



Transmission of Diseases via Animals and Insects



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Zoonotic infections

- Zoonoses are infections that can be passed from animals to humans.
- Sources of zoonoses include cattle, sheep, horses, pigs, dogs, cats, chickens, native birds, kangaroos, wild animals, rodents, reptiles (including turtles and tortoises) and bats.



- A zoonotic disease is a disease that can be shared between animals and people.
- A person may become infected with an animal disease *indirectly (from the environment or through flies, mosquitoes, ticks, and fleas) or directly (through close contact between animals and people).*

Ways Zoonotic Diseases Are Spread

- **Fecal-oral route** -Animal feces may pass directly from soiled hands to mouth, or indirectly by way of objects, surfaces, water or food contaminated with feces.
- **Inhalation** - Humans may breathe in droplets containing harmful organisms (aerosols) originating from an infected animal.

Ways Zoonotic Diseases Are Spread

- **Ingestion** - Consuming contaminated food or water may lead to illness – for example, consumption of unpasteurized milk from an infected animal or eating animal feed.
- **Vector transmission**

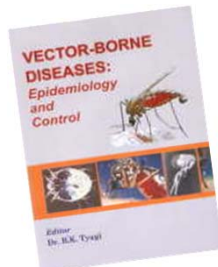
Vector

- **Biological Vector** – e.g. mosquitoes that transmit WNV
- **Mechanical Vector** – insect that carries pathogen on body surface or mouthparts, or even within the gut but which does not allow for multiplication of the pathogen. House flies
 - Think dirty needle!



Vector-borne Diseases

- A vector-borne disease is one in which the pathogenic microorganism is transmitted from an infected individual to another individual by an arthropod or other agent, sometimes with other animals serving as intermediary hosts.



Changes in the Incidence of Vector-borne Diseases Attributable to

- **Climate Change** -- Weather affects vector population dynamics and disease transmission, with temperature and humidity considered key variables.
- **International travel** -- The ease of international travel has made many of these health threats more difficult to contain.

Human Cases of Reportable Zoonotic Diseases in Texas, 2000-2009

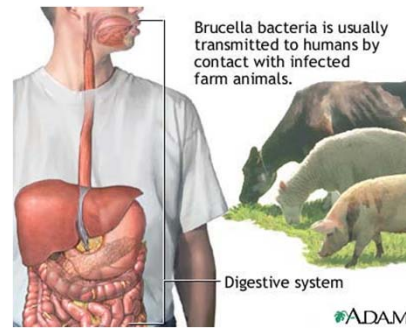
- Brucellosis
- Dengue
- Eastern Equine Encephalitis
- St. Louis Encephalitis
- West Nile Encephalitis
- Hantavirus Pulmonary Syndrome
- Lymes Disease
- Malaria
- Q-Fever
- Plague
- Rabies
- Tularemia
- Typhus
- West Nile Fever

<http://www.dshs.state.tx.us/idcu/health/zoonosis/disease/2000/>

Brucellosis

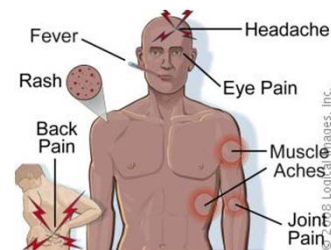
- Brucellosis is an infectious disease caused by the bacteria of the genus *Brucella*.
- These bacteria are primarily passed among animals, and they cause disease in many different vertebrates.
 - Affects sheep, goats, cattle, deer, elk, pigs, dogs

Humans become infected by coming in contact with animals or animal products that are contaminated with these bacteria.



Dengue Fever

- Dengue fever is a virus-based disease spread by mosquitoes.
- It is an infectious disease which is characterized by severe pains in the eyes, head, and extremities



Dengue Fever

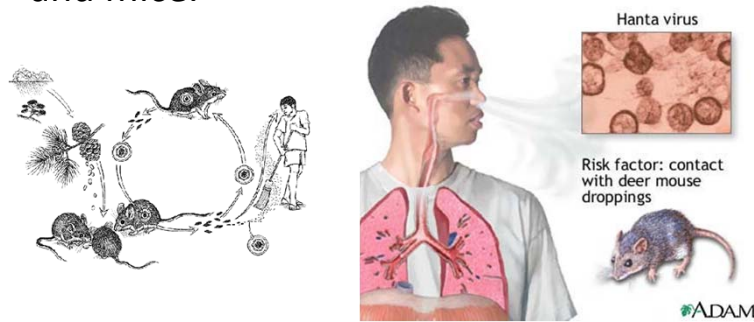
- It is spread by the bite of mosquitoes, most commonly the mosquito *Aedes aegypti*, which is found in tropic and subtropic regions.

**
As many as 100 million people are infected yearly.
Dengue fever is being seen more in world travelers

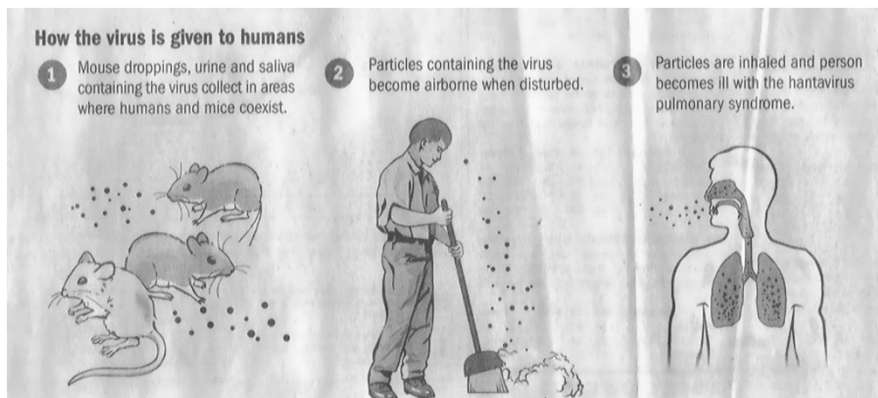


Hantavirus Virus

- Hantavirus Virus is an infectious disease that can cause death.
- It is spread to people by rodents, such as rats and mice.



Method of Infection - Hantavirus



Hantavirus Risk



- Factors increasing risk:
 - Presence of deer mice in structures.
 - Structures vacant during the winter months.
 - Fire camps, seasonal facilities (hunting camps)
 - Lack of sunlight and airflow in structure.
 - Sweeping (aerosolizing) rodent urine and feces.
 - Contact with rodent urine and feces.



Deer Mice

Malaria

- Malaria is a serious disease caused by a parasite.
- The most severe type is caused by *Plasmodium falciparum*, it can be rapidly fatal and is responsible for the majority of malaria-related deaths.
- People get malaria from the bite of a malaria-infected mosquito.
- Malaria is transmitted among humans by female mosquitoes of the genus *Anopheles*.



Anopheles Mosquito Pumping Blood

Malaria

- Common name: common malaria mosquito
Scientific name: *Anopheles quadrimaculatus* Say
(Insecta: Diptera: Culicidae)



Adult female common malaria mosquito,
Anopheles quadrimaculatus Say



University of Florida <http://entnemdept.ufl.edu>

West Nile Virus

- West Nile Virus is a **arbovirus** commonly found in Africa, West Asia, and the Middle East.
(an arbovirus - any of various RNA viruses which are the causative agents of encephalitis, yellow fever, and dengue and which are transmitted chiefly by arthropods, such as insects.)
- The virus can infect humans, birds, mosquitoes, horses and some other mammals.

West Nile Virus

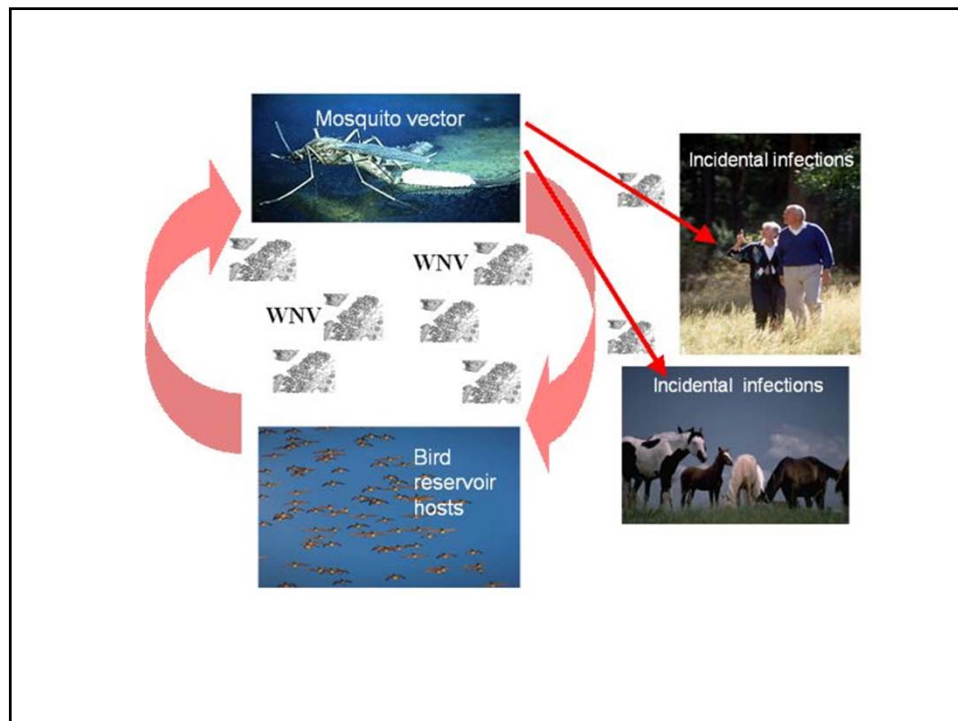
Where does the virus live? Do birds or mosquitoes get it first?

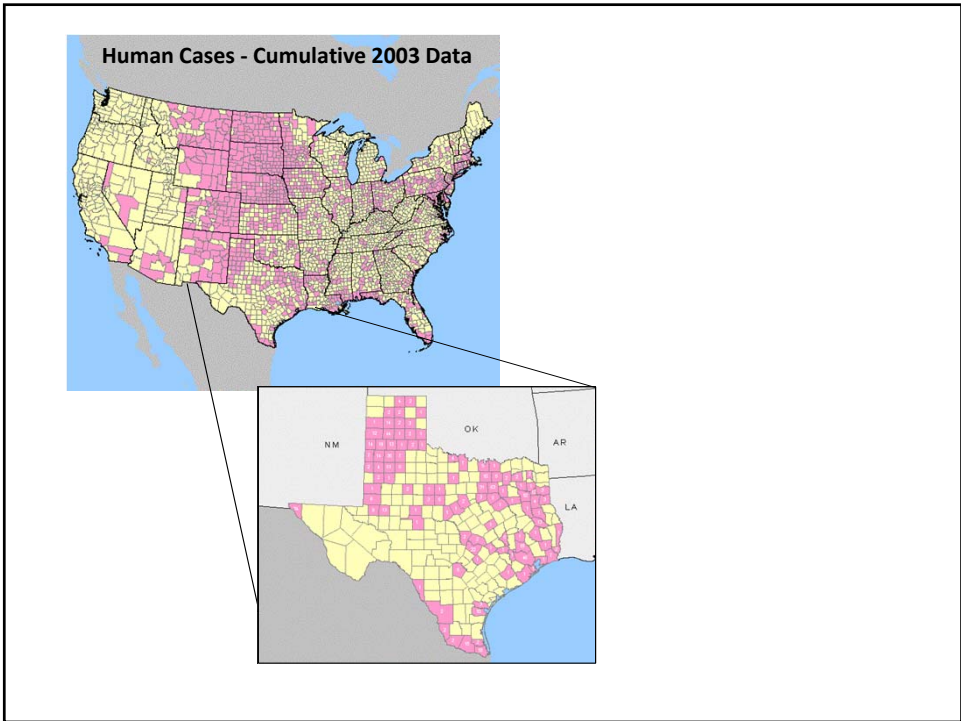
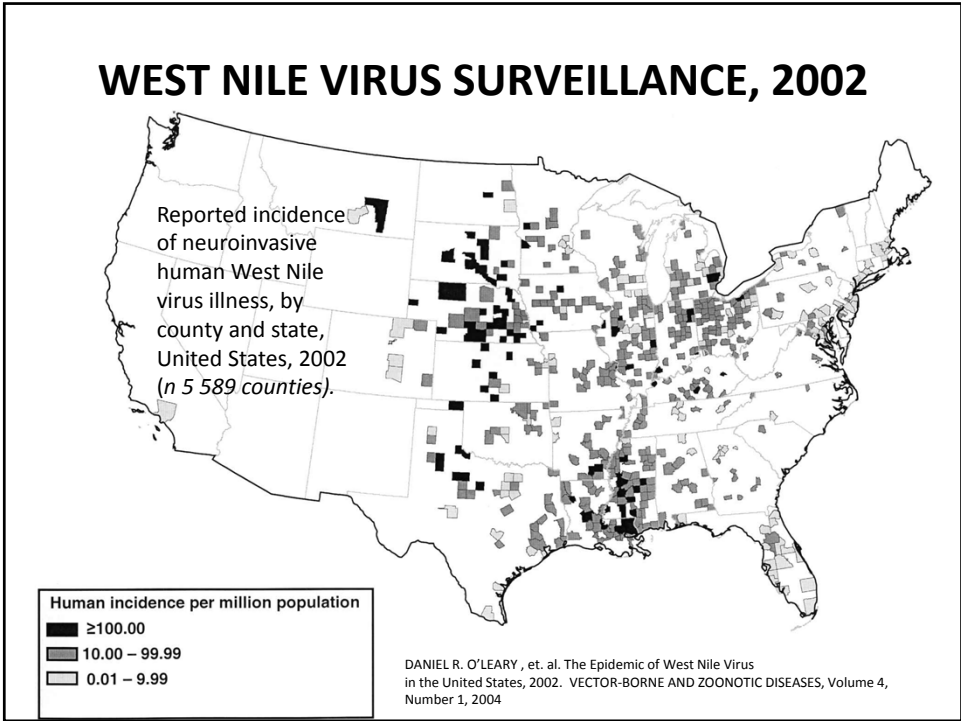
- Birds get it first.
- The virus is in their bloodstream.
- Mosquitoes become infected they feed on infected birds.

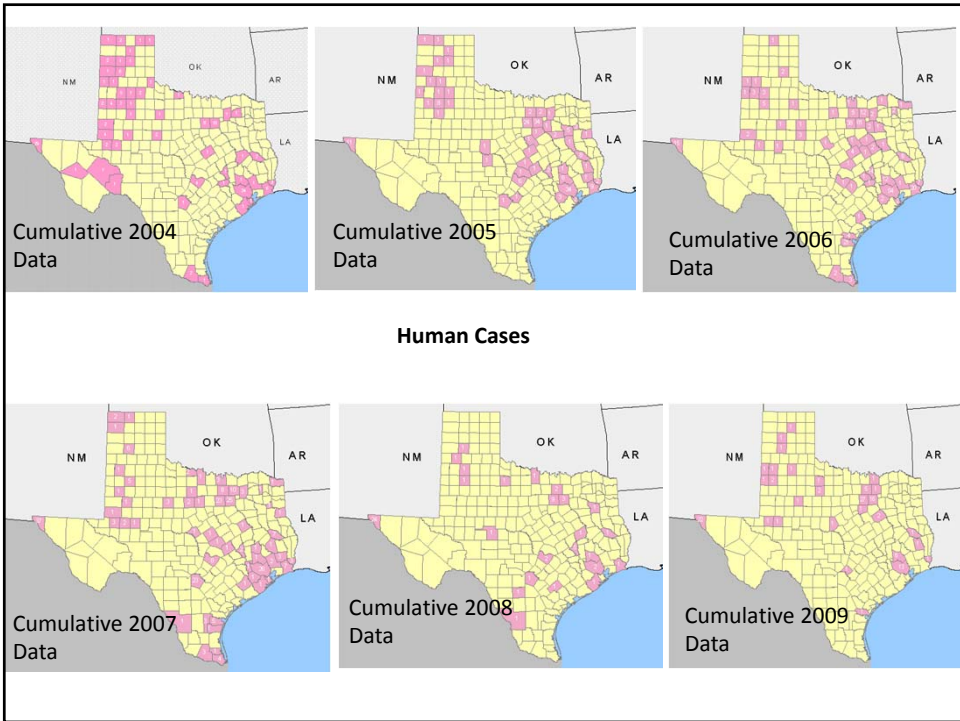
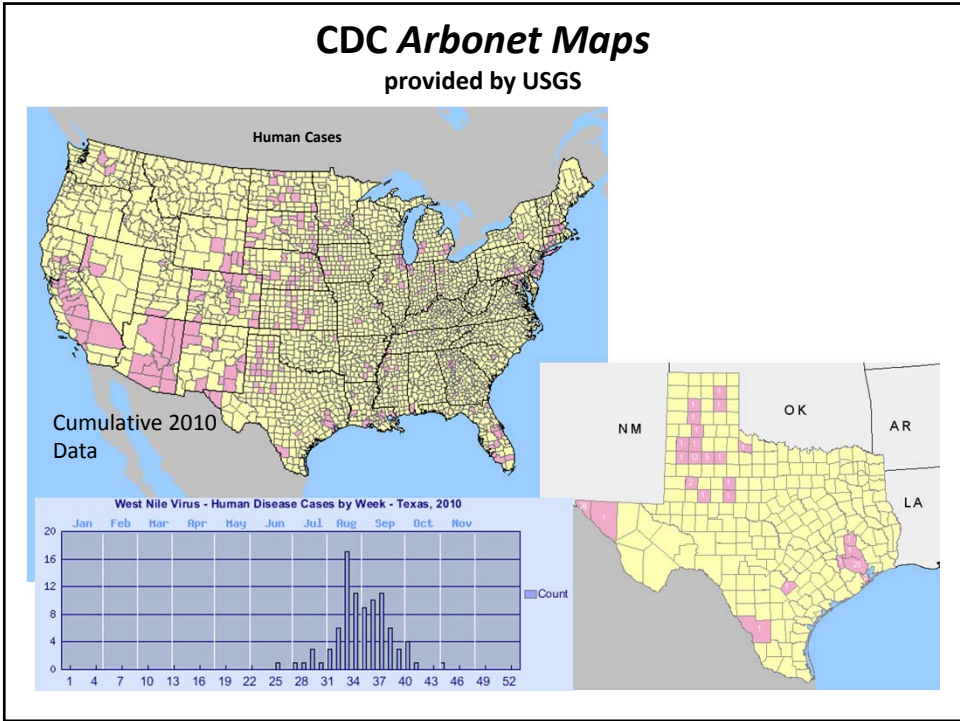


Bird Migratory Flyways

- The infected mosquitoes can then transmit West Nile virus to humans and animals while biting to take blood.
 - The virus is located in their salivary glands and, during blood feeding, the virus can be injected into the animal or human, where it can multiply, possibly causing illness in the animal or human.







Plague



- Plague is a disease caused by germs called bacteria, *Yersinia pestis*
- It is usually passed between rodents, such as rats, mice, and squirrels, by the bite of an infected flea.

The disease may be passed to people and cats by flea bites.

People and cats may also get plague by coming in contact with animals that have plague or have died from the disease



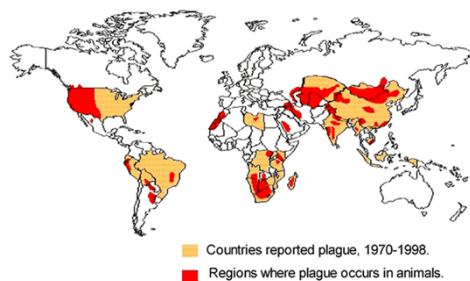
Plague

- Plague has been found in the western two-thirds of Texas where there are squirrels, prairie dogs, rabbits, rats, and mice.

If a large number of these animals are found dead or dying, plague may be the cause.

Plague in people is rare.

World Distribution of Plague, 1998



Plague Risk

- Factors increasing risk:
 - High rodent populations (especially ground squirrels).
 - High flea index (# of fleas per rodent).
 - High human-rodent contact (e.g. campgrounds).
 - History of plague transmission in the region.
 - Poor awareness of how plague is transmitted.
 - Domestic cats with outside hunting tendencies.

Risk Reduction Methods - Plague

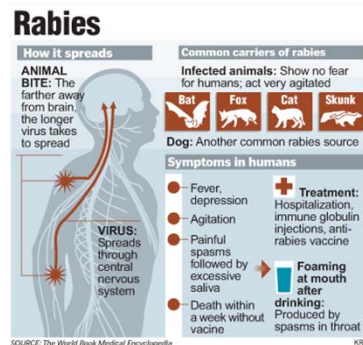
- Habitat management
 - Reduce the number of rodents
- Education
 - Post plague caution/warning signs.
 - Provide plague brochures.
- Reduce human-rodent contact
 - Temporarily close areas of high risk.
- Flea control
 - Pesticide application to kill fleas.

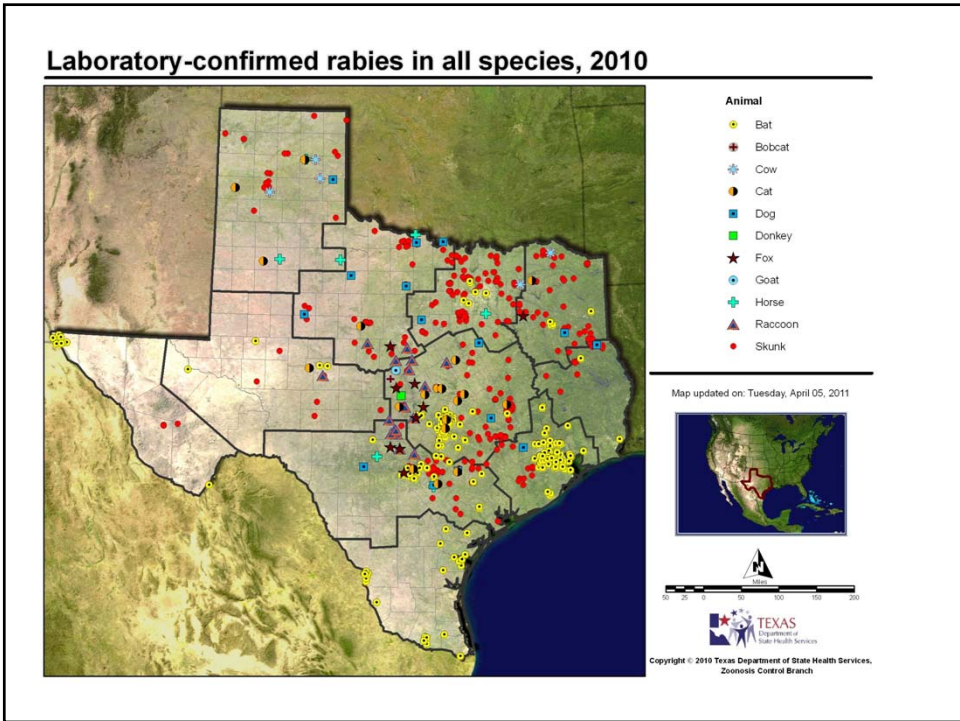
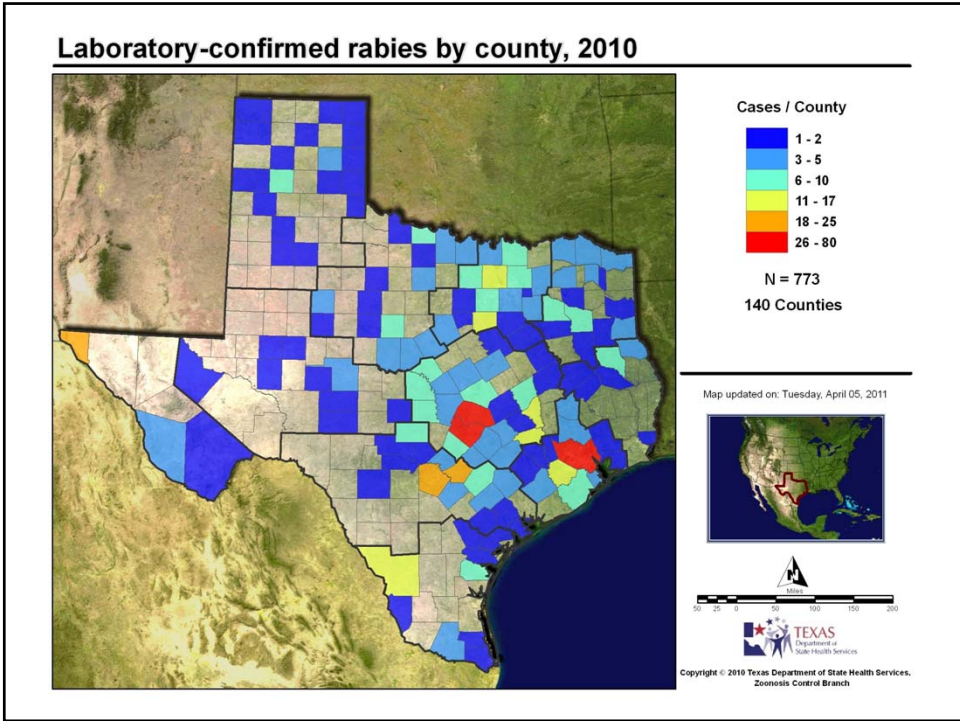
Personal Protection

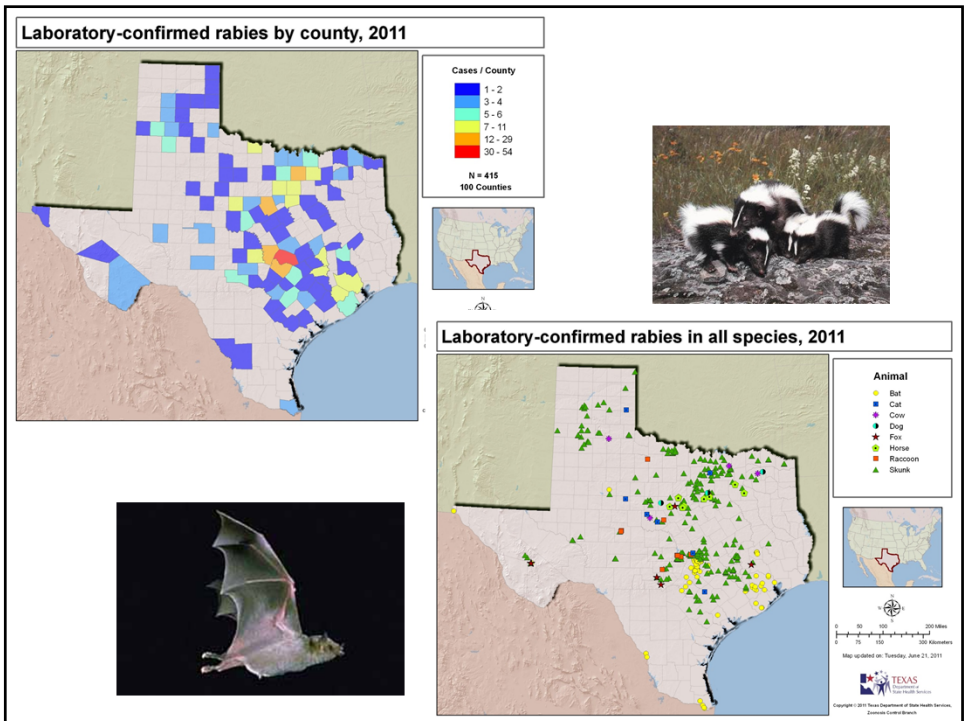
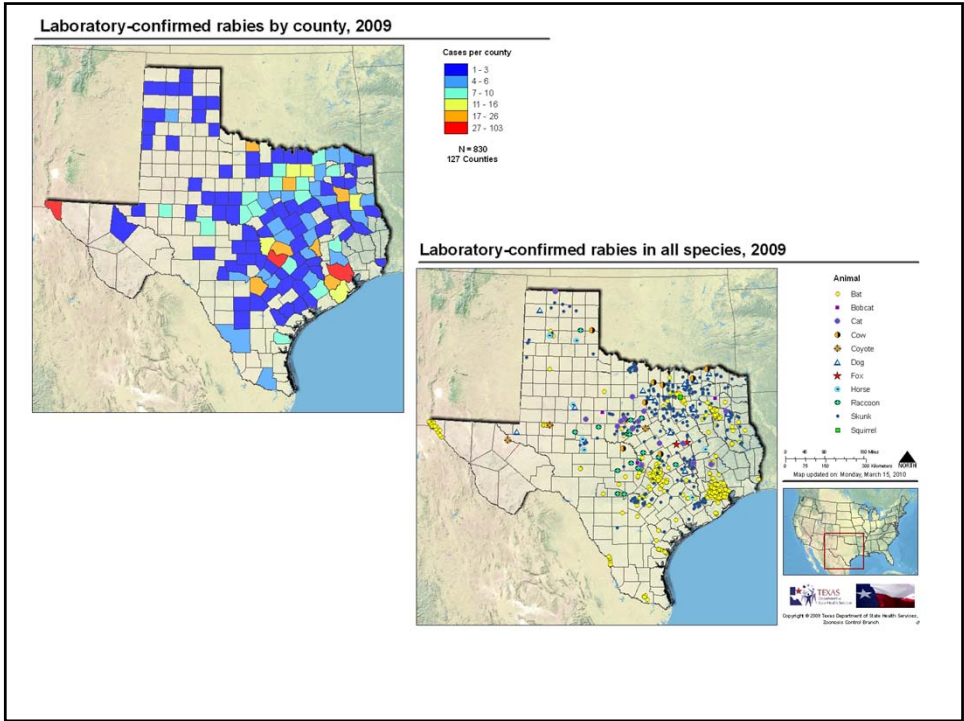
- Don't feed the rodents
 - Treat them as the dirty creatures they are!
 - Keep them away from camping areas.
- Be cautious with dead/dying rodents
 - Fleas will leave a dying animal.
 - Wear gloves and place dead animal in plastic bag (may want to submit to state for testing).
- Stay away from rodent burrows
 - Burrows are full of fleas (potentially hungry!)

Rabies

- Rabies is a virus that affects the *central nervous system*.
- You can be infected with the rabies virus if you are bitten by an animal that has the disease.
- You can also get rabies if the saliva from a rabid animal contacts your mucous membranes or any open wounds you might have.

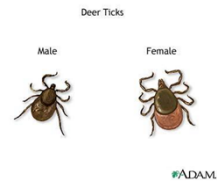






Tularemia

- Tularemia is disease caused by bacteria. Also know as Rabbit Fever.
- Many kinds of domestic and wild animals as well as people can get this disease.
- Tularemia is most commonly spread by the bite of **insects** (such as **ticks**) or **by handling or eating an infected animal**.



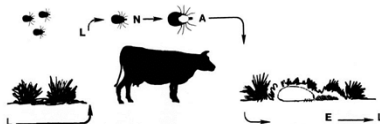
How does Tularemia spread?

- People can get Tularemia many different ways:
 - Being bitten by an infected tick, deerfly
 - The incidence, however, is higher for adults in early winter during rabbit hunting season and for children during the summer when ticks and deer flies are abundant.
 - Handling infected animal carcass
- Tularemia is not known to spread from person to person.

TICK-BORNE DISEASES

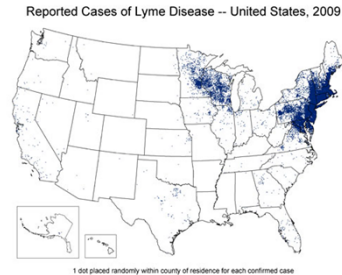
- Tick-borne pathogens can be passed to humans by the bite of infected ticks. Ticks can be infected with bacteria, viruses, or parasites.
- Some of the most common tick-borne diseases in the United States include: Lyme disease, babesiosis, ehrlichiosis, Rocky Mountain Spotted Fever, anaplasmosis, Southern Tick-Associated Rash Illness, Tick-Borne Relapsing Fever, and tularemia.
 - Other tick-borne diseases in the United States include: Colorado tick fever, Powassan encephalitis, and Q fever.

Tick Habitat



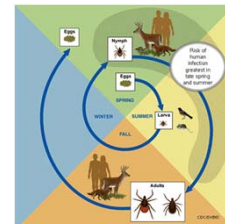
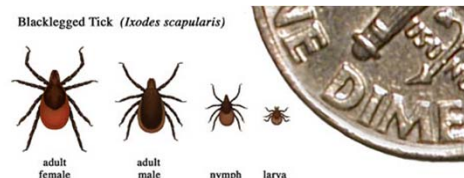
LYME DISEASE

- Lyme disease is the most commonly reported tick-borne disease in the United States.
- In 2009, nearly 30,000 confirmed and more than 8,500 probable cases of Lyme disease were reported to the Centers for Disease Control and Prevention (CDC).



Lyme disease

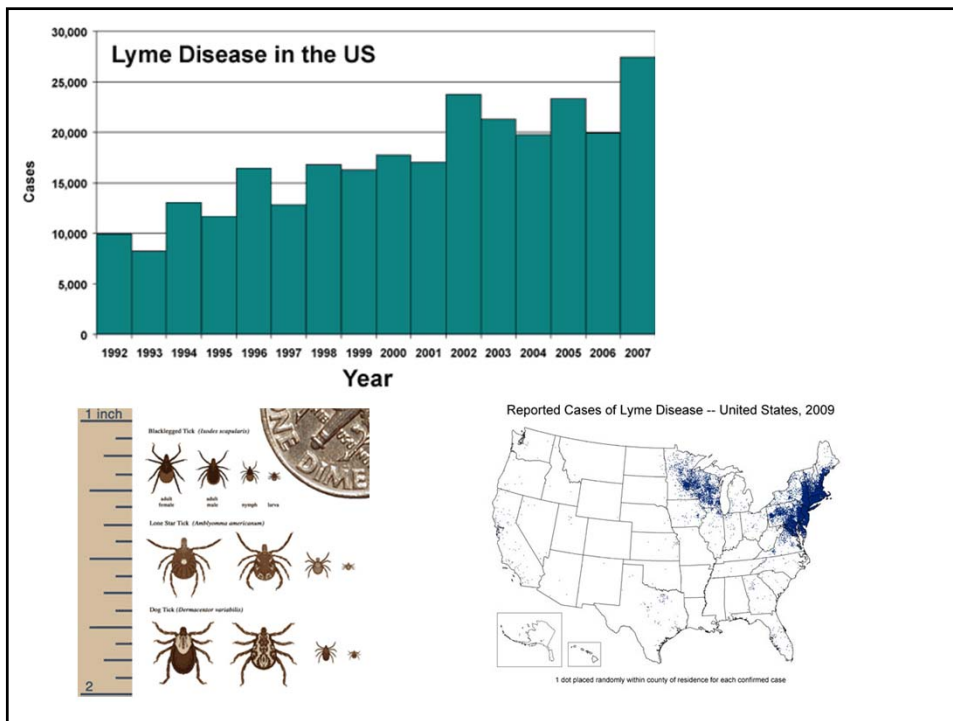
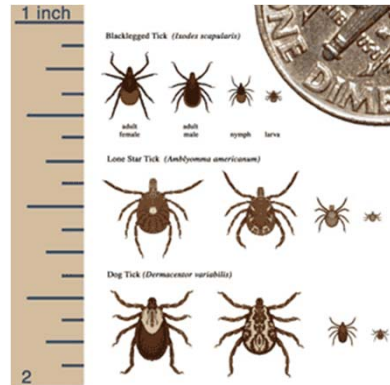
- Lyme disease is passed to humans by the bite of black-legged ticks (also known as deer ticks) and western black-legged ticks infected with the bacterium *Borrelia burgdorferi*.
 - The Lyme disease bacterium normally lives in mice, squirrels, and other small mammals.





Lyme disease

- Lyme disease is a disease which can cause skin, joint, heart and nervous system problems.
- It is vectored by ticks.
- It may affect people of all ages, possibly continuing months or years if not adequately treated.

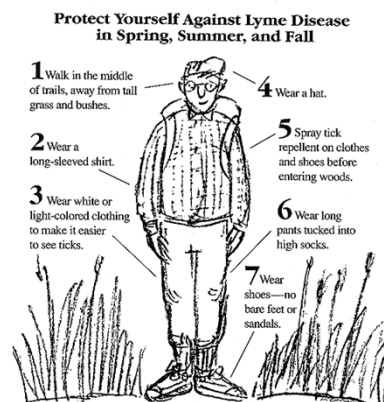


Tick-borne Disease Risk

- Factors increasing risk:
 - High tick populations
 - High human-tick contact
 - Off trail or trail edge travel
 - Open clothing (shorts, skirts, etc...)
 - Failure to use tick repellents
 - Failure to remove ticks following exposure

Risk Reduction Methods (Tick-borne Disease)

- Avoid high tick population areas
 - Do not walk along edge of trails.
- Dress appropriately
 - Long pants tucked into socks or boots.
 - Long sleeved shirt.
- Utilize tick repellents
- Remove ticks daily



Nuisance Flies Common Animal Operations

- Manure Breeding
 - House Fly (*Musca domestica*)
 - Stable Fly (*Stomoxys calcitrans*)
 - Face Fly (*Musca autumnalis*)
 - Little House Fly (*Fannia canicularis*)

- Carrion/Waste
 - Garbage Flies (Calliphoridae)



Flies have been confirmed to carry over 65 pathogens that affect humans and animals, including:

- | | |
|-----------------------------------|---------------------|
| • Exotic Newcastle disease virus | |
| • Turkey corona virus | |
| • <i>Salmonella</i> spp. | food poisoning |
| • <i>Campylobacter</i> spp | diarrhea |
| • <i>Escherichia coli</i> O157:H7 | diarrhea, dysentery |
| • <i>Shigella sonnei</i> | diarrhea, dysentery |
| • <i>Staphylococcus</i> spp. | UT, skin infection |
| • <i>Bacillus</i> spp. | food poisoning |
| • <i>Enterobacter sakazakii</i> | UT, blood infection |
| • <i>Acinetobacter baumannii</i> | meningitis, |
| pneumonia | |

Environmental Conditions

Stable flies develop in decaying organic matter mixed with manure, soil, and moisture

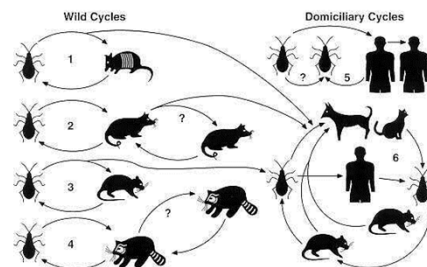


Chagas Disease

- Caused by a parasite, *Trypanosoma cruzi*, a single celled organism that burrows its way into the heart muscle.
- The disease is vectored by triatomine (cone-nosed) bugs.

Animal reservoirs include opossums, armadillos, rodents, dogs, and cats.

Outbreaks are associated with mud, thatched, or dirt-floored dwellings that harbor the vector.



Chagas Disease



<http://insects.tamu.edu/fieldguide/aimg53.html>

- The disease is vectored by triatomine (cone-nosed) bugs.
- "kissing bugs" live in cracks and holes around homes.
- Infection is spread to humans when an infected bug deposits feces on a person's skin, usually while the person is sleeping at night.
 - The person often accidentally rubs the feces into the bite wound, an open cut, the eyes, or mouth.

Other issues....

- 3 diseases people should have the greatest cause for concern about relative to feral hogs in Texas are swine brucellosis, psuedorabies and tularemia, but that the animals may harbor other diseases as well.
- Swine brucellosis, *Brucella suis*, is a bacterium transmitted among feral hog populations through breeding and through ingestion of the bacteria



Infections that Pets Carry

- [Campylobacter infection](#): can be transmitted by household pets carrying *Campylobacter jejuni* bacteria, which cause diarrhea, abdominal pain, and fever in people.
- The bacteria may be in the intestinal tract of infected dogs, cats, hamsters, birds, and certain farm animals.
 - A person can become infected through contact with contaminated water, feces, undercooked meat, or unpasteurized milk.



Infections that Pets Carry

- More than 2 million cases of campylobacter infection occur each year in the United States, and *C. jejuni* is now the leading cause of bacterial gastroenteritis.
- Campylobacter infections are contagious, especially among members of the same family and kids in childcare or preschools. Infection is treated with antibiotics.

Infections that Pets Carry

- **Cat scratch disease**: can occur when a person is bitten or scratched by a cat infected with *Bartonella henselae* bacteria.
- Symptoms include swollen and tender lymph nodes, fever, headaches, and fatigue, which usually resolve without treatment.



- A doctor may prescribe antibiotics if the infection is severe.
- Cat scratch disease rarely causes long-term complications.



Infections that Pets Carry

- **Rabies**: a serious illness caused by a virus that enters the body through a bite or wound contaminated by the saliva from an infected animal.
- Animals that may carry the rabies virus include dogs, cats, raccoons, bats, skunks, and foxes.
 - Widespread immunization of dogs and cats has decreased the transmission of rabies in these animals and in people.

Infections that Pets Carry

- **Ringworm**: also called tinea; a skin infection caused by several types of fungi found in the soil and on the skin of humans and pets.
 - Kids can get ringworm from touching infected animals such as dogs and cats.
 - Ringworm of the skin usually is a dry, scaly round area with a raised red bumpy border and a clear center.



Ringworm is treated with antifungal medications including shampoo, cream, or oral medicine.



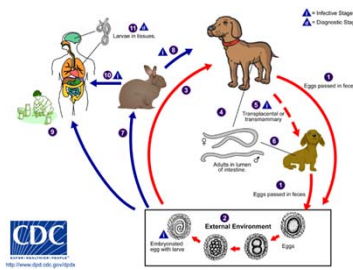
Infections that Pets Carry

- **Toxoplasmosis**: contracted after contact with a parasite found in cat feces.
- When symptoms do occur they may include swollen glands, fatigue, muscle pain, fever, sore throat, and a rash. In pregnant women, toxoplasmosis can cause miscarriage, premature births, and severe illness and blindness in newborns.
- Pregnant women should avoid contact with litter boxes.



Infections that Pets Carry

- **Toxocariasis**: an illness caused by the parasitic roundworm *Toxocara*, which lives in the intestines of dogs and cats.
 - The eggs from the worms are passed in the stools of dogs and cats, often contaminating soil where kids play.



Here are Six Ways to Prevent the Spread of Zoonotic Diseases Among Your Animals and to Members of Your Family.

- Wash Your Hands
- Practice Food Safety
- Use Biosecurity Measures
- Pay Attention to Animal Health
- Take Precautions when Handling and Caring for Animals
- Clean and Disinfect to Kill Disease-Causing Germs



Wash Your Hands



How to wash your hands

- Use warm water.
- Use liquid or bar soap. *Antibacterial soap is not necessary.*
- Rub hands together vigorously, producing friction.
- Work the soap and water into a lather, from the wrist to fingertips.
- Be sure to scrub under fingernails, between fingers, and under jewelry.
- Wash for at least **15 seconds** to remove germs.
- When warm water is not available, wash for a longer time.
- When soap and water are not available, use an alcohol- based hand sanitizer.

When to wash your hands

- before and after preparing meals
- before and after handling uncooked meat, fish, and eggs
- before and after eating and drinking
- before and after handling and caring for animals
- after using the restroom
- after cleaning animal pens and cages
- after laundering soiled laundry
- after caring for others who are ill
- after blowing your nose or sneezing

Washing your hands is the single most important thing you can do to prevent contagious diseases from spreading.!!



Practice Food Safety

- Do not consume unpasteurized milk and milk products.
- Do not consume meat or other products from an animal that died of an illness.
- Properly refrigerate and handle uncooked meat, eggs, and fish.
- Cook meat and fish to appropriate internal temperature.

Germ Farm



Use Biosecurity Measures



- Fence in animal areas.
- Separate animal areas from your family's home.
- Separate animal areas from human food and water supplies.
- Locate water wells uphill and at least 100 feet from animal areas and septic systems.
- Do not leave water hoses lying on the ground in animal areas.
- Reduce visitor contact with animals.
- Keep new animals away from other animals for at least two weeks



Pay Attention to Animal Health

- Keep your animals current on preventive care. Make sure they are up-to-date on vaccinations, parasite prevention, veterinary visits.
- Observe your animals Signs of illness:

diarrhea	sneezing
vomiting	coughing
weakness	blisters
unusual behavior	not eating or drinking
nasal discharge	



Take Precautions when Handling and Caring for Animals

- ***Wear personal protective clothing and equipment***
 - Personal protective clothing, boots, and equipment can reduce the risk of exposing other animals or people to contagious diseases.



Clean and Disinfect to Kill Disease-Causing Germs

Launder protective clothing separately

- Place soiled laundry in a separate laundry basket, apart from other family clothes.
- Wash and disinfect clothes separately from your family's clothes.
- Use detergent.
- Use water that is 130 degrees F.
- Dry on a clothesline in sunlight or in an automatic clothes dryer.



Disinfect to prevent the spread of diseases

- First, clean equipment and surfaces with a scrub brush and detergent mixed in water to remove all soil, food, and manure.
- Then, disinfect using a diluted household bleach solution or an EPA-approved disinfectant
 - Mix ¼ cup of household bleach with 1 quart of water for tires, vehicle undercarriages, boots, and footbaths.
 - Make a weaker solution of ¼ teaspoon bleach with 1 quart of water for hard surfaces.

THANK YOU!

