

# What is Chronic Wasting Disease?

---

## CWD Transmission and Progression

Minnesota Center for Prion Research and Outreach  
Illustrations by Pa Gar Vang



MINNESOTA CENTER FOR  
PRION RESEARCH AND OUTREACH  
UNIVERSITY OF MINNESOTA  
**Driven to Discover®**

This book provides information on the basic understanding of chronic wasting disease, a prion disease of the animals in the deer family, and is produced through the **Minnesota Center for Prion Research and Outreach**, a part of the University of Minnesota College of Veterinary Medicine.

---

## Glossary

**Bacteria** – small organisms found in many different environments, which sometimes cause disease in humans and animals. (page 8)

**Bovine spongiform encephalopathy** – a similar disease to CWD but it affects cows. It is also known as “mad cow disease.” (page 7)

**Brain** – the organ that controls the body’s functions. In CWD, the disease traveling to the brain leads to the animal’s death. (page 3, 6, 19, 24)

**Cervid** – a family of animals that includes deer, moose, elk, caribou, and reindeer. (page 6, 9)

**Creutzfeldt-Jakob disease** – a very rare disease that is similar to CWD, but affects humans. (page 7)

**Esophagus** – the tube that connects the mouth to the stomach. (page 3, 14)

**Fatal** – deadly (page 6)

**Ingesting** – taking into the body through the mouth or nose. Animals may become infected by CWD through eating, drinking, or breathing in CWD prions. (page 12)

**Intestines** – organs that transfer food from the stomach, break the food down into waste and nutrients, and move waste outside the body. (page 15, 18)

**Lymph nodes** – small glands that are part of the immune system. They can become swollen with infection and are a location where CWD prions accumulate. (page 3, 18)

**Mouth** – where CWD might enter an animal’s body when it eats infected grass, drinks infected water, or licks or grooms an infected deer. (page 3)

**Nerve** – a bundle of fibers that carries sensations from the body to the brain. They are pathways for CWD to travel through the body and to the spinal cord and brain. (page 3, 18)

**Prion** – small particles that normally exist in humans and animals. Prions can become unhealthy and cause disease such as CWD. (page 2, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26)

**Protein** – a structure in human and animal bodies that interact with cells for communication, transport of helpful and harmful molecules, and cellular structure. (page 8)

**Scrapie** – a similar disease to CWD but it affects sheep and goats. (page 7)

**Spinal cord** – a collection of nerves that runs between the brain and body that is protected by the bony spinal column. It is a direct pathway for CWD prions to travel from the body to the brain. (page 3, 18)

**Stomach** – the organ that stores food and begins the digestion process of breaking down food before it enters the intestines. In CWD transmission, the disease may enter an animal’s stomach and then spread throughout the body. (page 3, 15)

**Transmissible spongiform encephalopathies (TSEs)** – A family of diseases, also called “prion diseases.” These include diseases that impact various animals and humans.

**Virus** – small particles that may cause disease inside humans or animals. (page 8)

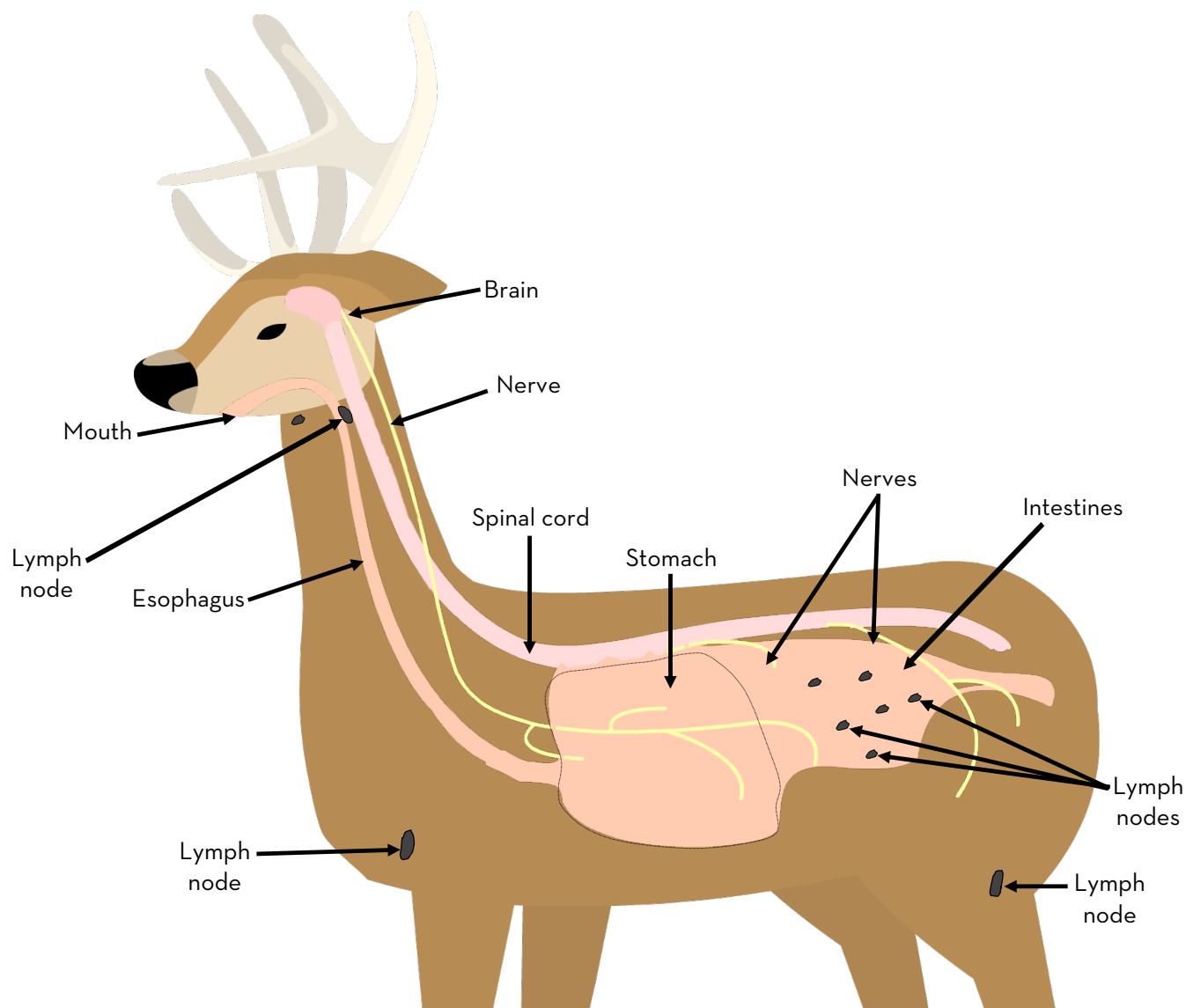
# What is Chronic Wasting Disease (CWD)?


---

## CWD Transmission and Progression

### Deer anatomy


CWD affects certain parts of an infected animal's body. Understanding the basic anatomy of a deer is important to grasping how CWD impacts and travels throughout a deer's body.





You may have heard of chronic wasting disease or CWD affecting deer within your community.

Or perhaps you and your family have been asked to submit samples for testing and to consider the results of the test before eating deer meat.

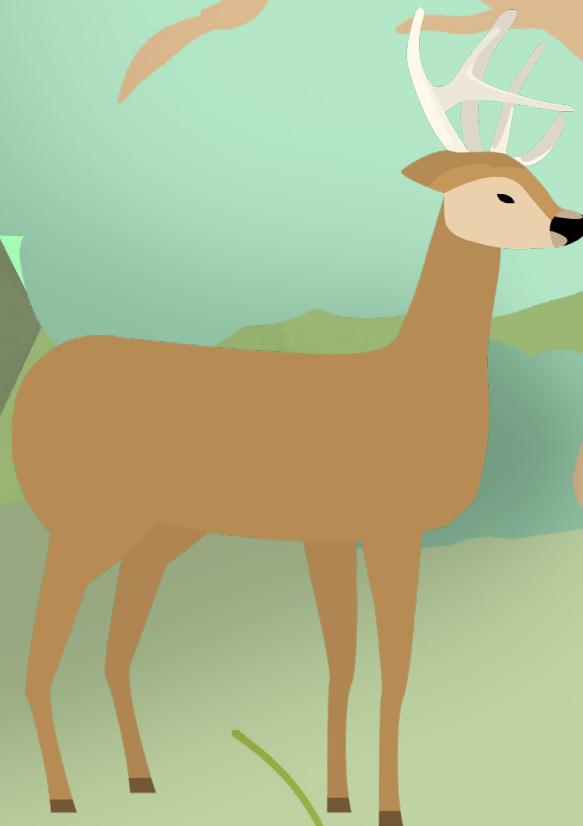


But what is chronic wasting disease?


And how does it spread?

Chronic wasting disease (CWD) is a contagious, always-fatal brain disease affecting animals in the cervid family.

Wild and farmed deer, moose, elk, caribou, and reindeer are all cervids.



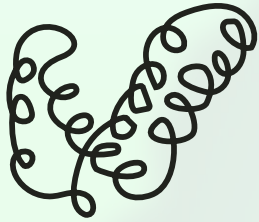


A stylized illustration of a landscape. In the foreground, a brown deer with a small white star on its head is grazing on a patch of orange grass. To the left, there is a green bush and some white flowers. In the background, there are green mountains and a body of water under a light blue sky.

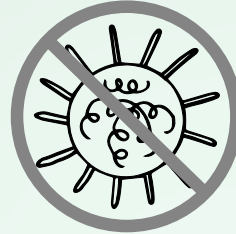
CWD belongs to a family of diseases called prion diseases or transmissible spongiform encephalopathies (TSEs).

Other TSEs include bovine spongiform encephalopathy (mad cow disease) in cattle, scrapie in sheep and goats, and Creutzfeldt-Jakob disease in humans.

Prions are a type of protein. They are not a virus or bacteria.



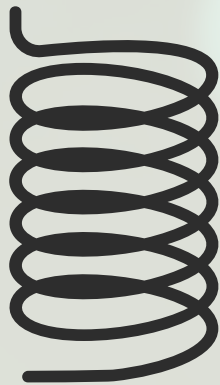
Protein



Virus



Bacteria



Healthy prions are found lining the cells of healthy animals and humans.

Prions may be pictured like metal springs because prions can easily change shape, similar to how springs can stretch and move.



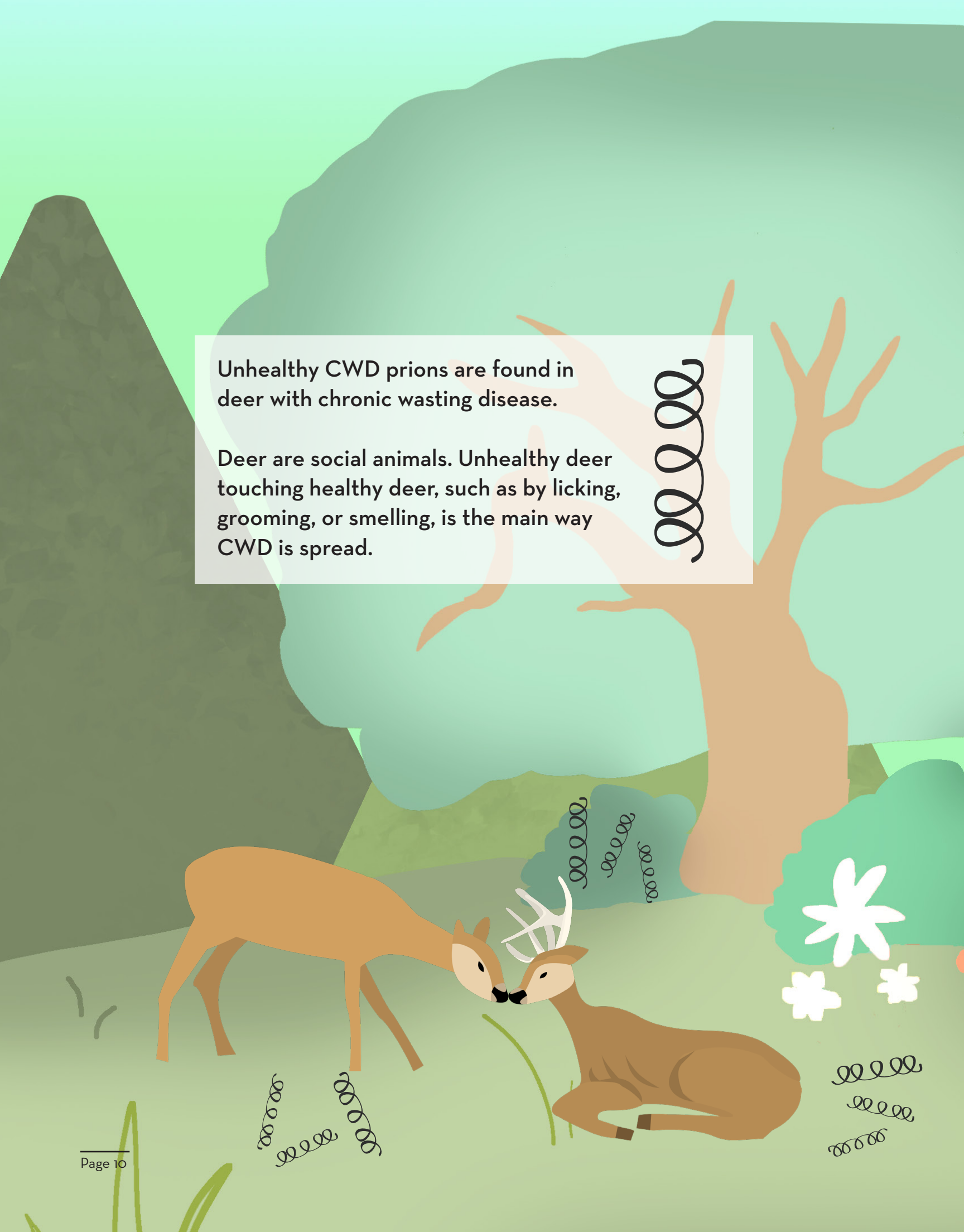
However, if part of a spring bends or overstretches, the spring can't stretch and bounce back to its original shape.

Something similar happens to CWD prions. They become misfolded or tangled, and can no longer function normally.




When CWD prions get stretched and bent, they can tangle with other prions.

When CWD prions touch healthy prions, they cause the healthy prions to misfold and tangle, too. This is how the disease spreads inside the deer's body.




Unhealthy CWD prions are found in deer with chronic wasting disease.

Deer are social animals. Unhealthy deer touching healthy deer, such as by licking, grooming, or smelling, is the main way CWD is spread.




These prions can also be transmitted into the environment—such as soil, food, and water—through feces, urine, and other bodily fluids of an unhealthy deer.

Once the prions are in the environment, they can remain for years. During this time, they can be spread around the environment.

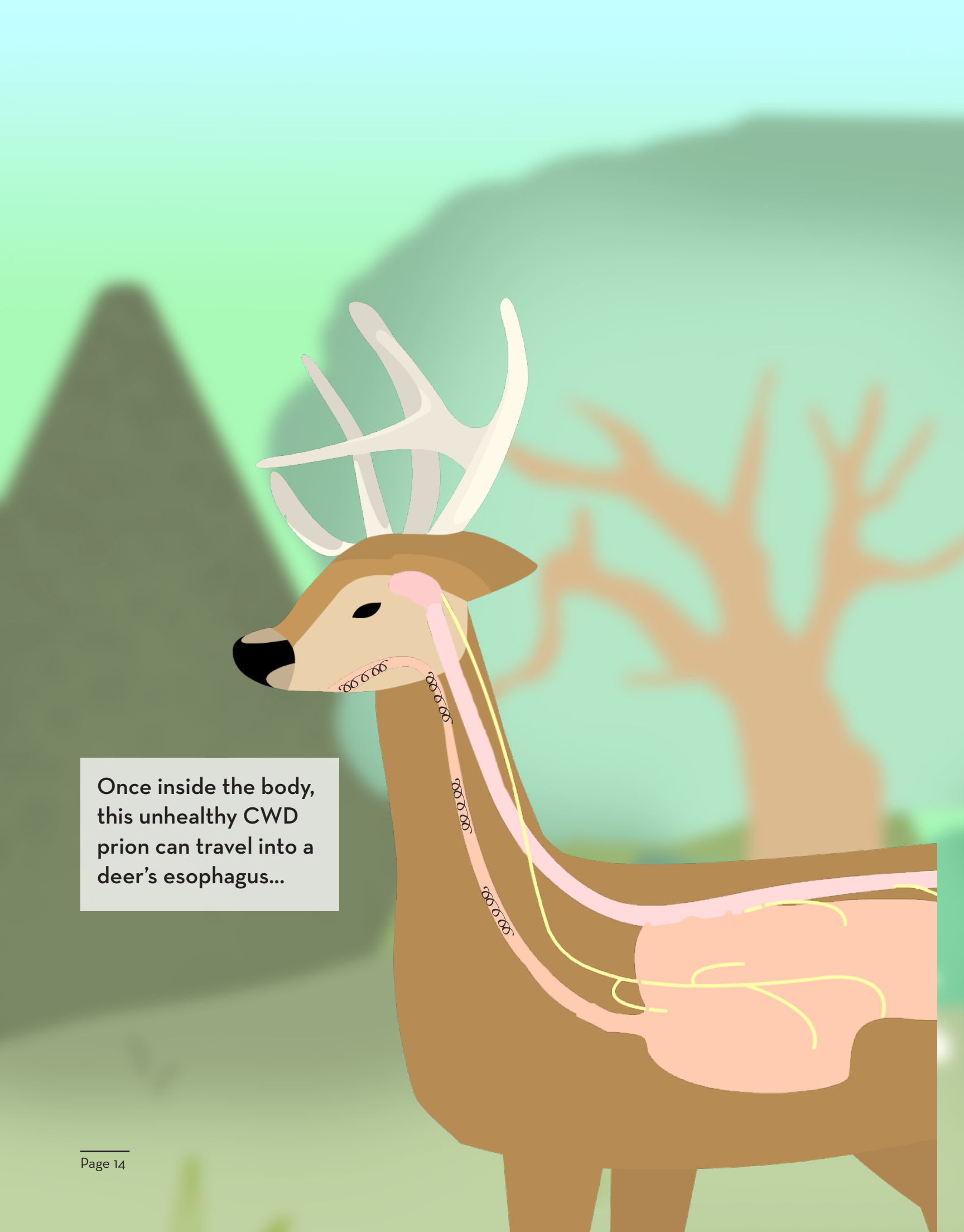
The background is a stylized illustration of a forest. On the left, a dark brown, textured hill rises. In the center, a large tree with a thick orange trunk and a large, rounded, light green canopy stands. To the right of the tree, there are smaller green bushes and two white, stylized flowers. The ground is a mix of light green and brown patches. Scattered on the ground are several black, wavy, spiral-shaped lines representing prions. One cluster of three is near the base of the tree, and another cluster of two is in the lower left foreground.

Another way CWD can spread to deer is through a deer ingesting these unhealthy CWD prions from their environment.

An illustration of a brown deer with white antlers and a pink star on its ear, grazing on a patch of orange grass. The grass is marked with several black squiggly lines representing CWD prions. The background features a green mountain, a blue sky, and some white flowers.

For example, a healthy deer can be exposed to the unhealthy CWD prions by eating grass that contains the unhealthy CWD prions.






Once inside the body,  
this unhealthy CWD  
prion can travel into a  
deer's esophagus...



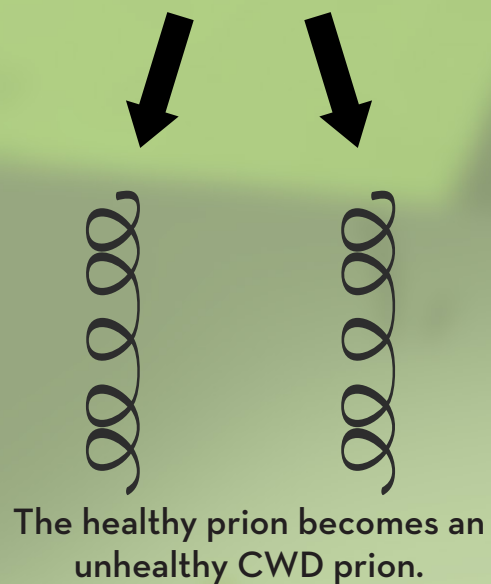
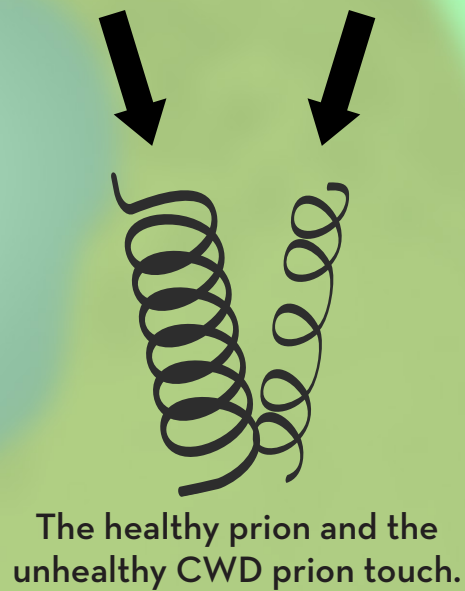
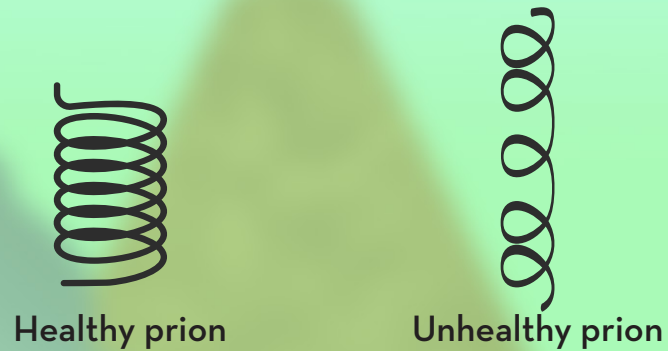


...and then into its stomach and intestines.

A stylized illustration of a brown deer with large antlers. A pink line representing the digestive tract runs from the mouth down to the stomach. A yellow line representing the nervous system runs from the brain down the spine. Black squiggly lines representing prions are shown in the mouth, along the pink digestive tract, and inside the stomach. A text box in the upper right explains that unhealthy CWD prions come into contact with healthy prions within the body.

Unhealthy CWD prions come into contact with healthy prions within the body.

This physical contact can cause the healthy prion to change shape and become an unhealthy CWD prion, resulting in more unhealthy CWD prions.

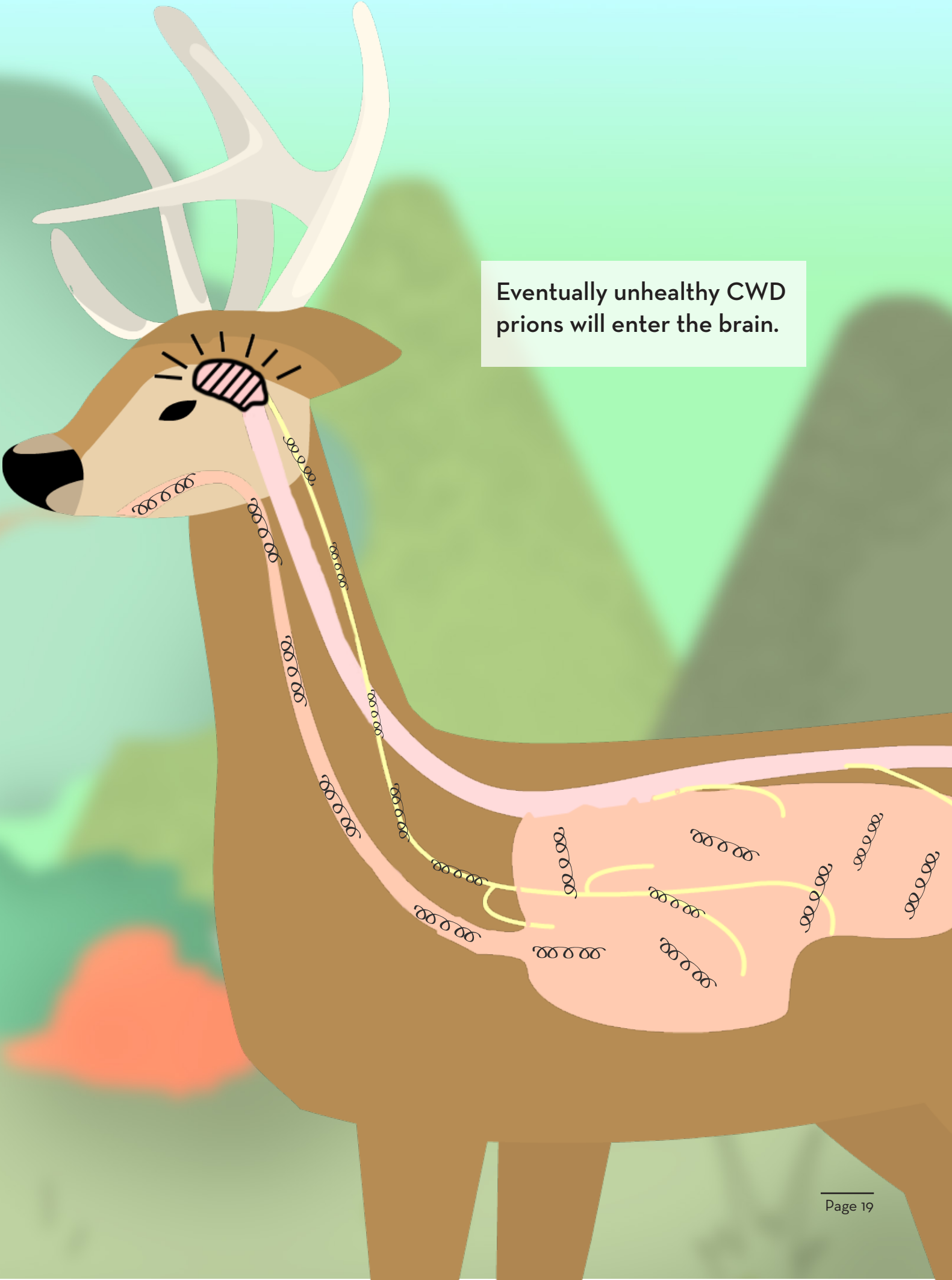


Unhealthy CWD prions continue to multiply in and throughout the body of a deer.


These prions can spread from the intestines to the lymph nodes and nerves traveling up the spinal cord.



Eventually unhealthy CWD prions will enter the brain.







An illustration of a brown deer with white antlers and a bright orange-red mane, lying down in a forest. The background features a large tree with orange-brown foliage on the left and a green, textured tree on the right. The ground is greyish-green with some orange and yellow leaves scattered around. A semi-transparent white text box is positioned in the upper-middle part of the image.

It takes time for the unhealthy CWD prions to build up in the body. As the disease progresses, the animal begins to show more signs of being unhealthy.






The most common sign of CWD is weight loss. You may see deer that appear very skinny.

The background of the page is a stylized illustration. On the left, there is a dark green, triangular mountain. To its right is a large tree with a brown trunk and a full, rounded canopy of light pink flowers. The ground is a mix of green and brown patches, representing grass and soil. Several stylized flowers are scattered across the ground: a large white flower with eight petals on the left, and a cluster of smaller pink and white flowers on the right near the base of the tree. The sky is a solid light green color.

Throughout the entire time the unhealthy CWD prions are spreading through the animal's body, it is also shedding those infectious prions into the environment and to other animals they encounter.

Remember, a deer with CWD mainly passes the CWD prions to a healthy deer through direct social contact.



These CWD prions can also enter into the environment through the unhealthy deer's bodily fluids, and even antler velvet.

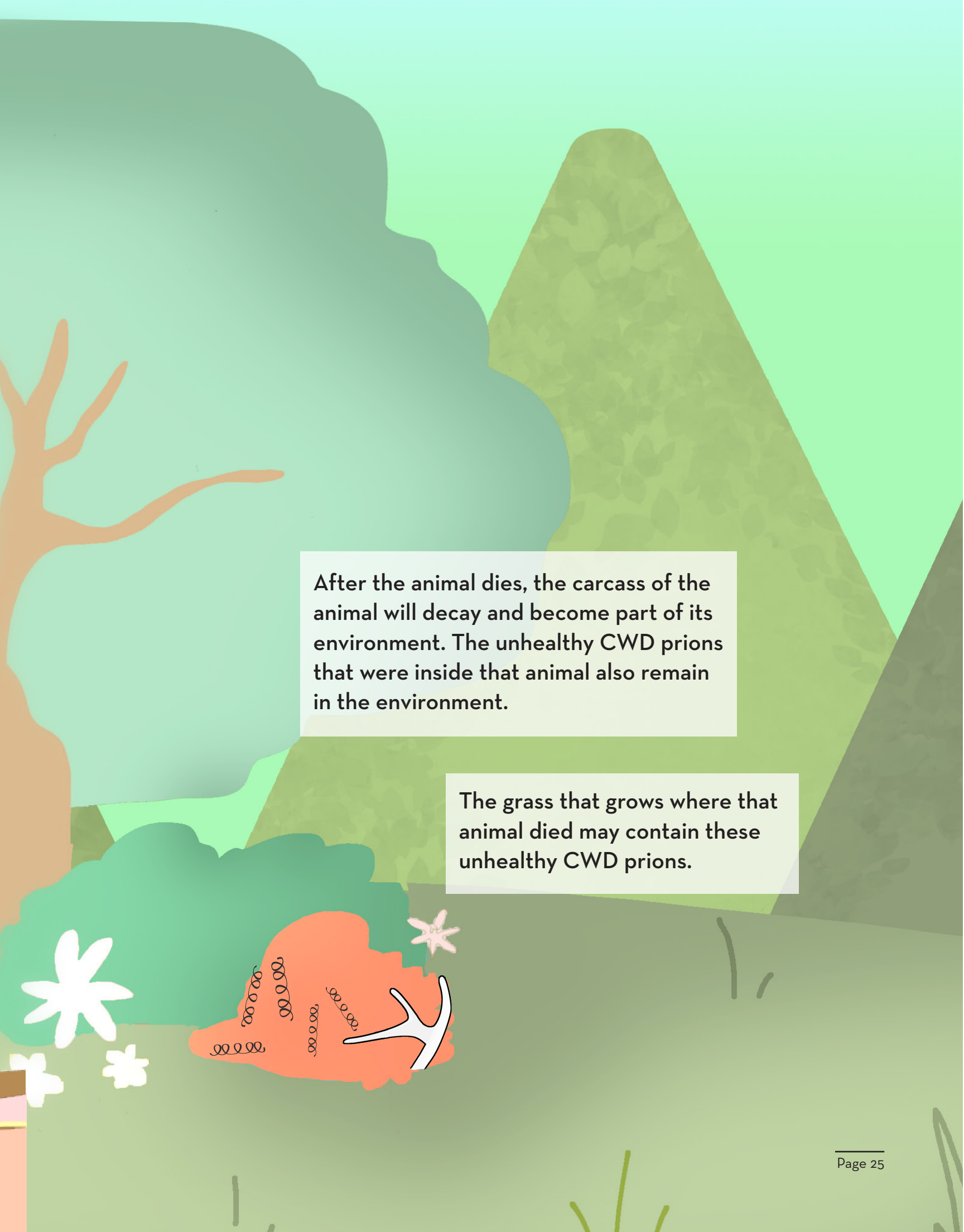
The CWD prions remain in soil, food, and water, even after the deer passes away.

The whole process from infection to death can take a very long time – up to two years.



During the process, unhealthy CWD prions continue to accumulate throughout the body and multiply to damaging levels in the brain.


This eventually leads to the animal's death.



After the animal dies, the carcass of the animal will decay and become part of its environment. The unhealthy CWD prions that were inside that animal also remain in the environment.


The grass that grows where that animal died may contain these unhealthy CWD prions.





In time, another animal will be exposed to the environment where the first deer left unhealthy CWD prions.





This deer will eat that same grass,  
which may become a source for  
another CWD infection.

And in time, the infection cycle  
continues.

# What is Chronic Wasting Disease?

## CWD Transmission and Progression

This book provides information on the basic understanding of chronic wasting disease, a prion disease of the animals in the deer family. This book has been produced through the Minnesota Center for Prion Research and Outreach and the Center for Animal Health and Food Safety at the University of Minnesota.

### AUTHORS

The Minnesota Center for Prion Research and Outreach (MNPRO) is a multi-disciplinary center at the University of Minnesota focusing on the biology and epidemiology of human and animal prion diseases and related human protein-misfolding disorders. [mnpro.umn.edu](http://mnpro.umn.edu)

### BOOK DESIGN AND DEVELOPMENT

The Center for Animal Health and Food Safety (CAHFS) is a service unit for veterinary public health at the U of M, working to build animal health capacity by facilitating collaborative research, responding to animal diseases, and delivering relevant outreach. [cahfs.umn.edu](http://cahfs.umn.edu)

### ILLUSTRATION DESIGN

Pa Gar Vang is an aspiring web designer and graphic design student at the University of Minnesota-Twin Cities. She is presently interning at Target as a product design intern where she assists product designers with product mockups, visual line plans, and market research. She is also part of Genesys Works Talent Development Pipeline. [linkedin.com/in/pagarvang](https://www.linkedin.com/in/pagarvang)



COLLEGE OF  
**VETERINARY MEDICINE**

UNIVERSITY OF MINNESOTA  
**Driven to Discover®**