



1



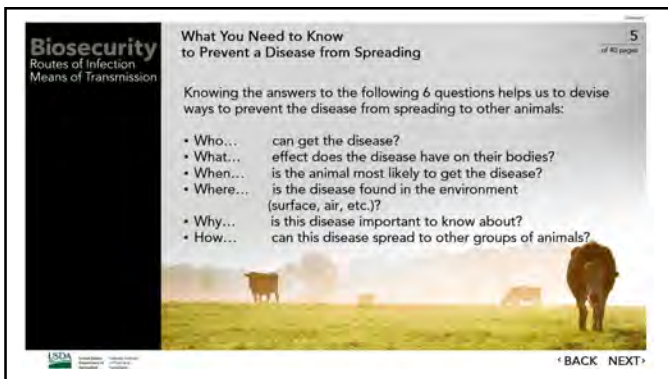
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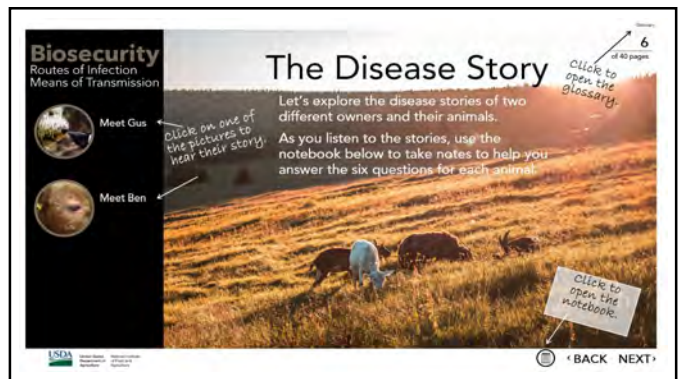
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Biosecurity
Routes of Infection
Means of Transmission

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Meet Gus

Who
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Meet Ben

MEET GUS
Rabies

Use the seek bar to control the page & audio

Use the notebook icon to open your notebook

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Meet Gus

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I let my dog "Gus" out of the house to run around and heard him yelp. I smelled something terrible and saw him being chased by a skunk. I called him back to me and we ran into the house. I was worried that the skunk was going to attack me too! Now we need to bathe Gus and tell my parents. Boy, does he stink!

My parents think the skunk had rabies, so I looked up rabies on the Center for Disease Control website... It said there are different strains of rabies virus found in different mammals in the USA, like bats, raccoons, foxes, skunks and coyotes. But all mammals can get rabies if bitten by an infected animal, including people!

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Meet Gus

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Question	Gus's Rabies Story	Answer
Who can get the disease?	mammals	All mammals, humans

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Rabies Virus

Nerve Cells

On the CDC website, it said that rabies is caused by a virus that infects nerve cells. The virus multiplies and grows inside the nerves and then travels up the nerves to the spinal cord and the brain. That means if an animal gets bitten near its head, rabies signs will occur faster than if it was bitten on a back leg because it takes more time for the virus to spread to the brain. Depending where on the body the bite occurred, it can take 4 months or more before an animal shows signs of rabies, such as unusual behavior, seizures, drooling, and trouble moving.

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Meet Gus

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Question	Gus's Rabies Story	Answer
Who can get the disease?	Mammals	All mammals, humans
What effect does it have on the body?	Neurological	infects nerve cells causing seizures, behavior changes, drooling

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Well, bad news: My parents called animal control and they killed the skunk and had it tested for rabies and it was positive! The crazy skunk must have been bitten by an infected mammal to develop what the CDC website called "the furious form of rabies". And now the skunk exposed my dog to the disease.

Rabies is deadly and there is no cure for animals. The only thing you can do is prevent animals from getting rabies by having them vaccinated. I sure hope Gus' rabies vaccination is up to date! We're calling the veterinarian to make sure.

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GUS

Question	Gus's Rabies Story	Answer
Who can get the disease?	Mammals	All mammals, humans <small>causative agent</small>
What effect does it have on the body?	Neurological	infects nerve cells causing seizures, behavior changes, drooling <small>causative agent</small>
When is the animal most susceptible?	If unvaccinated	Animals are susceptible when they're not vaccinated. <small>causative agent</small>
Where is the agent found in the environment?	Infected wildlife	Depending on the area of the US, rabies is primarily found in bats, raccoons, skunks, foxes, or coyotes. <small>causative agent</small>
How can this disease spread?	Bite wounds, saliva from infected	infected animals bite other animals <small>causative agent</small>

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Click on the images below to hear a story or view the map.

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GUS

Question	Gus's Rabies Story	Answer
Who can get the disease?	Mammals	All mammals, humans <small>causative agent</small>
What effect does it have on the body?	Neurological	infects nerve cells causing seizures, behavior changes, drooling <small>causative agent</small>
When is the animal most susceptible?	If unvaccinated	Animals are susceptible when they're not vaccinated. <small>causative agent</small>
Where is the agent found in the environment?	Infected wildlife	Depending on the area of the US, rabies is primarily found in bats, raccoons, skunks, foxes, or coyotes. <small>causative agent</small>

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I learned the main way the infection spreads to animals or humans is by contact with the saliva of an infected animal... like from a bite or even just getting saliva in an open cut or wound.

Sometimes saliva can get in your eyes, nose or mouth and you can get rabies, but not very often. Or sometimes through an organ transplant.

Whether it's a person or an animal that gets infected, make sure to wash the bite really well with soap and water for 5 minutes, and then you need to see your doctor or vet for medical help.

At the very least, try to identify the animal that bit you or your pet and tell your parents.

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GUS

Question	Gus's Rabies Story	Answer
Who can get the disease?	Mammals	All mammals, humans <small>causative agent</small>
What effect does it have on the body?	Neurological	infects nerve cells causing seizures, behavior changes, drooling <small>causative agent</small>
When is the animal most susceptible?	If unvaccinated	Animals are susceptible when they're not vaccinated. <small>causative agent</small>
Where is the agent found in the environment?	Infected wildlife	Depending on the area of the US, rabies is primarily found in bats, raccoons, skunks, foxes, or coyotes. <small>causative agent</small>
How can this disease spread?	Bite wounds, saliva from infected	infected animals bite other animals <small>causative agent</small>

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It's a good thing I didn't get bitten. If I had been I would have needed a series of shots to help my body fight off the virus.

The best protection for people is to make sure the animals close to us don't get rabies. The best way is keeping them up-to-date on their rabies vaccination. Any livestock that are in a rabies infected area should be vaccinated, too.

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Meet Gus

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Meet Ben

Question	Gus's Rabies Story	Answer
Who can get the disease?	Mammals	All mammals, humans <i>compare</i>
What effect does it have on the body?	Neurological	Infects nerve cells causing seizures, behavior changes, drooping <i>compare</i>
When is the animal most susceptible?	If unvaccinated	Animals are susceptible when they're not vaccinated. <i>compare</i>
Where is the agent found in the environment?	Infected wildlife	Depending on the area of the US, rabies is primarily found in bats, raccoons, skunks, foxes, or coyotes. <i>compare</i>
How can this disease spread?	Bite wounds, saliva from infected	Infected animals bite other animals. <i>compare</i>
Why is this disease important?	People and animals die if bitten and unvaccinated	When animals or people are exposed to the rabies virus, they will die if not protected by a vaccine. <i>compare</i>

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MEET BEN
Ringworm

Use the seekbar to control the page & audio

Use the notebook icon to open your notebook

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Meet Gus

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I had a steer that I had raised to take to the state fair. A couple of weeks before the show, I put him in his own stall in our old barn so I could give him special hay and steer grain, and get him ready to show. The day before the show I went to give him a bath and I found patches of skin on his head and neck where he had no hair and his skin was kind of gray and flaky. My parents told me to call our veterinarian. It turns out my steer had ringworm, a fungus that any mammal - including humans - can get.

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Meet Gus

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Question	Ben's Ringworm Story	Answer
Who can get the disease?	any mammals	All mammals, humans <i>compare</i>
What effect does it have on the body?		
When is the animal most susceptible?		
Where is the agent found in the environment?		
How can this disease spread?		
Why is this disease important?		

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Meet Gus

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Ringworm likes moist areas such as in the folds of skin, but they can grow anywhere. The fungus uses skin and hair and nails as food, which is why animals get bald patches. And it can get in the skin, which is irritating and can cause itching. If the animal scratches a lot the skin can break or get cuts in it and then THAT can get infected. What a mess!

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Meet Gus

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The vet says that moving the steer into a new place and all alone could've stressed him out and made it harder for him to fight off the fungus infection.

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Meet Gus

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The vet told me the fungus can be on almost anything: other animals, the soil, equipment, walls, dirt floors, and especially where there are lots of rocks and crevices – places that are hard to clean. That's why it's better to use metal parts in buildings instead of wood.

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Meet Gus

Meet Ben

Who
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My steer could've gotten the ringworm fungus from contaminated soil outside or from wood in the old barn. Or he could've gotten it from another animal, but I don't know of any others that have it... so far.

Our vet said that sunshine seems to keep the fungus under control. Also keeping everything clean and disinfected, and not sharing grooming tools...and don't stress the animals, especially the young ones!

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Meet Gus

Meet Ben

Who
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I could've gotten ringworm too! Just by touching and petting my steer, especially when I was feeling the skin patches. But I made sure that I washed my hands really well and after that I wore gloves when I groomed him until he was all cleared up. But I made sure I disinfected his grooming tools every day and I didn't use them on any other animals. We also kept my steer away from the other animals.

My dad and I tried to clean and disinfect the old barn, but it's hard because everything is made of old wood. We're worried that any animal we put in there could get ringworm and spread it to all the other animals, so my dad decided to use it for our machine shed and storage from now on.

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Meet Gus

Meet Ben

Who
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Question	Ben's Ringworm Story	Answer
Who can get the disease?	any animals	All mammals, humans
What effect does it have on the body?	gets into the skin	The fungus infects skin causing bald spots, itching, and more infections.
When is the animal most susceptible?	when they are stressed or real young	Animals are susceptible when they're stressed or weak.
Where is the agent found in the environment?	wood, dirt anywhere hard to clean	The ringworm fungus can be found on other animals, in the soil, on equipment, walls, and especially wood.
How can the disease spread?	animal to animal or from the environment	Animals can get infected by contact with the fungus on infected animals or equipment.
Why is this disease important?	people can get it from animals	Animals with ringworm can be refused entry to a show. Also, humans can catch it.

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Meet Gus

Meet Ben

Who
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Review the notes

Question	Gus's Rabies Story	Ben's Ringworm Story
Who can get the disease?	All mammals, humans	All mammals, humans
What effect does it have on the body?	infects nerve cells causing seizures, behavior changes, drooling	The fungus infects skin causing bald spots, itching, and more infections.
When is the animal most susceptible?	Animals are susceptible when they're not vaccinated.	Animals are susceptible when they're stressed or weak.
Where is the agent found in the environment?	Depending on the area of the US, rabies is primarily found in bats, raccoons, skunks, foxes or coyotes.	The ringworm fungus can be found on other animals, in the soil, on equipment, walls, & especially wood.
How can this disease spread?	Infected animals bite other animals.	Animals can get infected by contact with the fungus on infected animals or equipment.
Why is this disease important?	When animals or people are exposed to the rabies virus they will die if not protected by a vaccine.	Animals with ringworm can be refused entry to a show. Also, humans can catch it.

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Meet Gus

Meet Ben

Who
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Explore the 5 Routes of Infection

There are 5 ways animals can contract a disease. We call this the "5 Routes of Infection". Roll over each picture to learn more. You must explore all 5 before moving forward in the module.

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Routes of Infection

What routes of infection were used for Ben and Gus?

Gus Submit

Ben Submit

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Consider these situations and click on the correct answer in the pie chart.

A calf got Johne's Disease by nursing from an infected mother.

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Consider these situations and click on the correct answer in the pie chart.

A baby lamb got scrapie by coming in contact with fluids and tissues from the uterus after birth.

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Consider these situations and click on the correct answer in the pie chart.

A young goat kept in a wood pen in an old barn got ringworm.

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Consider these situations and click on the correct answer in the pie chart.

Thin cattle on pasture seen breathing hard suddenly died. Tests show the cows died from pneumonia caused by a fungus called aspergillus.

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Consider these situations and click on the correct answer in the pie chart.

Some calves were born with cloudy eyes two months after new cows were added to the herd. One of the cows was later found to be infected with Bovine Viral Diarrhea (BVD).

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Means of transmission

Routes of infection are the ways diseases get into the body.
But how are diseases spread among animals and between animals and people?



We call this "means of transmission".

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Means of transmission

Remember Gus and Ben?
How did each get their disease? Can it spread to other animals?

CLICK ON EACH PICTURE TO FIND THE REST OF THE STORY



Gus Ben

USDA United States Department of Agriculture

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Means of transmission

How are diseases spread between animals?

Click on each picture to find out

Direct Contact Indirect Contact



Livestock Wildlife Vector Fomite

USDA United States Department of Agriculture

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Means of transmission

Match the examples on the left with the type of transmission on the right.
Check the glossary for more information about each disease.

Ringworm		Direct
Toxoplasmosis		Wildlife Direct
Bluetongue		Wildlife Indirect
Rabies		Vector
Soremouth		Fomite

USDA United States Department of Agriculture

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Click on each term to hear its pronunciation and view its disease story.
Drag each disease story on the bottom to the correct means of transmission in the chart and select submit.

Direct Contact		Indirect Contact		
Livestock	Wildlife	Vector	Fomite	
<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid gray; width: 150px; height: 100px;"></div> <div style="border: 1px solid gray; width: 150px; height: 100px;"></div> <div style="border: 1px solid gray; width: 150px; height: 100px;"></div> <div style="border: 1px solid gray; width: 150px; height: 100px;"></div> <div style="border: 1px solid gray; width: 150px; height: 100px;"></div> </div>				

Rabies Leptospirosis Ringworm Porcine Epidemic Diarrhea Caseous Lymphadenitis
Scrapie Toxoplasmosis Bluetongue

USDA United States Department of Agriculture

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Means of transmission

Rabies: Where I live rabies is commonly found in raccoons and bats. These infected animals can bite our cattle. That's why our veterinarian vaccinates our herd every year to protect them.

USDA United States Department of Agriculture

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Routes of Infection
Means of Transmission

Let's Review
Can you identify the Routes of Infection?
Below are some of the terms you have learned today. Drag the terms that describe routes of infection and put them in the box on the left. Drag all other terms to the box on the right.

Routes of Infection

Not a Route of Infection

Rabies

Inhalation

Breaks in skin

Ingestion

Mucous Membranes

Fomite

Vector

In Utero

Indirect Contact

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Routes of Infection
Means of Transmission

Let's Review
Can you explain, in your own words, the different Means of Transmission?

Term	Your Explanation	Compare
<i>Direct:</i>	type your definition here	
• wildlife:	type your definition here	
<i>Indirect:</i>	type your definition here	
• wildlife:	type your definition here	
• vector:	type your definition here	
• fomite:	type your definition here	

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Biosecurity
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Means of Transmission

Summary
Routes of Transmission
(You can print the summary using the print button in the navigation bar on the bottom of your screen.)

Ingestion: By mouth
An animal or person can get sick by eating food, drink, or putting something in their mouth, like a finger or object, that carries the disease agent.

Inhalation: Breathe in
Some disease agents can be in the air that an animal or person breathes and then gets into the lungs and causes disease.

Breaks in skin:
One of the skin's main functions is to act as a barrier to keep out infections. But if there is a break in the skin, like a cut or a bite, some disease agents can get in to cause infection.

Mucous membranes:
Most membranes that line our eyes and all body cavities are open to the exterior, such as respiratory, digestive, urinary and reproductive tracks. Disease agents can get absorbed by the mucous membrane to cause infections.

In Utero:
Disease agents can infect a fetus while it's in its mother's uterus before being born.

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Means of Transmission

Summary
Means of Transmission

Direct Contact

Licksnuck Whistle Vectors Ticksnuck

Indirect Contact

Fomites

Direct contact:
Animal-to-animal contact

Indirect:
Contact with things or animals that carry the disease but are not infected

Wildlife:
Can be direct (bites, touching, licking, breathing) or indirect such as ingesting feed or water contaminated with wildlife droppings

Vector:
Insects and ticks that carry disease agents from animal to animal

Fomite:
Objects that carry disease agents

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PROTECTING HERD HEALTH

National Research Biotechnology Extension Program

Biosecurity
Routes of Infection
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Certificate of Completion

type your name here

Signature _____

type leader, parent, or guardian name here

Date _____

type date here

This certificate is a government form supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, contract grant number 2015-08006-00009.

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Biosecurity Credits
Routes of Infection
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VOCABULARY NOTES

My Term	My Definition
type your term here	type your definition here
type your term here	type your definition here
type your term here	type your definition here
type your term here	type your definition here
type your term here	type your definition here
type your term here	type your definition here
type your term here	type your definition here

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Create your own list of words and definitions.

VOCABULARY NOTES

My Notes

use this space to keep notes of things you think are important or want to learn more about.

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