoonotic prevention facts as well as engage their parents in a discussion about zoonotic diseases.

The Children's Discovery Wheel was a plastic wheel that each child could spin and answer a question for a prize (a sticker or a glow-stick.) The following questions were asked:

- What is a zoonotic disease?
- What do you do if an animal is acting strange?
- What do you do if an animal bites you?
- What do you do if you find a baby animal outside?
- What do you do after petting animals and before eating?

These questions were intended for five (5) to ten (10) year olds, although many older children and adults were unfamiliar with the definition of a zoonotic disease. Several of the county fair youth participants came back to try to land on every question.

Poster Display

Although transmission of each disease was listed on the interactive display board cards and preventative steps were included in each handout, I decided this important information needed to be summarized and displayed in a manner than demonstrated its importance. Therefore two posters were designed, one for transmission of zoonotic diseases and one for the prevention of zoonotic diseases. By utilizing a poster display, fair-goers that were not comfortable interacting or taking a free handout were still able to be educated about zoonotic diseases. Educational opportunities via different mediums allows for different learning styles to learn more efficiently and remember long-term.

Transmission Poster

Transmission routes included direct contact, oral, fomites, vector and aerosol. Each route included one to two sentences that further described how zoonotic diseases can be transmitted. For example, under Vectors was the statement "Mosquitoes, fleas, and ticks can pass pathogens from wildlife, pets, and livestock to people."

"Certain diseases can be passed from sick people to animals too!" was also included on this poster, as this transmission is rarely discussed.

See Appendix A, Figure A.1 for a copy of the transmission poster.

Prevention Poster

The prevention of zoonotic disease poster listed easy to remember ways to minimize transmission of zoonotic diseases. They were broken up into three categories: From Our Animals, In the Outdoors, and In the Kitchen.

Also included on this poster was the statement “Children, the elderly, and immunocompromised individuals are at greater risk for contracting a zoonotic disease.” The intent was to encourage the reader to undertake preventative steps for others as well as for him/her.

See Appendix A, Figure A.2 for a copy of the prevention poster.

Informational Handouts

Because some fair-goers have a limited amount of time or willingness to stay and read at the zoonosis stand, free informational handouts were offered that they could take with them and read at their convenience. Five different handouts were offered to cover the basics of zoonotic disease risk.

See Appendix A, Figure B.2 for a copy of the prevention poster.

Pet Handout

It is estimated that over 83 million dogs and 95 million cats are owned in the United States.⁴⁵ By sheer numbers alone, zoonotic diseases transferred from pets to their owners is a concern.

Rabies was the first disease included on the handout. The seriousness of this virus and the fact that it is relatively easy to prevent via vaccination made it a top priority. A common myth is that indoor only pets do not need vaccinated for rabies, a serious and potentially deadly disease; hopefully this handout will encourage owners to vaccinate all pets. Vaccinating pets is an important step in minimizing human exposure.

Toxoplasmosis was included because of the serious risk to a pregnant woman’s unborn child, even though the disease itself is mild in most people. Pregnant women should take extra precaution and speak to their health-care provider about toxoplasmosis.

Cat Scratch Disease was the last disease mentioned in the pet handout. It was important to include this disease because, although initial injury is mild scratches or bites, it can progress to devastating complications. Immediate wound care is important.

See Appendix B, Figure B.1 for a copy of the Pet Handout.

Exotic Pet Handout

It is estimated that over 50 million birds, reptiles or small mammals are owned in the United States.⁴⁵

In 2013, an outbreak of over 450 cases of Salmonella were linked to small turtles, most in children under five (5) years old.¹³ Reptiles and amphibians continue to be important sources of human Salmonella cases in the United States.

Psittacosis was added to this handout due to the general lack of awareness and potentially life-threatening sequelae. It is reportable in most states and may be hard to diagnose.²¹

Tularemia cases are most common in the Missouri/Kansas/Oklahoma/Arkansas area of the United States. Although this disease is more commonly contracted from the consumption of wild-rabbits, it is possible to become infected by handling infected animals.²⁷

See Appendix B, Figure B.2 for a copy of the Exotic Pet Handout.

Production Animal Handout

Food-animal production is a large part of the Kansas culture and economy.

Cryptosporidium is an important zoonotic parasite. Although the majority of US cases are from contaminated water outbreaks, this disease is important to producers because they risk exposure on a daily basis.¹¹ The extent of the disease varies with each person's immune status. In some people, cryptosporidium may not be curable.¹¹

According to the United States Department of Agriculture Animal and Plant Health Inspection Service's National Animal Health Monitoring System (USDA APHIS NAHMS) 2001 sheep survey, 40 percent of U.S. operations reported the Orf virus infecting their flocks in the previous three years.¹⁴ This disease can cause painful blisters in humans that may take up to two months to heal.

Food-borne diseases were briefly mentioned in this handout. Most food-borne diseases originate in the digestive tract of the live animal which contaminated the meat during slaughter or the milk during milking. Many producers also eat product from their own farms and should be aware of the possibility of these diseases in both live and slaughtered animals.⁴

See Appendix B, Figure B.3 for a copy of the Production Animal Handout.

Wildlife Handout

In 2011, Kansas reported 400,000 anglers, 283,000 hunters and 792,000 total wildlife-watching participants.⁵

Rabies and Tularemia were discussed in this brochure for similar reasons they were listed in the Pet Handout and Exotic Pet Handout respectively.

Baylisascaris was included because all reported cases are severe. The source of these roundworms is raccoons, a wildlife species that the general public and wildlife enthusiasts encounter alike.²

Campers or those who participate in outdoor sports are most at risk for Leptospirosis. A wide range and severity of symptoms can occur, so this is a disease that outdoor activity participants should be aware of.¹⁷

See Appendix B, Figure B.4 for a copy of the Wildlife Handout.

Food Safety Handout

Rather than focus on individual food-borne illness agents, this handout focused on preventative measures. The top five agents were listed as well as common symptoms.¹⁰ The intent of this project was to focus more on human-animal interactive zoonotic diseases because it was presented at the county fair. However, the public is aware of food-borne illness so I included a limited amount of information in case this was their main interest.

See Appendix B, Figure B.2 for a copy of the Food Safety Handout.

Chapter 3 - Discussion and Recommendations

The design of this project went fairly smoothly. The Riley County Extension Agency granted me a lot of leeway in design and execution. My design objectives included diversity, attractiveness and durability. Diversity was needed in presentation to ensure the presentation attracted all learning styles and was accomplished through the use of many mediums presenting the information. Bright colors and professionalism added to the attractiveness of the project. The stands were made of wood and the cards and posters were laminated for durability.

My presentation at the Riley County Fair was successful. Approximately 30 of the 240 hours spent on this project were presenting the information in person at the fair. The majority of that time was spent with children and the Children's Discovery Wheel. A significant number of parents were happy that their children had some answer for the questions they were asked and many of them added on to my answers when the children did not know. The majority of the information the parents added was either an example the children would recognize (e.g. remember that bird we found last week...) or accurate additional comments (e.g. when bit, not only do we tell a parent but we wash the bite and go to the doctors.) Several fair patrons were unaware of what zoonotic diseases are and stopped to discuss them with me. If I asked adults to think of a zoonotic disease, rabies and the various influenzas were the most commonly thought of examples. The Pet Handout was the most popular with approximately 50 distributed. At least 15 copies of all of the other handouts were taken. When I was not presenting at the fair, all of the material remained available to the public, with the exception of the Children's Discovery Wheel, as the wheel is fragile and expensive.

The Riley County Extension Agency has decided to offer this display to the other Kansas Counties for use at their fairs, farm shows, and other events in which the public may interact with animals. This project could be expanded upon in several ways. Images in the project were very limited; photographs of the disease in both humans and animal species could solidify the severity and consequently the importance of these diseases. A section of "Hot Topic" disease could be added that includes zoonotic diseases that the media has recently highlighted. This section would be a way to draw the public to the stand. Another option would be to add something for the children to take home, such as coloring pages or mazes. This may encourage

parents to take home brochures themselves or talk to their children about basic preventative measures.

In the future it would be possible to use this project as a way to distinguish how much the public knows about public health and in what areas. This could be done through a survey, a quiz or through a log of discussions.

References

- 1 - "Anthrax." *Medline Plus*. National Institute of Health, 5 Nov 2013. Web. 18 Jul 2013. <<http://www.nlm.nih.gov/medlineplus/anthrax.html>>.
- 2 - "Baylisascariasis." *The Center for Food Security and Public Health*. Iowa State University, Mar 2012. Web. 16 Jul 2013.
- 3 - "Canadian Centre for Occupational Health and Safety." *Psittacosis*. Canada, 2 Feb 2009. Web. 9 Jul 2013. <<http://www.ccohs.ca/oshanswers/diseases/psittacosis.html>>
- 4 - "Causes and Symptoms of Foodborne Illness." *Minnesota Department of Health*. N.p., 17 Nov 2010. Web. 16 Jul 2013. <<http://www.health.state.mn.us/divs/idepc/dtopics/foodborne/basics.html>>.
- 5 - "Census Bureau." National Survey of Fishing, Hunting, & Wildlife-Associated Recreation (FHWAR). United States, 19 Jul 2013. Web. 24 Nov 2013. <<http://www.census.gov/prod/www/fishing.html>>
- 6 - "Centers for Disease Control and Prevention." *Anthrax*. United States, 15 Aug 2013. Web. 18 Jul 2013. <http://www.cdc.gov/anthrax/index.html>
- 7 - "Centers for Disease Control and Prevention." *Avian Flu*. United States, 25 Nov 2011. Web. 9 Jul 2013. <http://www.cdc.gov/flu/avianflu/>
- 8 - "Centers for Disease Control and Prevention." *Bartonella Infection*. United States, 1 Aug 2013. Web. 16 Jul 2013. <<http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-3-infectious-diseases-related-to-travel/bartonella-infections>> and 2 Dec 2013 <<http://www.cdc.gov/bartonella/veterinarians/index.html>>
- 9 - "Centers for Disease Control and Prevention." *Cat Scratch Disease*. United States, 30 Apr 2013. Web. 16 Jul 2013. <<http://www.cdc.gov/healthypets/diseases/catscratch.htm>>
- 10 - "Centers for Disease Control and Prevention." *CDC Estimates of Foodborne Illness in the United States*. United States, 22 May 2013. Web. 19 Jul 2013. <http://www.cdc.gov/foodborneburden/2011-foodborne-estimates.html>
- 11 - "Centers for Disease Control and Prevention." *Cryptosporidium*. United States, 2 Nov 2013. Web. 12 Jul 2013. <http://www.cdc.gov/parasites/crypto/> and 2 Dec 2013. <http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6105a1.htm>
- 12 - "Centers for Disease Control and Prevention." *Diseases from Cats*. United States, 28 Jul 2010. Web. 16 Jul 2013. <<http://www.cdc.gov/healthypets/animals/cats.htm>>

- 13 - "Centers for Disease Control and Prevention." *Eight Multistate Outbreaks of Human Salmonella Infections Linked to Small Turtles (Final Update)*. United States, 18 Oct 2013. Web. 16 Jul 2013. <<http://www.cdc.gov/salmonella/small-turtles-03-12/index.html>>
- 14 - "Centers for Disease Control and Prevention." *Frequently Asked Questions About Sore Mouth Infection (Orf Virus)*. United States, Jul 2013. Web. 15 Jul 2013. http://www.cdc.gov/ncidod/dvrd/orf_virus/
- 15 - "Centers for Disease Control and Prevention." *Giardia*. United States, 13 Jul 2010. Web. 6 Jul 2013. <http://www.cdc.gov/parasites/giardia/>
- 16 - "Centers for Disease Control and Prevention." *Key Facts about Swine Influenza (Swine Flu) in Pigs*. United States, 5 Jan 2012. Web. 12 Jul 2013. http://www.cdc.gov/flu/swineflu/keyfacts_pigs.htm
- 17 - "Centers for Disease Control and Prevention." *Leptospirosis*. United States, 13 Jan 2012. Web. 18 Jul 2013. <http://www.cdc.gov/leptospirosis/>
- 18 - "Centers for Disease Control and Prevention." *Lyme Disease*. United States, 6 May 2013. Web. 18 Jul 2013. <http://www.cdc.gov/lyme/>
- 19 - "Centers for Disease Control and Prevention." *Parasites – Baylisascaris Infection*. United States, 11 Oct 2012. Web. 16 Jul 2013. <http://www.cdc.gov/parasites/baylisascaris/index.html>
- 20 - "Centers for Disease Control and Prevention." *Plague*. United States, 13 Jan 2012. Web. 5 Jul 2013. <http://www.cdc.gov/plague/>
- 21 - "Centers for Disease Control and Prevention." *Psittacosis*. United States, 13 Jan 2009. Web. 9 Jul 2013. <http://www.cdc.gov/ncidod/dbmd/diseaseinfo/psittacosis_t.htm>
- 22 - "Centers for Disease Control and Prevention." *Rabies*. United States, 24 Sep 2013. Web. 1 Jul 2013. <http://www.cdc.gov/rabies/>
- 23 - "Centers for Disease Control and Prevention." *Rocky Mountain Spotted Fever*. United States, 4 Nov 2010. Web. 10 Jul 2013. <http://www.cdc.gov/rmsf/index.html>
- 24 - "Centers for Disease Control and Prevention." *Salmonella*. United States, 22 May 2013. Web. 16 Jul 2013. <http://www.cdc.gov/salmonella/>
- 25 - "Centers for Disease Control and Prevention." *Toxocariasis*. United States, 10 Jan 2013. Web. 2 Jul 2013. <http://www.cdc.gov/parasites/toxocariasis/>
- 26 - "Centers for Disease Control and Prevention." *Toxoplasmosis*. United States, 10 Jan 2013. Web. 12 Jul 2013. <http://www.cdc.gov/parasites/toxoplasmosis/>

- 27 - "Centers for Disease Control and Prevention." *Tularemia*. United States, 11 Jan 2013. Web. 8 Jul 2013. <http://www.cdc.gov/tularemia/>
- 28 - "Centers for Disease Control and Prevention." *Variant (Swine Origin) Influenza Viruses in Humans*. United States, 6 Jan 2012. Web. 15 Jul 2013. <http://www.cdc.gov/flu/swineflu/variant.htm>
- 29 - "Centers for Disease Control and Prevention." *West Nile Virus*. United States, 7 Jun 2013. Web. 13 Jul 2013. <http://www.cdc.gov/westnile/index.html>
- 30 - "Connecticut Department of Agriculture." *West Nile Virus In Domestic Animals and Birds*. United States, 2012. Web. 13 Jul 2013. <<http://www.ct.gov/doag/cwp/view.asp?a=1367&q=259124>>
- 31 - "Cryptosporidium." *The Center for Food Security and Public Health*. Iowa State University, Aug 2005. Web. 12 Jul 2013. <www.cfsph.iastate.edu/Factsheets/pdfs/cryptosporidiosis.pdf>
- 32 - Dee, Scott. "Swine Influenza." *The Merck Veterinary Manual*. Merck, Mar 2012. Web. 15 Jul 2013. <http://www.merckmanuals.com/vet/generalized_conditions/plague>
- 33 - Epp, T, C Waldner, K West, and H Townsend. "Factors associated with West Nile virus disease fatalities in horses." *Canadian Veterinary Journal*. 48.11 (2007): 1137-45. Print.
- 34 - Ettestad, Paul. "Overview of Plague." *The Merck Veterinary Manual*. Merck, Mar 2012. Web. 5 Jul 2013. <http://www.merckmanuals.com/vet/generalized_conditions/plague>
- 35 - Fayer, Ronald, and Lihua Xiao. *Cryptosporidium and Cryptosporidiosis*. 2nd ed. Boca Raton: Taylor and Francis Group LLC, 2008. 132-5. eBook.
- 36 - Feldman, Katherine Anne. "Zoonosis Update: Tularemia." *Journal of the American Veterinary Medical Association*. 222.6 (2003): 725-30. Print.
- 37 - "Giardiasis." *The Center for Food Security and Public Health*. Iowa State University, Dec 2012. Web. 3 Dec 2013.
- 37 - Hunt, Richard. "Virology." *Rabies*. 2011. <<http://pathmicro.med.sc.edu/virol/rabies.htm>>.
- 39 - Institute of Medicine (US) Forum on Microbial Threats. *Vector-Borne Diseases: Understanding the Environmental, Human Health, and Ecological Connections, Workshop Summary*. Washington (DC): National Academies Press (US); 2008. Summary and Assessment. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK52939/>

- 40 - "Leptospirosis." *The Center for Food Security and Public Health*. Iowa State University, May 2005. Web. 2 Dec 2013.
- 41 - McQuiston, Jennifer. "Rocky Mountain Spotted Fever." *The Merck Veterinary Manual*. Merck, Mar 2012. Web. 10 Jul 2013. <
http://www.merckmanuals.com/vet/generalized_conditions/rickettsial_diseases/rocky_mountain_spotted_fever.html>
- 42 - Miller, Jennifer. United States. Wisconsin Department of Health Services. *FIRST BIRD IN WISCONSIN TEST POSITIVE FOR THE WEST NILE VIRUS THIS YEAR*. 2013. Web. <
<http://www.dhs.wisconsin.gov/news/PressReleases/2013/062013.htm>>
- 43 - "Parinaud oculoglandular syndrome." *Medline Plus*. National Institute of Health, 31 Oct 2013. Web. 20 Jul 2013.
<<http://www.nlm.nih.gov/medlineplus/ency/article/000736.htm>>.
- 44 - Patton, Sharon. "Overview of Giardiasis." *The Merck Veterinary Manual*. Merck, Mar 2012. Web. 6 Jul 2013. <
http://www.merckmanuals.com/vet/digestive_system/giardiasis_giardosis_lambliosis_lambliosis/overview_of_giardiasis.html>
- 45 - "Pet Industry Market Size & Ownership Statistics." *American Pet Products Association*. (2013): n. page. Web. 20 Jul. 2013.
<http://www.americanpetproducts.org/press_industrytrends.asp>.
- 46 - "Plague." *National Geographic*. 24 Nov 2013: n. page. Web. 5 Jul. 2013.
<<http://science.nationalgeographic.com/science/health-and-human-body/human-diseases/plague-article/>>.
- 47 - "Rabies." *College Of Veterinary Medicine Pet Health Topics*. Washington State University, 20 Dec 2007. Web. 1 Jul 2013. <<http://www.vetmed.wsu.edu/cliented/rabies.asp&xgt;>>.
- 48 - "Rabies Fact Sheet." *Media Centre*. World Health Organization, n.d. Web. 1 Jul 2013.
- 49 - "Select Agents and Toxins List." Animal and Plant Health Inspection Services (APHIS) and Center for Disease Control and Prevention (CDC). Riverdale and Atlanta: 2013. Web.
<[http://www.selectagents.gov/Select Agents and Toxins List.html](http://www.selectagents.gov/Select%20Agents%20and%20Toxins%20List.html)>.
- 50 - "State of Hawaii, Department of Health." *Rocky Mountain Spotted Fever (tick-borne typhus fever)*. United States, 2013. Web. 10 Jul 2013.
<<http://health.hawaii.gov/docd/dib/disease/rocky-mountain-spotted-fever/>>.
- 51 - Swayne, David. "Avian Influenza." *The Merck Veterinary Manual*. Merck, Mar 2012. Web. 2 Dec 2013. <http://www.merckmanuals.com/vet/generalized_conditions/plague>

- 52 - "Terrestrial Manual." *Leptospirosis*. OIE, 2008. Web. 2 Dec 2013.
<www.oie.int/fileadmin/Home/eng/Health.../tahm/2.01.09_LEPTO.pdf>.
- 53 - Thompson, Maggie. United States. Kansas Department of Health and Environment. *Strain of swine influenza identified in Kansas county*. Topeka: , 2009. Web.
<http://www.kdheks.gov/news/web_archives/2009/08062009a.htm>.
- 54 - "Toxocariasis." *The Center for Food Security and Public Health*. Iowa State University, May 2012. Web. 2 Jul 2013.
- 55 - "Toxoplasmosis." *Cornell Feline Health Center*. Cornell University, 2008. Web. 12 Jul 2013. <http://www.vet.cornell.edu/FHC/health_resources/toxoplasmosis.cfm>.
- 56 - "Toxoplasmosis Fast Facts." *The Center for Food Security and Public Health*. Iowa State University, 2013. Web. 2 Dec 2013.
<www.cfsph.iastate.edu/FastFacts/pdfs/toxoplasmosis_F.pdf>
- 57 - United States. Kansas Department of Health and Environment. *Rabies Investigation Guideline*. Topeka: 2010. Web.
<http://www.kdheks.gov/epi/Investigation_Guidelines/Rabies_Disease_Investigation_Guideline.pdf>.
- 58 - Warner, Ronald, and Wallace Marsh. "Zoonosis Update: Rocky Mountain Spotted Fever." *Journal of the American Veterinary Medical Association*. 221.10 (2002): 1413-7. Print.

Appendix A - Poster Display Contents

Below are the two posters displayed at the 2013 Riley County Fair, Manhattan, KS.

Figure A.1 Transmission Routes of Zoonotic Diseases Poster

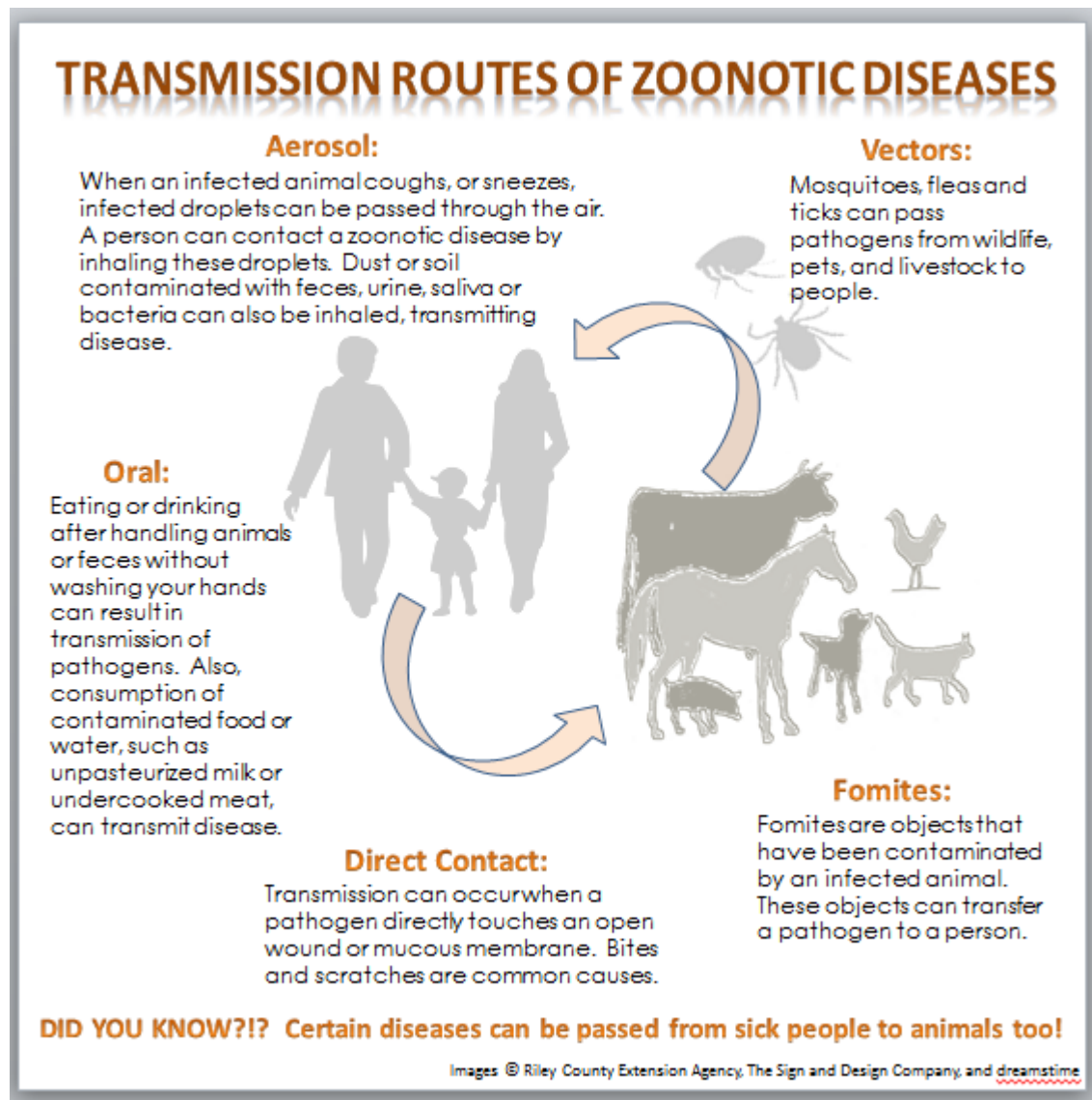
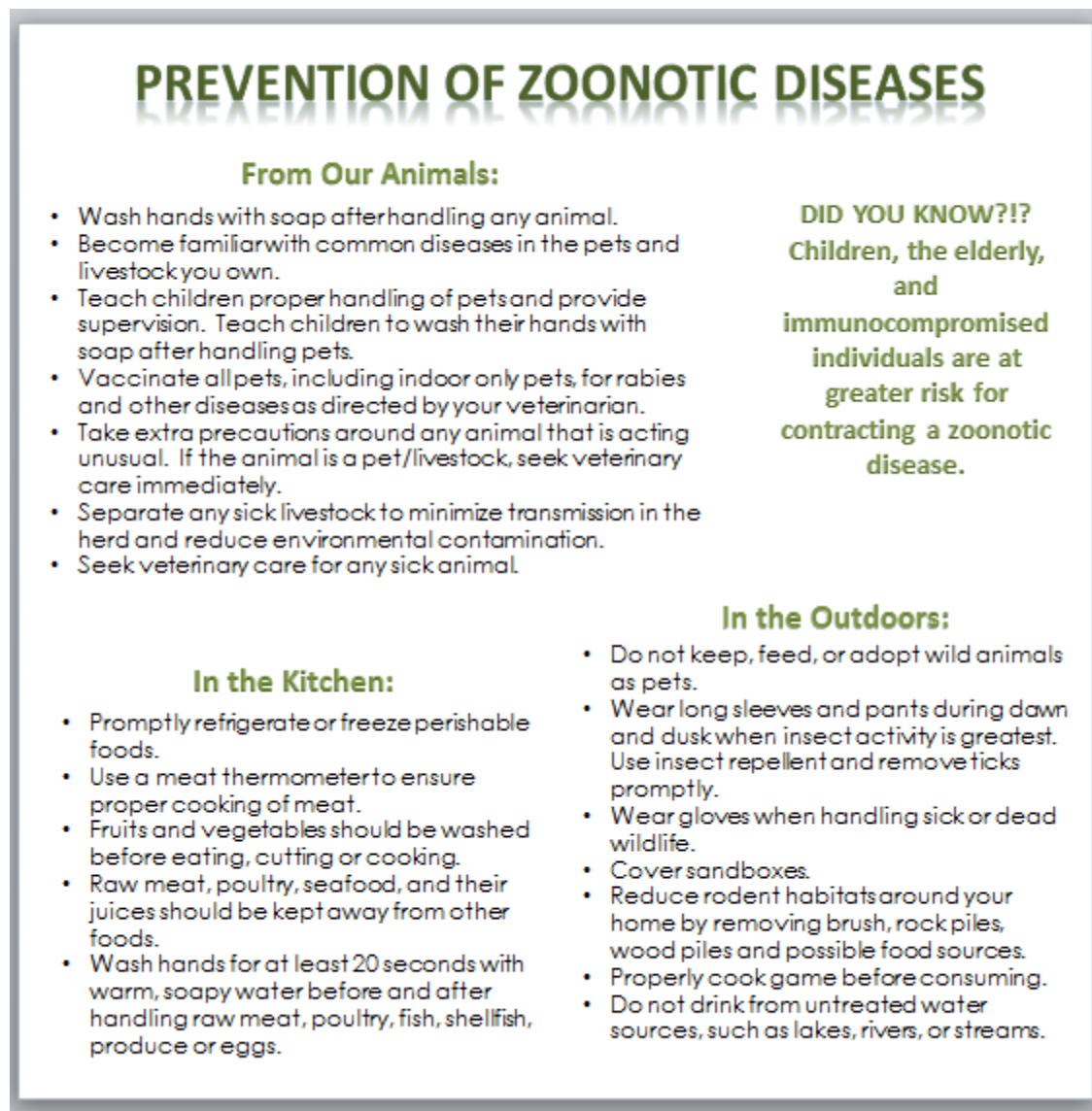


Figure A.2 Prevention of Zoonotic Diseases Poster



Appendix B - Informational Handouts

This appendix includes the five information handouts offered at the 2013 Riley County Fair, Manhattan, KS.

Figure B.1 Pet Handout

Fun Facts for Kids!

- Dogs provide many services for humans, including hunting, farm work, security and assisting the blind and disabled.
- Dogs can hear sounds four times farther away than humans can hear.
- Cats sleep an average of 13-14 hours a day.
- A cat uses its whiskers to help detect objects and navigate in the dark.



For Additional Information:

- <http://www.cdc.gov/24-7/cdcfastfacts/zoonotic.html>
- <http://www.cdc.gov/healthypets/>
- http://www.kdheks.gov/epi/human_animal_health.htm

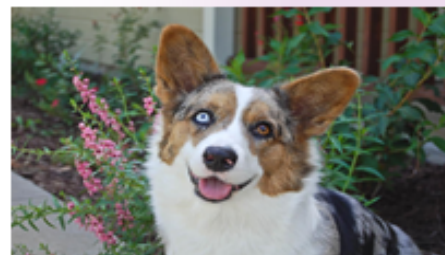
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Zoonotic Diseases of Dogs and Cats

Important things to know about zoonotic diseases in your pets, symptoms to look for and prevention tips!





What is a Zoonotic Disease?

-Zoonotic diseases are diseases or infections that can be naturally transmitted from animals to humans. Some diseases can also be transmitted from humans to animals.

-The disease agents can be viruses, bacteria, fungi, parasites, or prions.

-Diseases can be contracted from pets (including exotic pets,) horses, livestock, or wildlife. Some diseases can be transmitted through food.

-This brochure will focus on a few common zoonotic diseases in dogs and cats.

Some Diseases To Know About:

Rabies:

Common pets: Any mammal, including indoor only pets

Animal Symptoms: Acts unusual, either vicious and attacks without provocation, or is dumb-acting

Human Symptoms: Initially anxiety, fever, and headache. Develops into excitement and light or sound sensitivity. Eventually, delirium, seizures, coma and death can occur.

Toxoplasmosis:

Common pets: Cats

Animal Symptoms: Typically no symptoms

Human Symptoms: Many people have no signs. Some have flu-like signs and vision problems. Pregnant women can transmit the parasite to their child, who may then be born with serious eye and brain damage.

Cat Scratch Disease

Common pets: Cats

Animal Symptoms: No symptoms

Human Symptoms: Mild infection at the site of bite or scratch, swollen lymph nodes, fever, headache, poor appetite. Rarely, more severe complications can occur.

Other zoonotic diseases occur. Tell your healthcare provider about all animal contact, including any pets.

How Do I Prevent These Diseases?

- Wash hands with soap after handling any animal.
- Become familiar with common diseases in the pets you own.
- Teach children proper handling of pets and provide supervision. Teach children to wash their hands with soap after handling pets.
- Vaccinate all pets, including indoor only pets, for rabies and other diseases as directed by your veterinarian.
- Take extra precautions around children, the elderly, or any immunocompromised individuals, as these groups are more susceptible to disease.
- Take extra precautions around any animal that is acting unusual. If the animal is a pet, seek veterinary care immediately.
- Seek veterinary care for any sick animal.
- Seek health care immediately if you suspect any zoonotic disease.



Figure B.2 Exotic Pet Handout

Fun Facts for Kids!

- A bird's heart beats 400 times per minute while they are resting.
- Larger parrots, such as macaws, can live to be more than 75 years old.
- Ferrets are currently the third most popular pet in the US.
- Turtles don't have vocal cords.
- All ferrets have white fur at birth.
- The average pet mouse lives between 1-2 years.
- Hamsters have poor eyesight and will use smells to find their way around.

For Additional Information:

- <http://www.cdc.gov/24-7/cdcfastfacts/zoonotic.html>
- <http://www.cdc.gov/healthypets/>
- http://www.kdheks.gov/epi/human_animal_health.htm

All images courtesy of Kellie Lewis Photography.

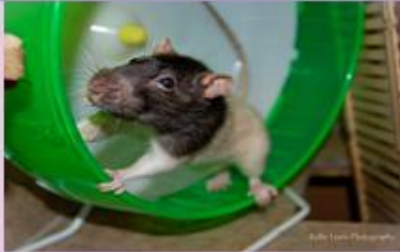
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Zoonotic Diseases of Exotic Pets

Important things to know about zoonotic diseases in your exotic pets, symptoms to look for and prevention tips!





What is a Zoonotic Disease?

-Zoonotic diseases are diseases or infections that can be naturally transmitted from animals to humans. Some diseases can also be transmitted from humans to animals.

-The disease agents can be viruses, bacteria, fungi, parasites, or prions.

-Diseases can be contracted from pets (including exotic pets,) horses, livestock, or wildlife. Some diseases can be transmitted through food.

-This brochure will focus on a few common zoonotic diseases in exotic pets. Exotic pets include birds, reptiles, amphibians and small mammals such as rabbits, ferrets and mice.

Diseases To Know About:

Salmonella:

Common pets: Any animal, but reptiles and amphibians are common carriers

Animal Symptoms: None to mild diarrhea

Human Symptoms: Diarrhea, fever and abdominal cramps. Severe diarrhea could result in dehydration, hospitalization and possibly death. Rarely reactive arthritis develops.

Psittacosis:

Common pets: Birds

Animal Symptoms: Fever, discharge from the nose and eyes, weakness, weight loss, ruffled feathers

Human Symptoms: Fever, cough, chills, muscle aches, and atypical pneumonia. Other, more severe complications can occur.

Tularemia:

Common pets: Rabbits and rodents, among others

Human and Animal Symptoms: Five forms:

-Ulceroglandular: The most common form. A skin ulcer appears at the site where the organism entered the body and swelling of regional lymph glands, usually in the armpit or groin.

-Pneumonic: This is the most serious form of tularemia. Symptoms include cough, chest pain, and difficulty breathing.

-Other forms include oculoglandular, glandular and oropharyngeal.

Other zoonotic diseases occur. Zoonotic diseases are more common in wild-caught animals than in captive breeding operations. **Tell your healthcare provider about all animal contact, including any exotic pets.**

How Do I Prevent These Diseases?

- Wash hands with soap after handling any animal.
- Adopt exotic pets from reputable sources. Ask about if the animal was captive bred, what veterinary care it has had, and the facilities' quarantine procedures.
- Become familiar with common diseases in the pets you own.
- Teach children proper handling of pets and provide supervision. Teach children to wash their hands with soap after handling pets.
- Take extra precautions around children, the elderly, or any immunocompromised individuals, as these groups are more susceptible to disease.
- Seek veterinary care for any sick animal.
- Seek health care immediately if you suspect any zoonotic disease.



Figure B.3 Production Animal Handout

Fun Facts for Kids!

- Clothing can be made from the wool of a sheep or the hair from an alpaca. Alpaca hair is warmer than wool.
- Most of the milk we drink is from cows, but you can also get milk from goats.
- Cows produce 15-20 gallons of saliva a day.
- Other than food and clothing, animal products are used to make plastics, rubbers, detergents, candles, wallpapers, glue, crayons and some medicines.
- A baby cow is called a calf, a baby sheep is called a lamb, and a baby goat is called a kid.
- Horses have 205 bones in their skeletons.

For Additional Information:

- <http://www.cdc.gov/24-7/cdcfastfacts/zoonotic.html>
- <http://www.cdc.gov/healthypets/>
- http://www.kdheks.gov/epi/human_animal_health.htm



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Zoonotic Diseases of Large Animals

Important things to know about zoonotic diseases in large animals, symptoms to look for and prevention tips!



What is a Zoonotic Disease?

Zoonotic diseases are diseases or infections that can be naturally transmitted from animals to humans. Some diseases can also be transmitted from humans to animals.

The disease agents can be viruses, bacteria, fungi, parasites, or prions.

Diseases can be contracted from pets (including exotic pets,) horses, livestock, or wildlife. Some diseases can be transmitted through food.

This brochure will focus on a few common zoonotic diseases in cattle, pigs, horses, sheep, and goats.



Some Diseases To Know About:

Cryptosporidium:

Common livestock: Any animal may carry.

Animal Symptoms: None to mild diarrhea

Human Symptoms: Watery diarrhea, stomach cramps, dehydration, nausea, vomiting, fever, weight loss. Some people have no symptoms.

Orf:

Common livestock: Sheep and Goats

Animal Symptoms: Blisters and crusty scabs, typically found on the lips, muzzle and in the mouth.

Human Symptoms: Sores, most commonly on the hands.

Foodborne Illness:

Foodborne illness can occur from improperly prepared food.

Human Symptoms: Vomiting, diarrhea, abdominal pain, fever, chills. More severe signs can occur.

These include weakness, blurred vision, dizziness, paralysis, headache, and tingling or numbness of the skin.

Other zoonotic diseases occur. **Tell your healthcare provider about all animal contact, including any livestock.**

How Do I Prevent These Diseases?

- Wash hands with soap after touching any animal.
- Become familiar with common diseases in the livestock you own.
- Properly prepare food in a clean kitchen.
- Take extra precautions around children, the elderly, or any immunocompromised individuals, as these groups are more susceptible to disease.
- Separate any sick livestock to minimize transmission in the herd and reduce environmental contamination.
- Take extra precautions around livestock that are acting unusual. Livestock can become infected with Rabies if bitten by a wild animal. Seek veterinary care immediately.
- Seek veterinary care for any sick animal.
- Seek health care immediately if you suspect any zoonotic disease.



Figure B.4 Wildlife Handout

<h3>How Do I Prevent These Diseases?</h3> <ul style="list-style-type: none">• Do not keep, feed, or adopt wild animals as pets.• Wear long sleeves and pants during dawn and dusk when insect activity is greatest. Use insect repellent and remove ticks promptly.• Wear gloves when handling sick or dead wildlife.• Cover sandboxes.• Reduce rodent habitats around your home by removing brush, rock piles, wood piles and possible food sources.• Properly cook game before consuming.• Do not drink from untreated water sources, such as lakes, rivers, or streams.• Take extra precautions around children, the elderly, or any immunocompromised individuals, as these groups are more susceptible to disease.• Seek health care immediately if you suspect any zoonotic disease.	<h3>Fun Facts for Kids!</h3> <ul style="list-style-type: none">• The hummingbird is the only animal that can fly backward.• Prairie dogs live in colonies and build tunnels with specialized areas for sleeping, eating and raising their young.• Millions of Monarch butterflies fly to Mexico for the winter.• A squirrel's four front teeth never stop growing.• Wild rabbits live in groups called warrens. <p>For Additional Information: Visit http://www.cdc.gov/24-7/cdcfastfacts/zoonotic.html</p> <p>All images courtesy of Kellie Lewis Photography.</p> <p>K-State Research and Extension is an equal opportunity provider and employer.</p> <p>Riley County K-State Research & Extension 110 Courthouse Plaza, Rm. 5220 Manhattan, KS 66502 785-837-6350 www.riley.ksu.edu</p>	<h2>Zoonotic Diseases of Wildlife</h2> <p>Important things to know about zoonotic diseases in wildlife, symptoms to look for and prevention tips!</p>  
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What is a Zoonotic Disease?

-Zoonotic diseases are diseases or infections that can be naturally transmitted from animals to humans. Some diseases can also be transmitted from humans to animals.

-The disease agents can be viruses, bacteria, fungi, parasites, or prions.

-Diseases can be contracted from pets (including exotic pets,) horses, livestock, or wildlife. Some diseases can be transmitted through food.

-This brochure will focus on a few common zoonotic diseases in wildlife.

Wildlife in the Woods:

Leptospirosis:

Common wildlife: Rodents, squirrels, deer, fox, raccoons, opossums, and more

Animal Symptoms: May have no symptoms. Some have fever, vomiting, abdominal pain, diarrhea, anorexia, and muscle pain.

Human Symptoms: High fever, headache, chills, muscle aches, vomiting, yellow skin/eyes, red eyes, abdominal pain, diarrhea, rash

Tularemia:

Common wildlife: Rabbits and rodents, among others

Human and Animal Symptoms: Five forms:

-Ulceroglandular: The most common form. A skin ulcer appears at the site where the organism entered the body and swelling of regional lymph glands, usually in the armpit or groin.

-Pneumonic: This is the most serious form of tularemia. Symptoms include cough, chest pain, and difficulty breathing.

-Other forms include oculoglandular, glandular and oropharyngeal.

Wildlife Around the House:

Rabies:

Common wildlife: Any mammal, including indoor only pets

Animal Symptoms: Acts unusual, either vicious and attacks without provocation, or is dumb-acting

Human Symptoms: Initially anxiety, fever, and headache. Develops into excitableness and light or sound sensitivity. Eventually, delirium, seizures, coma and death can occur.

Baylisascaris:

Common wildlife: Raccoons

Animal Symptoms: Typically no symptoms

Human Symptoms: Nausea, tiredness, loss of coordination, lack of focus, blindness, coma, vision problems and many more.

Other zoonotic diseases occur. **Tell your healthcare provider about all animal contact, including any wildlife or outdoor activity.**



Figure B.5 Food Safety Handout

<h3>Fun Facts for Kids!</h3> <ul style="list-style-type: none">• There are around 2000 different plant types used to make food today.• China is the world's largest producer of garlic.• India is the world's largest producer of bananas.• Around 8% of children and 2% of adults have some kind of food allergy; this occurs when the body's immune system incorrectly assumes a certain food protein is harmful and attacks it.• 2/3 of the blueberries produced in the US are from Michigan and New Jersey.	<h3>For Additional Information:</h3> <ul style="list-style-type: none">• http://www.cdc.gov/24-7/cdcfastfacts/zoonotic.html• http://www.cdc.gov/healthypets/• http://www.kdheks.gov/epi/human_animal_health.htm <p>All images courtesy of Kellie Lewis Photography.</p> <p>K-State Research and Extension is an equal opportunity provider and employer.</p> <p>Riley County K-State Research & Extension 110 Courthouse Plaza, Rm B220 Manhattan, KS 66502 785-637-6350 www.riley.ksu.edu</p>	<h3>Food Safety</h3> <p>Important things to know about foodborne illness, symptoms to look for and prevention tips!</p>  
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What is a Foodborne Illness?

-Commonly called food poisoning, foodborne illness is any illness resulting from the consumption of contaminated food.

-Most foodborne diseases are caused by bacteria but they can also be caused by viruses or parasites.

-Foodborne illness can occur from any food, including meat and fish, fruits and vegetables. Foodborne illness may result from commercially produced food, organic food, locally grown food and any other production method.

-This brochure will focus on the top five causes of foodborne illness, symptoms and how to prevent illness.



Causes and Symptoms:

The five most common causes of foodborne illness are:

1. Norovirus
2. Salmonella (non-typhoidal)
3. Clostridium perfringens
4. Campylobacter spp.
5. Staphylococcus aureus

Other common causes of foodborne illness include Toxoplasma gondii, E. coli, and Listeria.

Symptoms of foodborne illness include vomiting, diarrhea, abdominal pain, fever, chills. More severe signs can occur. These include weakness, blurred vision, dizziness, paralysis, headache, and tingling or numbness of the skin.

Although most cases of foodborne illness are mild, they can result in hospitalization or death.



Prevention:

- Raw and cooked perishable foods—foods that can spoil—should be refrigerated or frozen promptly. Refrigerators should be set at 40 degrees or lower and freezers should be set at 0 degrees.

- A meat thermometer should be used to ensure foods are cooked to the appropriate internal temperature:
 - +145 degrees for roasts, steaks, and chops of beef, veal, pork, and lamb, followed by 3 minutes of rest time after the meat is removed from the heat source

- +160 degrees for ground beef, veal, pork, and lamb
 - +165 degrees for poultry

- Fruits and vegetables should be washed under running water just before eating, cutting, or cooking. A produce brush can be used under running water to clean fruits and vegetables with firm skin.

- Raw meat, poultry, seafood, and their juices should be kept away from other foods.

- People should wash their hands for at least 20 seconds with warm, soapy water before and after handling raw meat, poultry, fish, shellfish, produce, or eggs.