

Educational Pamphlets of Infectious and Zoonotic Diseases

Prairie Park Nature Center-Lawrence, KS

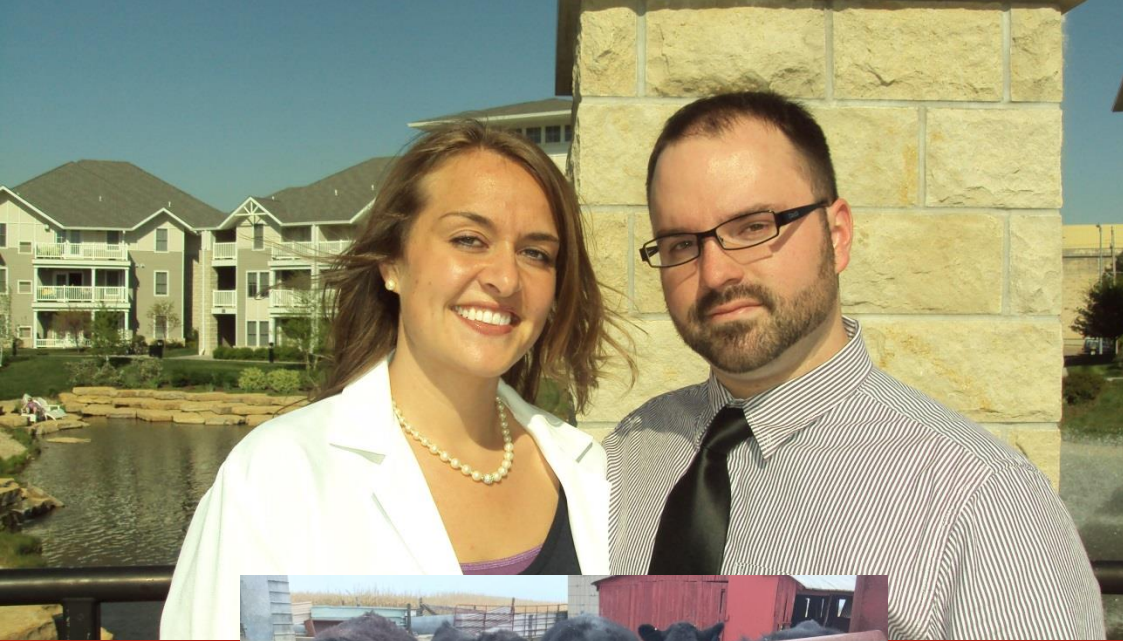
Michelle Colgan-Hall, D.V.M.

11-15-18

Manhattan, Kansas











Products Developed

- Five species specific brochures that included infectious and zoonotic diseases transmittable by animals. With each disease discussed, I explained ways to prevent the disease from being transmitted. In each brochure, information was provided on whom to call in an emergency and how to determine if an animal is sick or injured. I also explained when to approach wildlife and how to approach the animal without being bitten. I discussed the correct way to catch a wildlife animal if needed and what to do if the nature center is not open.
- One disease specific brochure was made for rabies due to its nearly 100% fatality rate in humans. This brochure went over the prevalence of rabies in Douglas County, how rabies is transmitted, what to watch for in animals for signs of rabies, and what to do when you suspect that an animal could be sick from rabies.
- The Lawrence Police Department is going to have a meeting where I will be speaking on rabies and the ways they can keep the general public safe from this disease. I made a PowerPoint presentation to discuss how rabies is transmitted and what they need to look for in clinical signs for animals with the disease. I also discussed humane ways of euthanizing wildlife animals that may be contagious.

Rabies

- 300 BC several literatures mentioned bites from dogs that affect other dogs.
- World Health Organization—55,000 human deaths occur annually.
- 2017-39 positive cases of rabies in Kansas

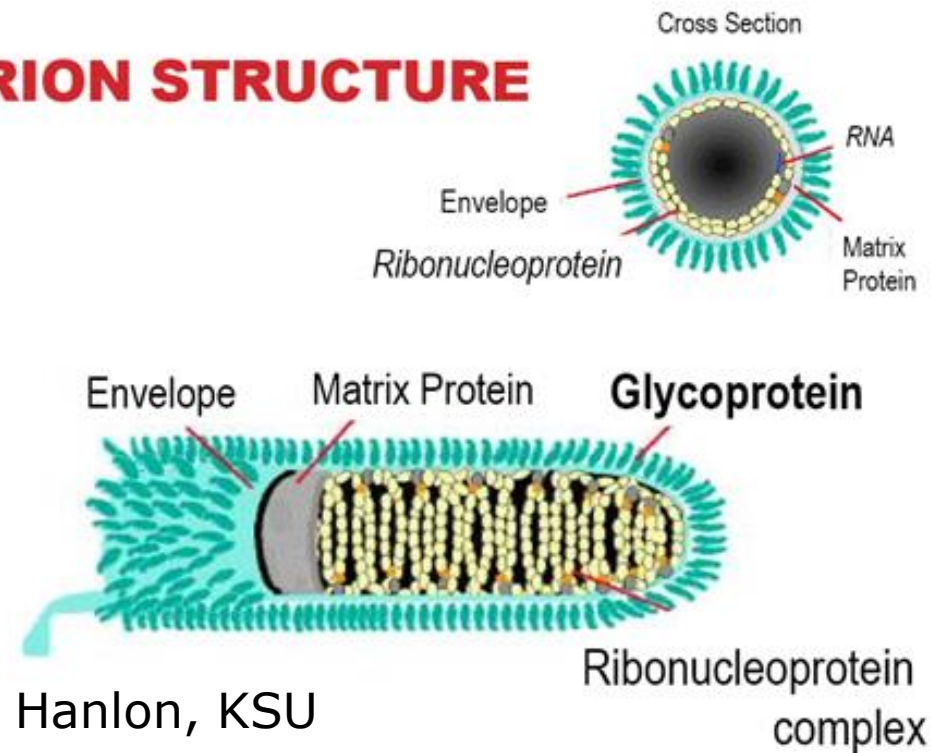
Family gives warning about bats after man becomes Utah's first fatal rabies case in over 70 years

POSTED 6:15 PM, NOVEMBER 8, 2018, BY [AMANDA GERRY](#), UPDATED AT 07:06AM, NOVEMBER 9, 2018

Rabies

- Negative stranded RNA virus
- Shaped like a bullet
- Only affects mammals
- Easily disinfected, fragile

VIRION STRUCTURE



Rabies

- Transmission:
 - **Bite wound**
 - Contamination of fresh, bleeding wounds
 - Oral-consumption
 - Inhalation-droplets
 - Ocular-transplant
 - Transplacentally
 - Animals

Virus goes up the nerves into the spinal cord and brain.



Bite –
virus may
replicate
locally.



Bite Incubation - non-infectious
10 days – 6 months or possibly more

Rabies



CDC

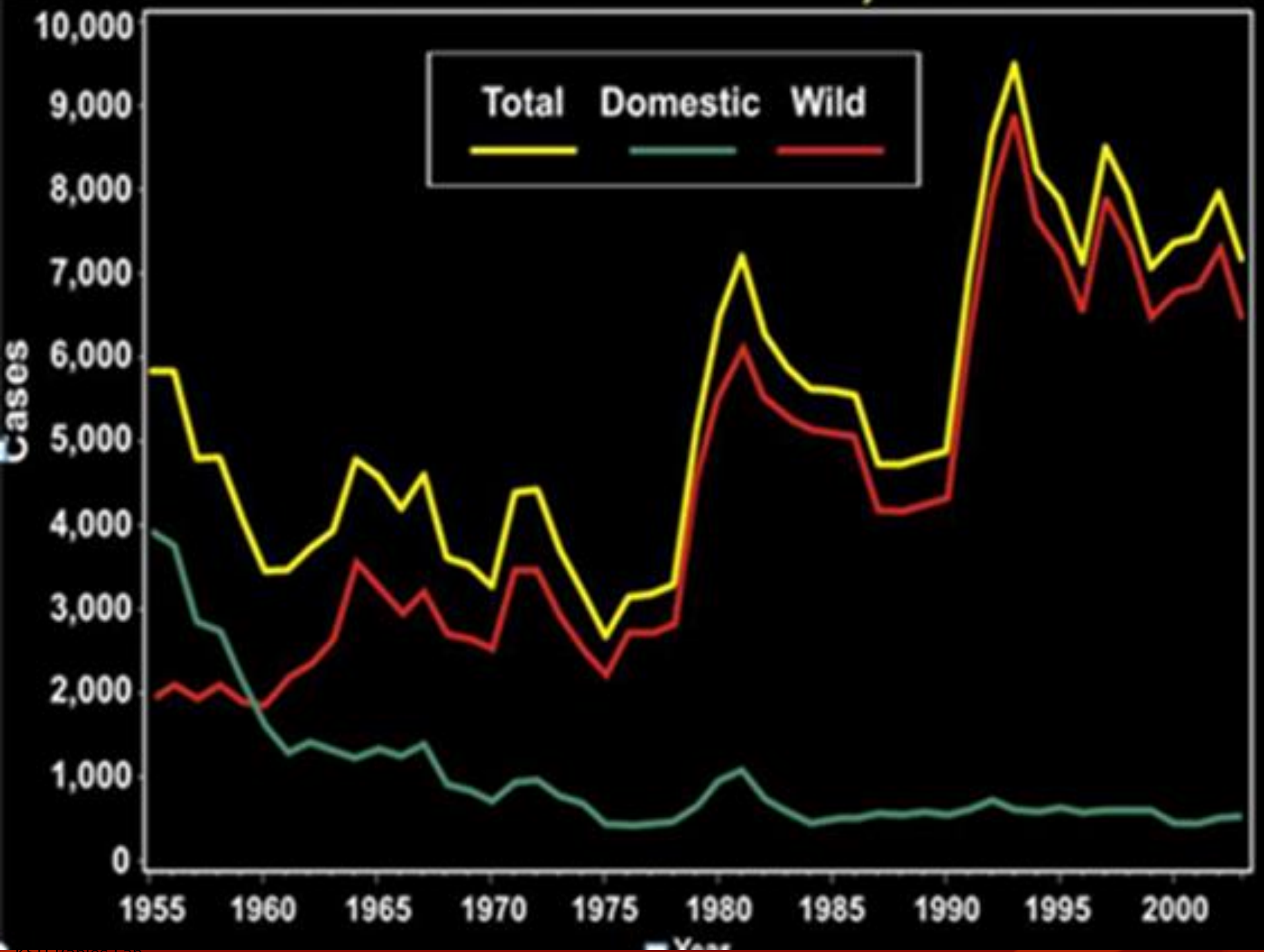
Rabies

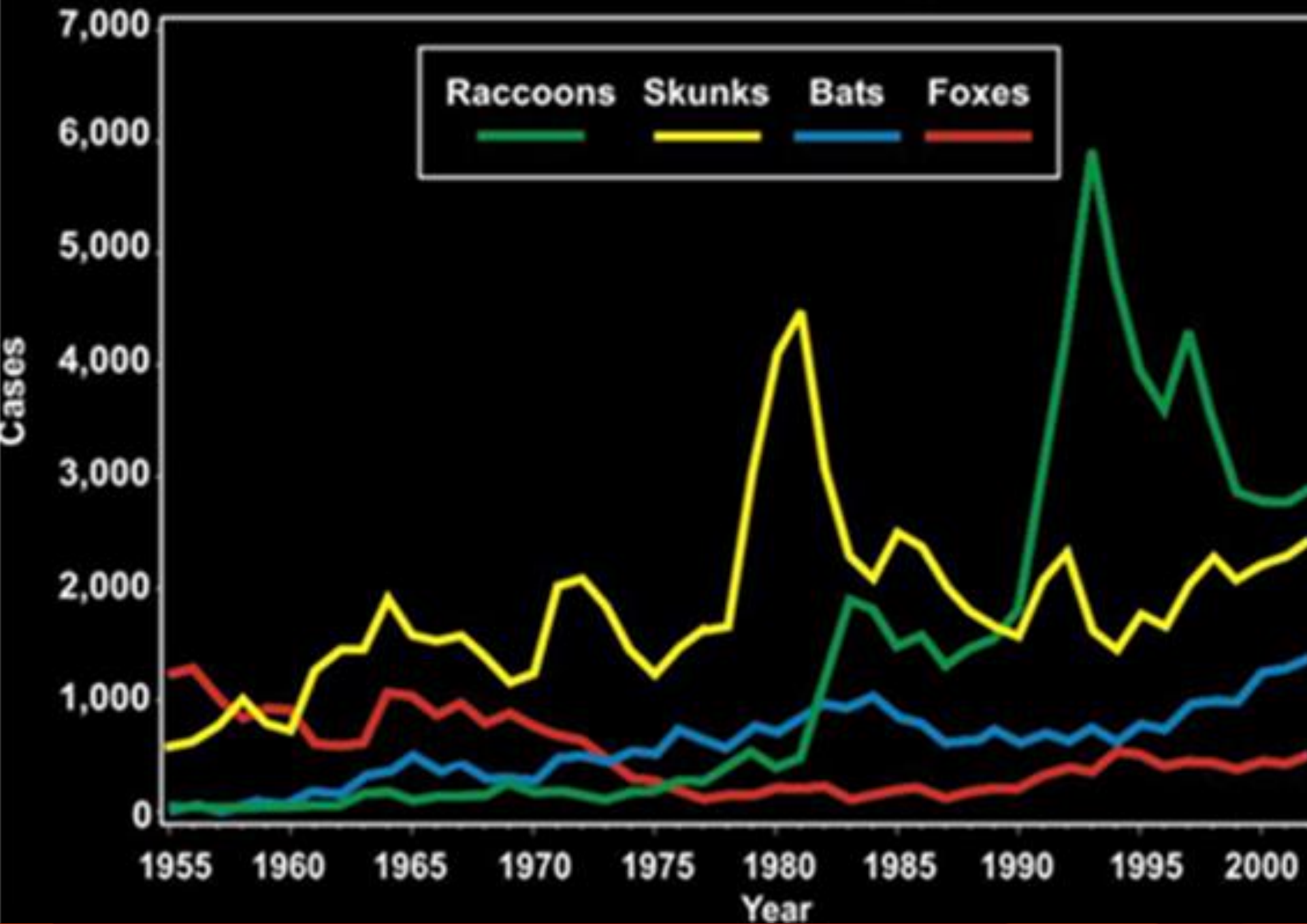
- Clinical signs
 - Aggression
 - Fearfulness
 - Excessive drooling
 - Difficulty swallowing
 - Staggering
 - Seizures
 - Unusual behavior (Especially wildlife)
 - Self-mutilation
 - Increased sensitivity to light
 - Depression



Rabies







Rabies

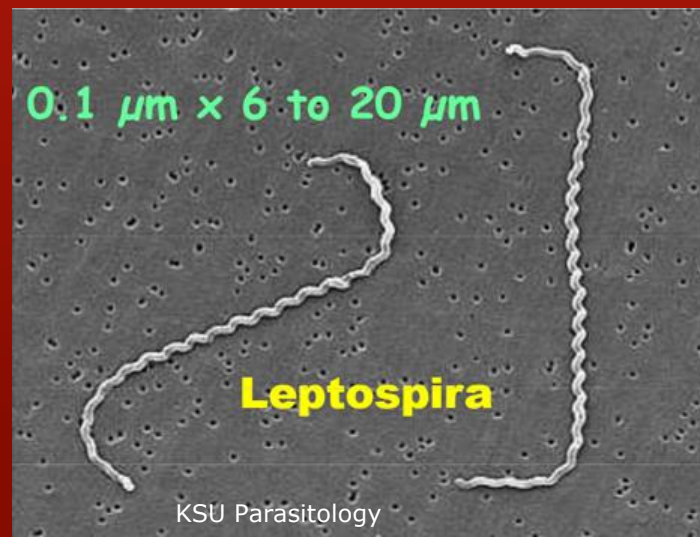
- Treatment

- Immunotherapy-Given after bite

- **NO TREATMENT, 100% fatality-
Neurologic signs seen**

Leptospirosis

- Worldwide distribution
- Cattle, swine, sheep, goats, dogs, horses
- Humans
- Wild animals
- Over 200 sero types,
 - *L. pomona* (Cattle mainly, sheep, horses, swine)
 - *L. hardjo* (Swine mainly, cattle)



Leptospirosis

○ Transmission

- Contaminated urine
- Cuts, wounds
- Contaminated waters



○ Clinical Signs

- Mild or acute
- Fever, muscle weakness, weight loss
- Milk drop syndrome (cattle)
- Moon blindness (horses)
- Kidney damage
- Abortion and infertility
- Death

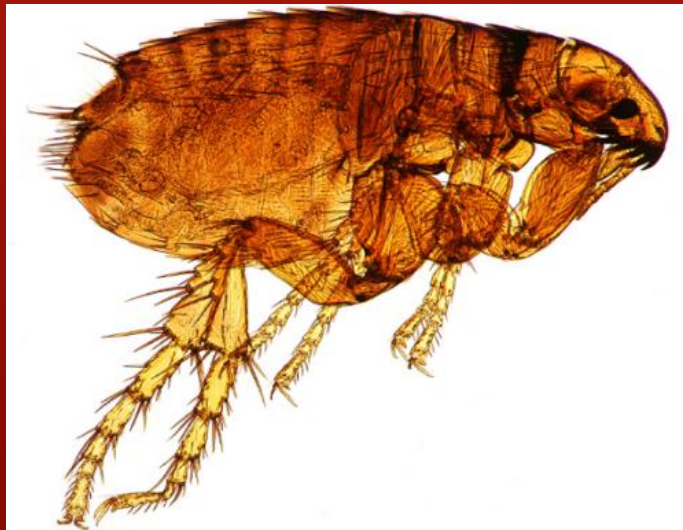
Leptospirosis

- Treatment
 - Antibiotics if caught early enough



The Plague

- *Yersinia pestis*
- 3,248 cases and 584 deaths (2010-2015)
- Colorado-20 human plague cases
- Transmission:



Global distribution of natural plague foci as of March 2016



The Plague

- Clinical signs:
 - Febrile, chills, head and body aches, weakness, vomiting
 - Non-Specific systemic symptoms
- 2 main types of plague:
 - Bubonic
 - Most common
 - Enlarged lymph nodes
 - Human to human transmission is rare
 - Pneumonic
 - Most virulent form
 - Lungs involved
 - Transmission vis droplets to other humans
 - Fatal if not diagnosed FAST (within 24 hours)

Plague

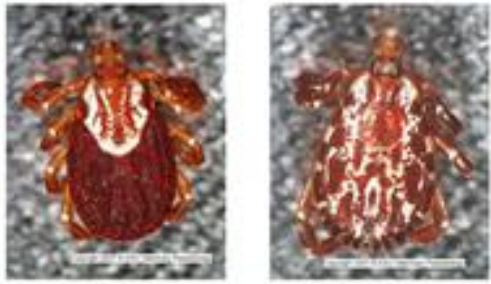



- Treatment
 - Antibiotics
 - Supportive care



Tickborne Diseases

- 3 host ticks
 - Stage 1: Larva hatches from egg. Feeds on host for a few days then falls off host and molts
 - Stage 2: Nymph finds host and feeds, falls off and molts.
 - Stage 3: Adult finds host, feeds, and falls off to lay eggs. Then dies.
- 1-3 years for the whole cycle
- 2,000-8,000 eggs are laid.



<u>Tick Name</u>	<u>Picture Description</u>	<u>Known Diseases they Transmit</u>	<u>Geographical Location in United States</u>
<p><i>Dermacentor variabilis</i></p> <p>American Dog Tick</p>	<p style="text-align: center;">Ticks</p> <p style="text-align: center;">Female <i>Dermacentor</i> Male</p> 	<ul style="list-style-type: none"> --Cytauxzoonosis (<i>Cytauzoon felis</i>) --Rocky Mountain Spotted Fever (<i>Rickettsia rickettsi</i>) --Tularemia (<i>Francisella tularensis</i>) --Tick paralysis in North America 	 <p style="text-align: center;"><i>Dermacentor variabilis</i></p>
<p><i>Amblyomma americanum</i></p> <p>Long Star Tick</p>	<p style="text-align: center;">female male</p> 	<ul style="list-style-type: none"> --Human Monocytic Ehrlichiosis (<i>Ehrlichia chaffensis</i>) --<i>Ehrlichia ewingii</i> -Tularemia (<i>Francisella tularensis</i>) Southern Tick-Associated Rash Illness (<i>Borrelia lonestari</i>) a Lyme disease-like infection? --Cytauxzoonosis (<i>Cytauzoon felis</i>) --Meat allergy disease 	

*Ixodes
scapularis*

The Black-
Legged Tick
Or Deer Tick

female



male



--*Borrelia burgdorferi*
(Lyme disease)
--*Anaplasma
phagocytophilum* (HE
agent, E. equi)
--*Babesia microti*
(Humans)



*Rhipicephalus
sanguineus*

Brown Dog
Tick

female



male

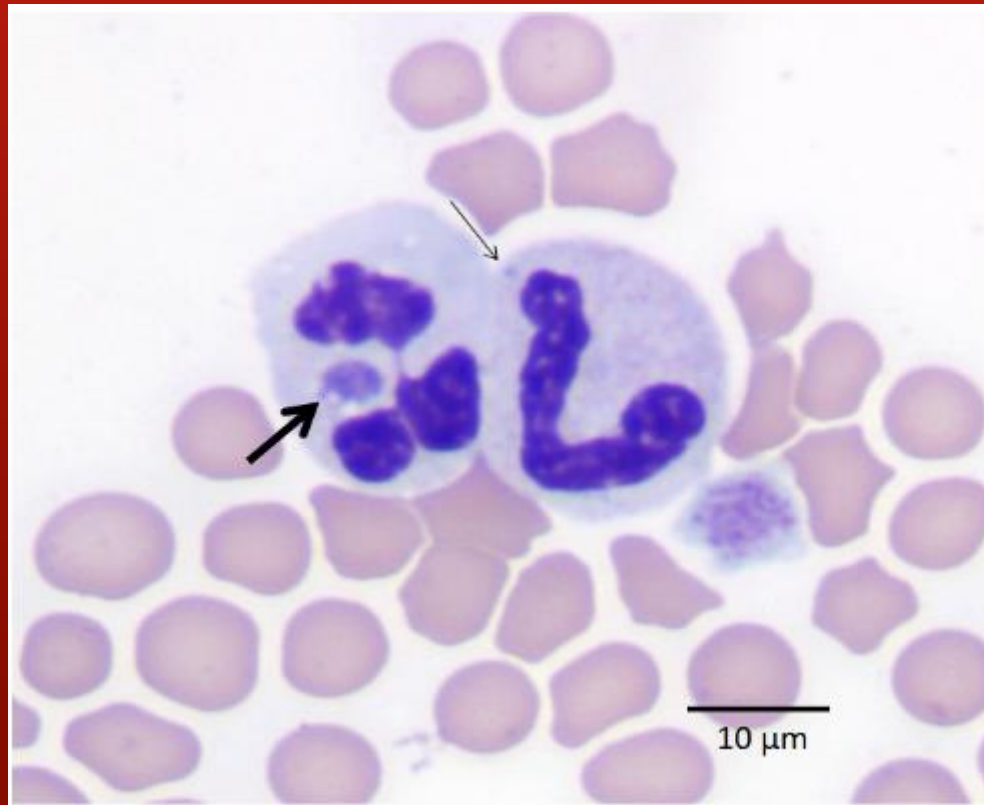


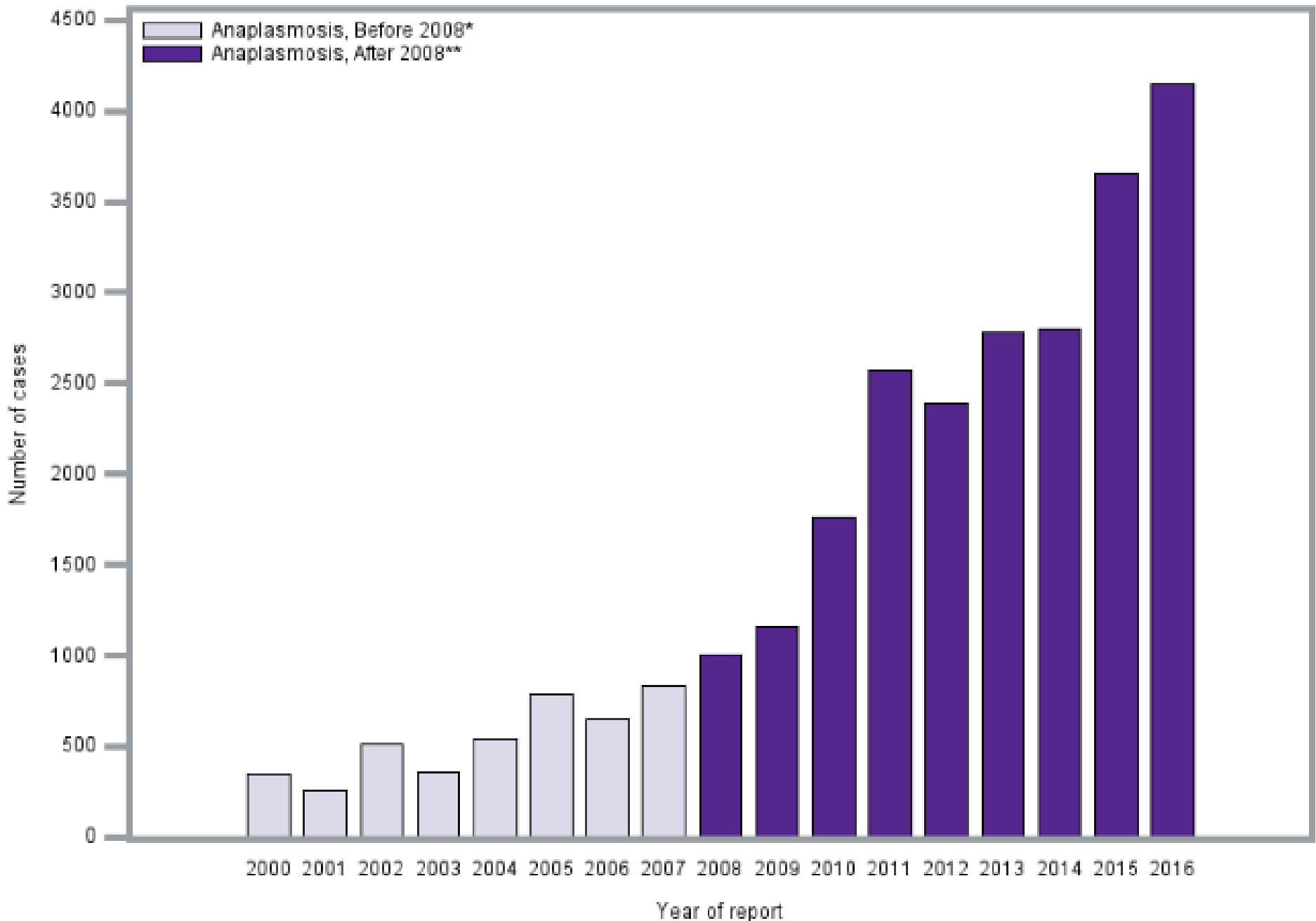
--*Ehrlichia canis*
(Canine Monocytic
Ehrlichiosis)
--*Babesia canis* (Canine
Babesiosis)



Anaplasmosis

- *Anaplasma phagocytophilum*
- First recognized in 1990s, not notifiable until 1999.
- Primary vector-Black-Legged tick (*Ixodes scapularis*)





Anaplasmosis

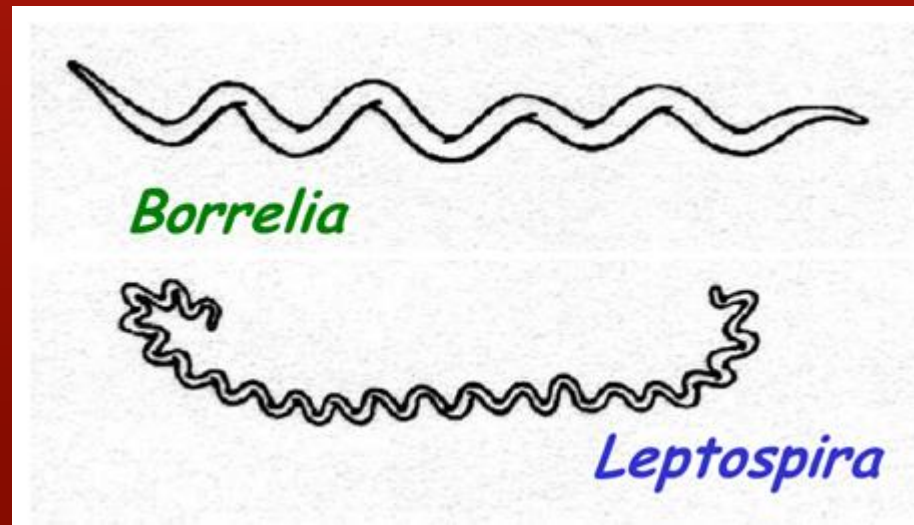
- Clinical signs
 - Fever
 - Anemia
 - Dehydration
 - Anorexia
 - Difficulty breathing
 - No signs
- Treatment
 - Antibiotics
 - Carriers



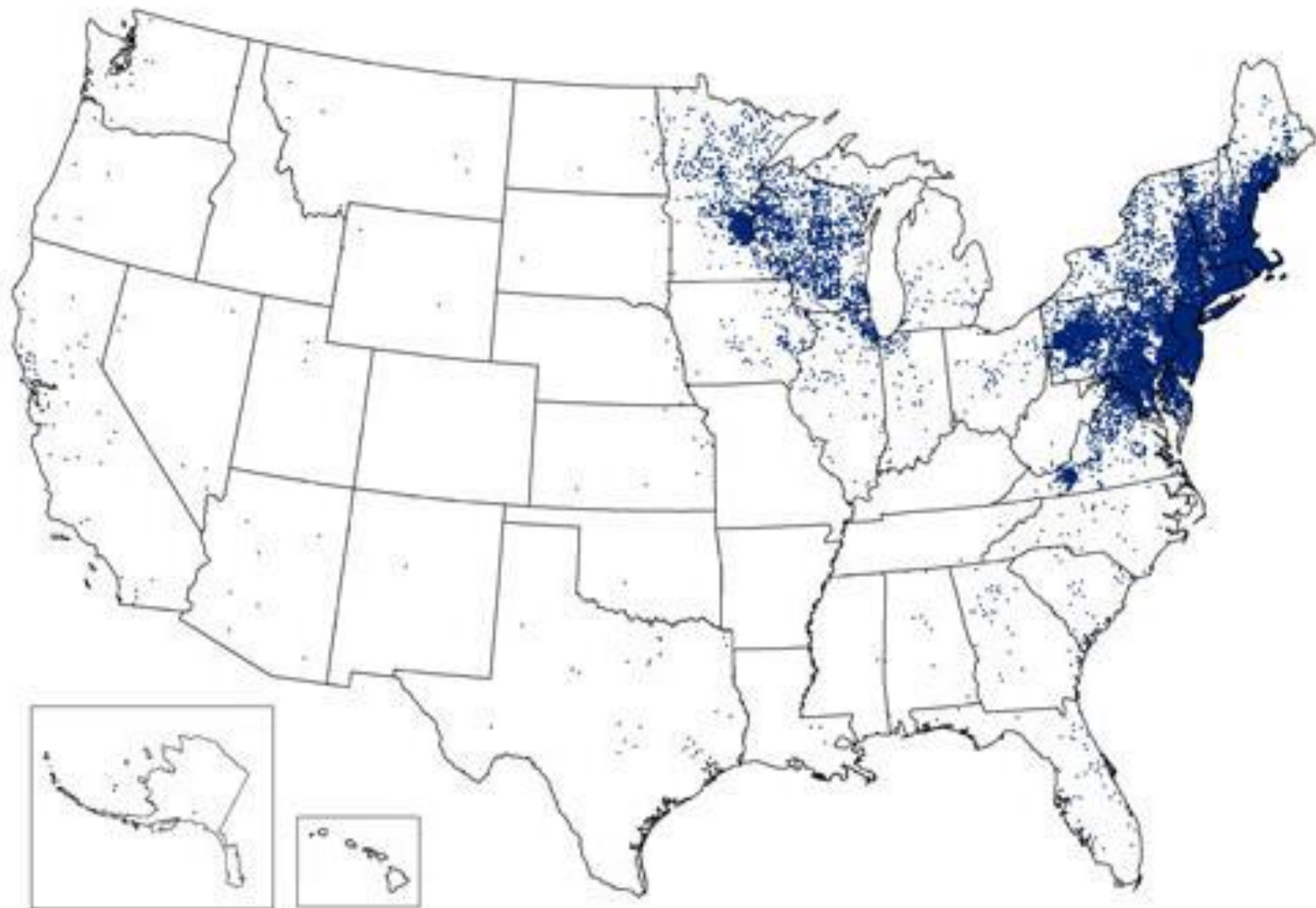
Bangor Daily News

Lyme Disease

- *Borrelia burgdorferi*
- Dogs, horses, cattle, cats, humans
- Primary vector-Black-Legged tick (*Ixodes scapularis*)
- 30,000 cases last year (Undiagnosed 300,000)



Reported Cases of Lyme Disease - United States, 2012



1 dot placed randomly within county of residence for each confirmed case

CDC

Reported Cases of Lyme Disease -- United States, 2017



1 dot placed randomly within county of residence for each confirmed case

CDC

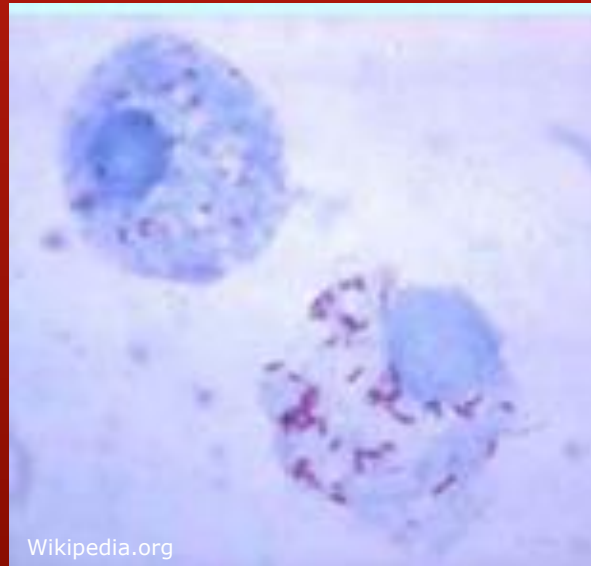
Lyme Disease

- Clinical Signs
 - Bulls eye rash (humans)
 - Fever, chills, fatigue
 - Swollen joints
 - Swollen lymph nodes
- Treatment
 - Antibiotics
 - Chronic not labeled



Rocky Mountain Spotted Fever

- Was identified in 1920s
- *Rickettsia rickettsii*
- *Dermacentor spp* transmit the disease



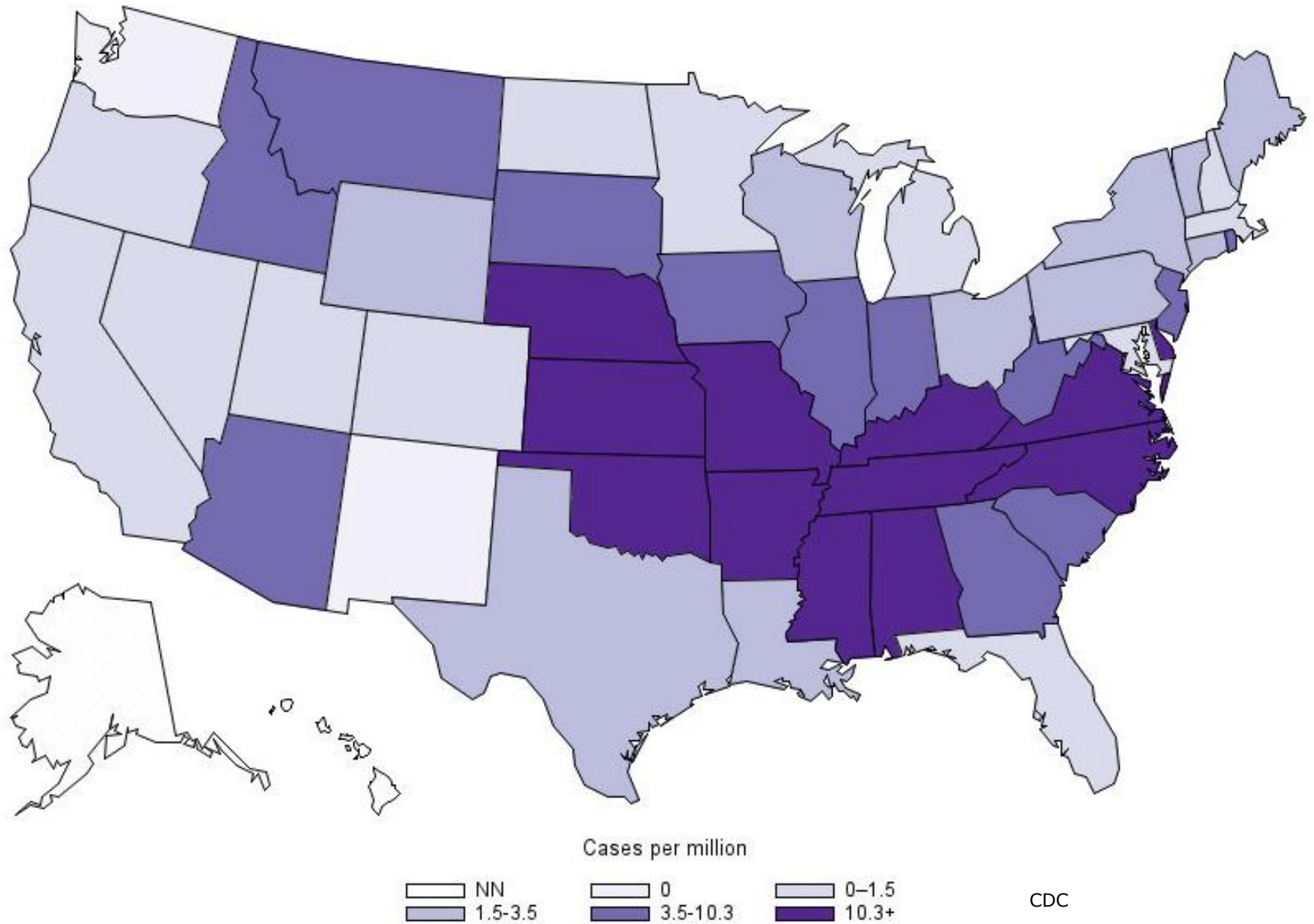
D. andersoni
(RM wood tick)



D. variabilis
(American dog tick)

KSU Parasitology

Epidemiology Figure 4 – Annual incidence (per million persons) for SFR in the United States, 2016



Rocky Mountain Spotted Fever

- Clinical Signs

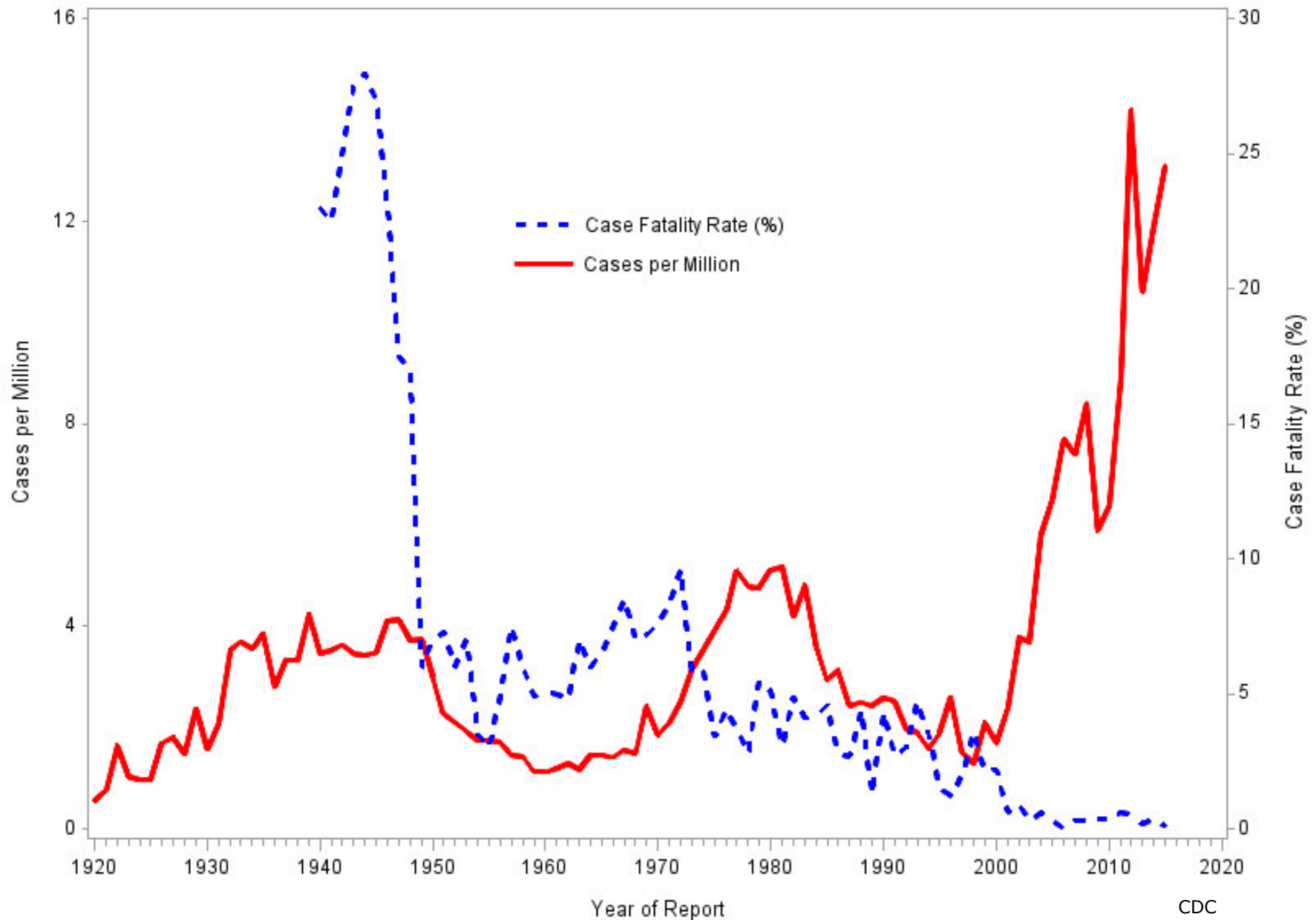
- Fever
- Headache
- Rash
- Nausea, vomiting
- Muscle pain and/or stomach pain
- Lack of appetite

- Treatment

- Antibiotics
- CAN be deadly if no treatment sought



Epidemiology Figure 2 – Reported incidence and case fatality of SFR in the United States, 1920–2015



Ehrlichiosis

- In the United States since the 1980s
- *Ehrlichia chaffeensis*, *E. ewingii*, *E. muris eauclairensis*
- 1,377 cases-2016
- 5-14 days after bite of an infected tick symptoms occur
- Lone Star Tick (*Amblyomma americanum*) and Black-Legged Tick (*Ixodes scapularis*)

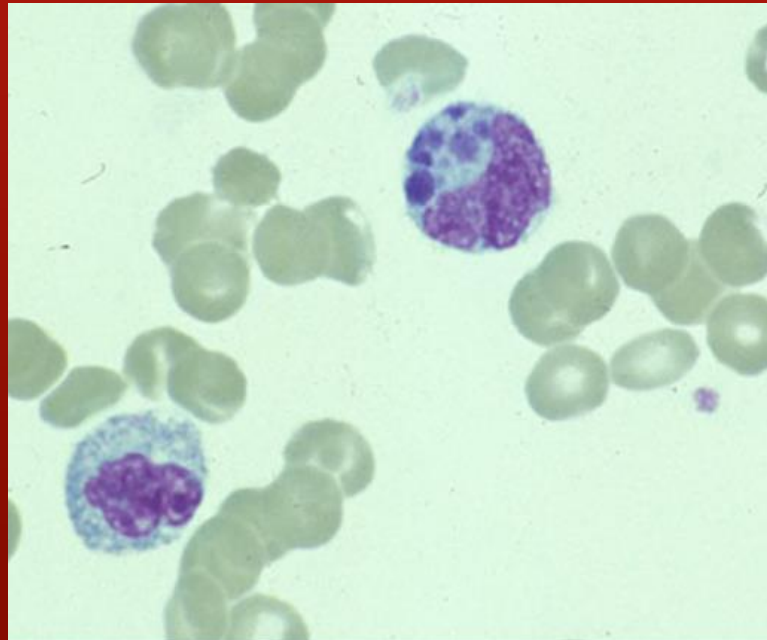
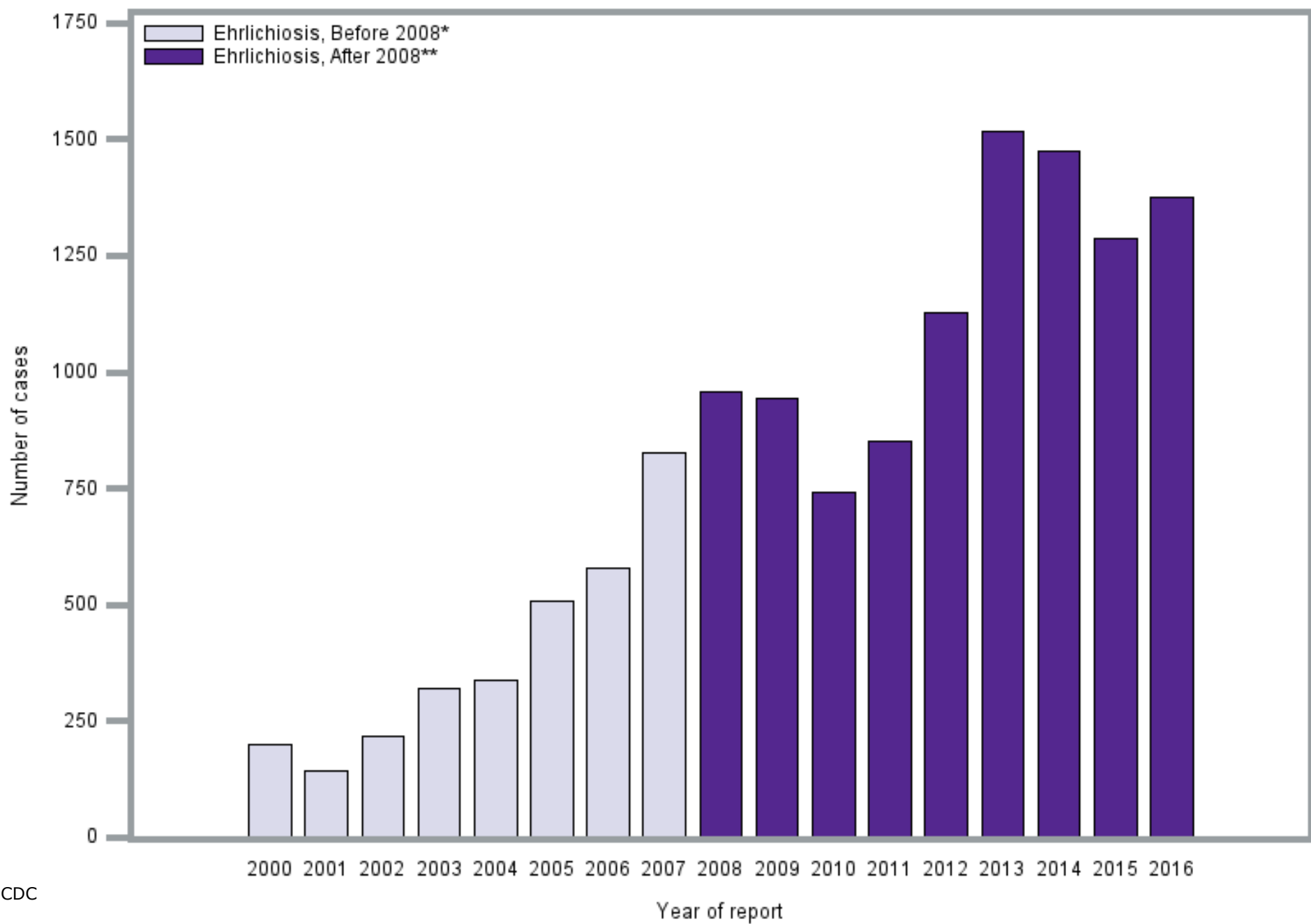


Figure 1 - Number of U.S. ehrlichiosis cases caused by *Ehrlichia chaffeensis* and reported to CDC, 2000-2016.



Ehrlichiosis

- Clinical Signs
 - Fever
 - Headache
 - Malaise
 - Gastrointestinal symptoms
 - Confusion
 - Rash
- Treatment
 - Antibiotics
 - Supportive care
 - If delayed, organ failure



Emerging Disease?

- Meat allergy from tick bites
- 2007-University of Virginia Dr. Commins, allergist
 - Hikers
 - Lone Star tick
 - Same area as Rocky Mountain Spotted fever

*Amblyomma
americanum*

Long Star
Tick

female



male



--Human Monocytic Ehrlichiosis (*Ehrlichia chaffensis*)
--*Ehrlichia ewingii*
-Tularemia (*Francisella tularensis*)
Southern Tick-Associated Rash Illness (*Borrelia lonestari*) a Lyme disease-like infection?
--Cytotoxicosis (*Cytauxzoon felis*)
--Meat allergy disease



Meat Allergy

- Allergy is from alpha gal, a sugar made in animal meat
- Red meat-Cows, pigs, lamb
- Why? 3 Theories:
 1. The tick has something in its saliva that causes the response.
 2. Residual mammalian glycoproteins or glycolipids are present in the tick from a previous mammalian blood meal. That then causes the response when the tick gets a blood meal and transfers some of those mammalian glycoproteins or glycolipids into the human.
 3. It is possible that the response is from something that has not been discovered yet, such as Rickettsia, the same bacteria that causes Rocky Mountain spotted fever.

Digging deeper...

- Journal of Allergy Clinical Immunology
 - Dr. Anthony Deutsch and Ms. Sandra Latimer
 - 1989
 - 10 cases – Athens, Georgia
 - Georgia Allergy Society and to the CDC 1991
- Length of time reaction takes
 - 3-5 hours or longer
- Dairy?
- Steaks??



Tularemia

- *Francisella tularensis*
- Infections all over United States
 - Exception: Hawaii
- Bioterrorism
- Rabbits, hares, rodents

- Transmission
 - Tick and deer fly bites
 - Skin contact with infected animals
 - Contaminated water
 - INHALATION (aerosols)



Tular

- Clinical sig
- 6 types
Fahrenh
- Ulcer
node
- Glan
- Ocul
- Orop
water
- Pneu
breath
- Typh



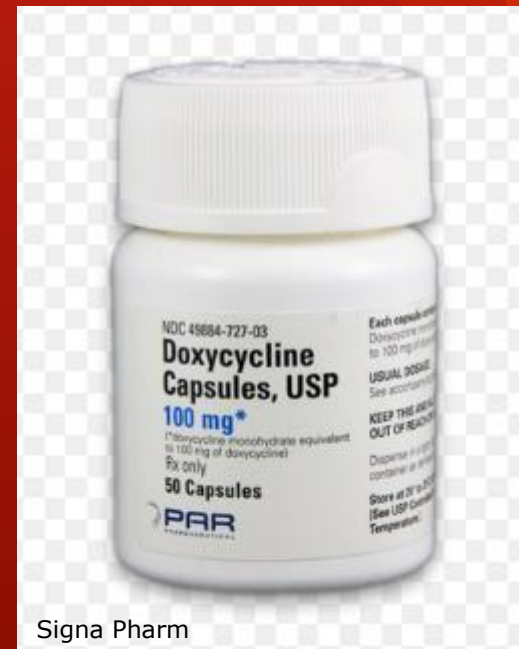
CDC

es

or

Tularemia

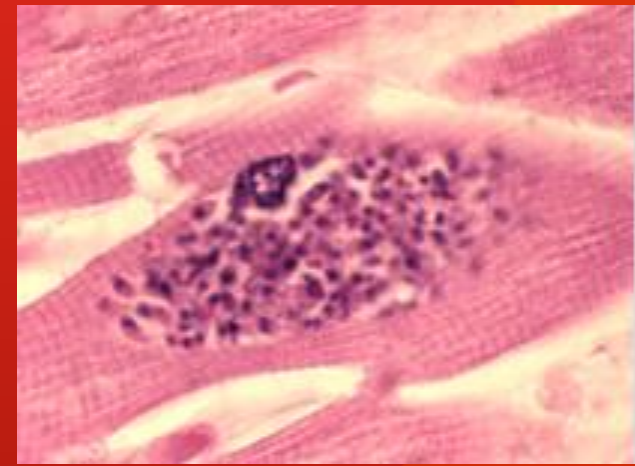
- Treatment
 - Antibiotics
 - Supportive care
 - Most completely recover



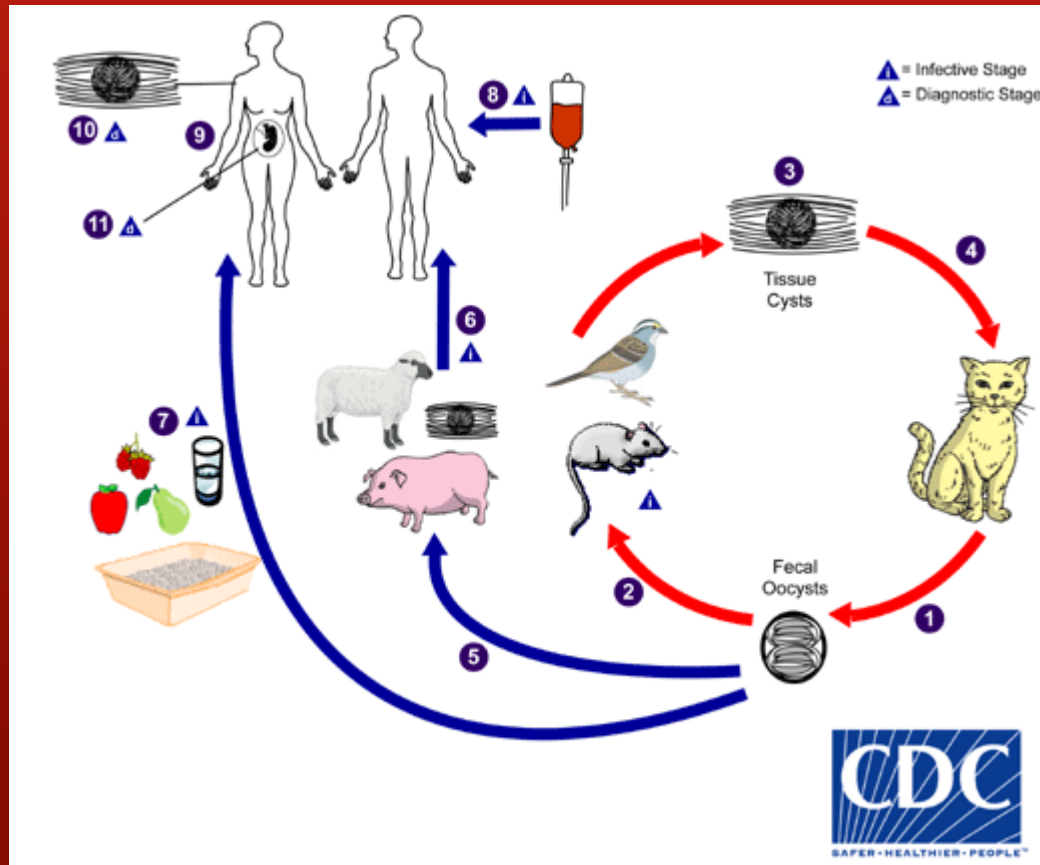
Signa Pharm

Toxoplasmosis

- *Toxoplasma gondii* – protozoan
- Cats-definitive hosts
- Warm blooded animals-paratenic hosts



CDC



Toxoplasmosis

- **One of the leading causes of death due to foodborne illness**
 - *Salmonella, Listeria, Toxoplasma*-75% of foodborne illness
 - 750 deaths
- 40 million are carriers in the United States
- CDC-One of the neglected parasitic infections in the United States
- Not routinely reported
 - CDC estimates: 4,700-12,100 persons have chronic toxoplasmosis annually

Toxoplasmosis

- Transmission:
 - Cat feces-Garden, litter box
 - Eat or drink contaminated food or water
 - Contaminated knives, cutting boards, or other utensils
 - Unwashed fruits and vegetables
 - Infected organ transplant or transfused blood



Toxoplasmosis

- Clinical signs:
 - Abortion or neonatal toxoplasmosis
 - Especially sheep, goats, humans, cats
 - 4,000 cases of congenital toxoplasmosis in United States annually
 - Uveitis
 - Necrotizing pneumonia
 - Myocarditis
 - Flu-like symptoms – Humans
- Treatment:
 - No treatment approved

Toxoplasmosis

- Prevention
 - Cook foods to a proper temperature
 - Drink treated water
 - Cover sandboxes
 - Wear gloves when gardening
 - Wash hands frequently!
 - Do not feed raw or undercooked food to cats



West Nile Virus

- Family *Flaviviridae*
- New York City-1999





West Nile virus disease cases reported to ArboNET, United States, 1999

State	Neuroinvasive disease cases*	Non-neuroinvasive disease cases	Total cases†	Deaths
New York	59	3	62	7
Total	59	3	62	7

*Includes cases reported as meningitis or encephalitis.

†Includes confirmed and probable cases.

West Nile Virus Disease Cases* and Presumptive Viremic Blood Donors by State – United States, 2017

State	Neuroinvasive Disease Cases†	Non-neuroinvasive Disease Cases	Total cases	Deaths	Presumptive Viremic Blood Donors‡
Alabama	40	20	60	2	13
Arizona	98	13	111	8	16
Arkansas	15	3	18	4	5
California	401	152	553	44	54
Colorado	29	39	68	4	4
Connecticut	2	1	3	0	0
Delaware	0	1	1	0	0
District of Columbia	1	3	4	0	0
Florida	4	1	5	0	2
Georgia	44	4	48	7	15
Idaho	16	9	25	0	7
Illinois	72	18	90	8	2
Indiana	18	8	26	4	6
Iowa	10	2	12	2	5
Kansas	12	15	27	0	4
Kentucky	9	1	10	1	0
Louisiana	38	15	53	4	4
Maryland	5	1	6	0	0
Massachusetts	5	1	6	0	1
Michigan	32	8	40	1	8
Minnesota	13	17	30	1	19
Mississippi	46	17	63	2	3
Missouri	17	2	19	1	2
Montana	3	8	11	0	3
Nebraska	19	49	68	2	18
Nevada	31	36	67	3	5
New Hampshire	0	1	1	0	0
New Jersey	6	2	8	2	0
New Mexico	23	10	33	1	2
New York	45	6	51	4	0
North Carolina	8	0	8	2	0
North Dakota	20	42	62	2	1
Ohio	23	11	34	5	8
Oklahoma	34	8	42	4	6
Oregon	3	3	6	1	2
Pennsylvania	15	5	20	3	2
Rhode Island	1	1	2	0	1
South Carolina	16	2	18	2	5
South Dakota	27	46	73	4	2
Tennessee	22	8	30	1	2
Texas	87	48	135	6	14
Utah	39	23	62	6	6
Vermont	2	1	3	0	1
Virginia	12	1	13	1	3
Washington	10	3	13	0	2
West Virginia	1	0	1	0	0
Wisconsin	47	4	51	4	13
Wyoming	4	3	7	0	0
Totals	1,425	672	2,097	146	266

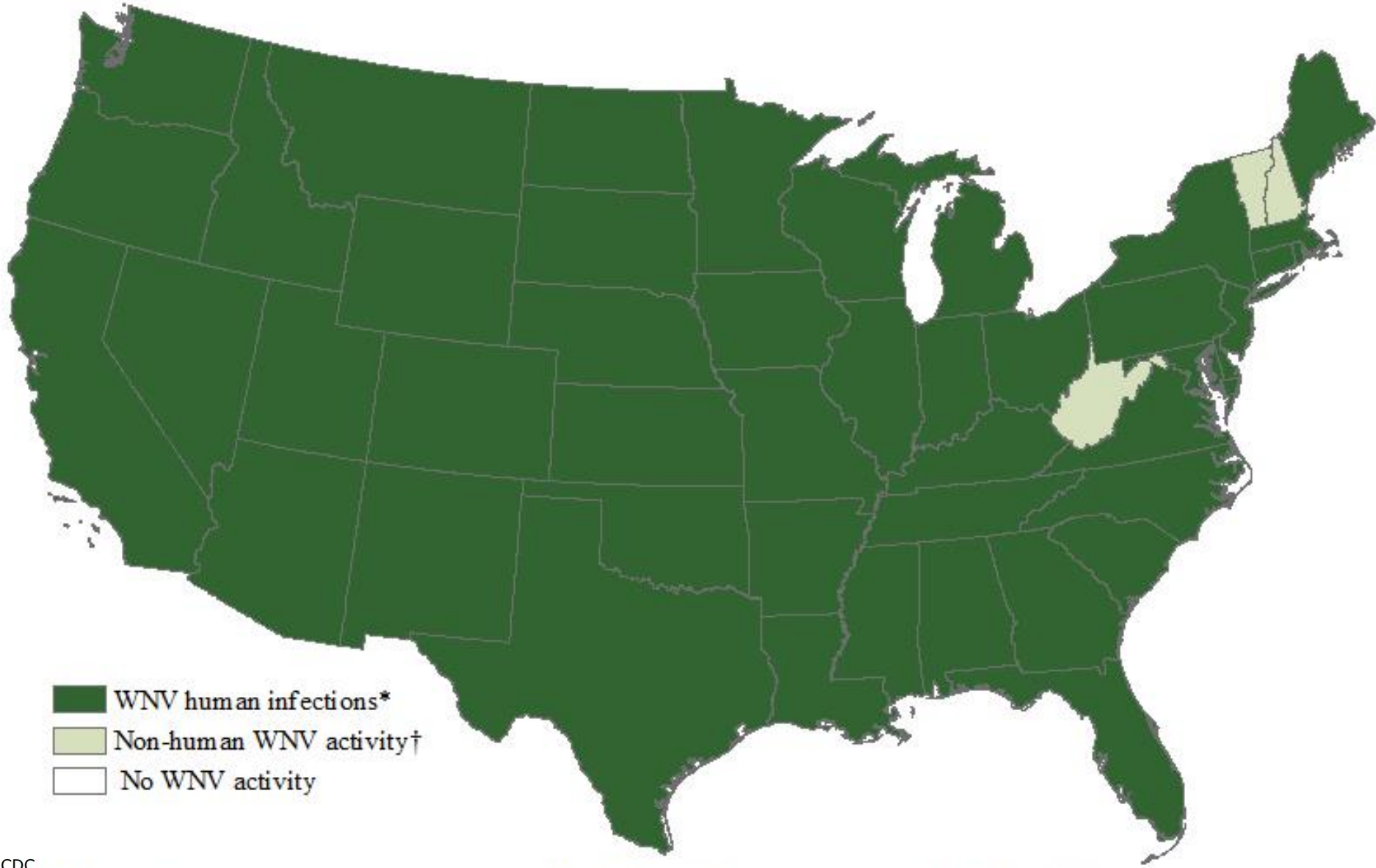
*E.g., meningitis, encephalitis, or acute flaccid paralysis

West Nile Virus

- Clinical signs:
 - High fever
 - Neck stiffness
 - Vision loss
 - Disorientation
 - No symptoms at all
- Treatment
 - Supportive care



West Nile Virus Activity by State - United States, 2018 (as of November 13, 2018)



Raccoon Roundworm



- *Baylisascaris procyonis* – parasitic roundworm
- Fecal oral transmission
- Once ingested, larva can travel to the brain, called cerebrospinal nematodiasis or neural larva migrans.



Raccoon Roundworm

- Dryden and Broce study
- Treatment
 - None once neurologic



What other diseases?

- Other diseases discussed:
 - Parvoenteritis
 - Distemper
 - Equine Protozoal Myeloencephalitis-Horses
 - White Nose Syndrome-Bats
 - Hepatitis





Appendix 1

Bats



There is a bat in my house. What should I do?

First, make sure your family and pets are away from the bat. If you need to move to a separate room, or get out of the house, do so. Next, assess the situation and call the Prairie Park Nature Center at 785-832-7980. Here are the questions they may ask you:

- Is the bat hurt?
- Is the bat healthy, but needs to find a way out of your house?

The bat I found is hurt (inside your house or on the sidewalk outside), what do I do next?

If you ever find a bat that could be hurt, contact the Prairie Park Nature Center. If the bat is able to be caught, first make sure you have thick leather gloves and a net to catch the bat. Once the bat is in the net, put it in a container that it cannot get out of but can breathe in. Take the bat to the Prairie Park Nature Center as soon as possible.

The bat I found in my house is healthy. How do I get it out?

If you have thick leather gloves and a net, it is possible for you to catch the bat to release it back into the wild. When doing so, make sure you release the bat into a tree. Bats cannot fly from the ground, they have to drop to fly so need to be released from high areas. However, it would be best to contact a professional wildlife catcher to get the bat and release it into the wild. If there was one bat in your house, it is possible there is a den in your house with more bats. The wildlife professional will be able to look into other areas of your house to see if there are more. If there are more bats they will help to get them out of your house and to seal your house to make sure more bats do not move in. If you would like suggestions on who to call to help you, call the Prairie Park Nature Center at 785-832-7980.

Should I keep a bat as a pet?

No! It is illegal for people of the public to keep wildlife as pets in their house. Bats will bite if they feel threatened. Due to the risk of rabies, if you are bitten from a bat, you will need to contact the health department and your physician to decide the next steps. They are wild animals and they belong outside.

What diseases can bats carry?

-Rabies

Rabies is a disease that can cause encephalitis (or inflammation of the brain) that is nearly 100% fatal after neurological symptoms have developed. The disease infects mammals-including humans, dogs, cats, raccoons, and skunks. Rabies virus targets the brain and viral shedding is mainly seen in the salivary glands of mammals. Only mammals can become infected with rabies. Most cases of rabies occur in wild animals, mainly bats, skunks, raccoons, coyotes, and foxes.

In 2017, Kansas had 39 positive cases of rabies according to the K-State Veterinary Diagnostic Rabies Laboratory. The positive cases in Kansas were:

[Type text]

- 3 big brown bats
- 1 hoary bat
- 2 bovines
- 3 cats
- 1 dog
- 3 horses
- 26 skunks

Since the rabies virus is concentrated in the salivary glands, there are several ways for the virus to be transmitted. The most commonly known way that the virus is transmitted is from the bite of an animal that is infected. However, if the person that comes into contact with a rabid animal has a cut on their skin, and they touch the animal with the cut on their hand rabies can infect the body. Lots of animals clean themselves, especially bats, and the saliva stays on their bodies. If a cut on a hand comes into contact with just the fur, a transmission of rabies can occur.

Rabies has also been transmitted through organ donations, contamination of mucous membranes (ex. eyes, mouth, nose), and aerosolized transmission. In animals, rabies can be transmitted through the placenta to the babies in the uterus. That means it is possible for the mother to transmit rabies to her young while they are in the womb. If the mother does not die from rabies before the babies are born, the babies will be born with the rabies virus already shedding making baby skunks not safe.

Once the rabies virus goes into the body, it travels to the nerves of the brain. There can therefore be a multitude of signs seen. Some of the signs you should watch for:

- Fearfulness
- Aggression
- Excessive drooling
- Difficulty swallowing
- Staggering
- Seizures
- Wild animals-Unusual behavior. For example, an animal that should only be seen at night may be seen in the daytime.
- Depression
- Self-mutilation
- Increased sensitivity to light

-Fleas (The Plague)

Bats can have fleas, but did you know that fleas can give your family a disease? *Yersinia pestis* is a disease that is transmitted through the bite of an infected rodent to humans, more commonly called the Plague. In March of 2017, there was a plague outbreak in Colorado. Bats might not even show signs or symptoms, but the animal may be seen scratching. Human symptoms start within 48 hours of exposure with high fever and enlarged lymph nodes. You can prevent your family from getting this disease by not approaching wildlife and making sure all of your animals are up to date on flea prevention.

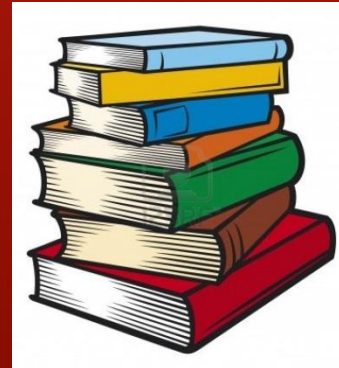
-Ticks

Bats do carry a type of tick known as a 'soft tick'. Its shell is softer than the normal tick we are used to seeing. These ticks are routinely found in houses and



What did I cover?

- How do you know if the animal needs help?
 - Rabies vs sick?
- Interesting facts/Understand the animal
 - Opossums eat 5,000 ticks per year
- Infectious and zoonotic diseases per animal
 - Bats
 - Opossums
 - Raccoons
 - Skunks
 - Squirrels
- Rabies



Prevention

- Don't feed wildlife! When you feed wildlife you are giving them a reason to live near your house, defecate near your house, and cause frequent sightings near your house.
- Make sure you cap your chimney before spring when raccoons are looking for places to put their nests.
- Wildlife are smart, they can maneuver pet doors. Make sure your pet's door is secure and is locked when you are not home. In Lawrence there have been several calls of raccoons in homes that entered through the pet door.



Prevention, cont.

- Remove outside food sources that wildlife can get to. If you have outdoor animals, make sure they are fed routinely and that their food is finished and not sitting out all day.
- Make sure all garbage cans are secured that are outside your house.
- Close off areas that are easy for wildlife to get to such as patio areas and beneath concrete steps. Wildlife will take advantage of these areas, so do not give them an option.
- Have your attic entrance correctly closed so no wildlife can enter. Professionals can help you make sure your attic is blocked shut and will check to make sure there are no holes that wildlife can enter.

Use repellents/preventatives!





Acknowledgements

- Dr. Justin Kastner
- Dr. Elyn Mulcahy
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- Barta Stevenson
- Jon Hall
- Charlsee Hall
- Marilyn Colgan
- Melissa Kalb
- Margaret Hodges
- Gina Hall
- Prairie Park Nature Center-The WHOLE team!

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Any Questions?

