Livestock Challenge: Ruminants!

How many stomachs do cattle, sheep and goats have? These animals have an amazing stomach system that converts forages into milk and meat!

The rumen houses a thriving microbe system (bacteria, protozoa, fungi) that digest forages (hay, haylage, corn silage) and concentrates (pellets, corn meal, distillers grains) into cow-usable nutrition. The balance of feedstuffs, the order or combination of feeds creates a healthy rumen and ruminant!

Learn all about what a ruminant is, the different parts of the digestive system and function of each stomach chamber while building a rumen in your own kitchen!

Starting Out

- Learn about the four sections of the stomach (rumen, reticulum, omasum, abomasum).
- Learn how they work together to help an animal digest their food.
- Take a look at what each section looks like and where it sits in the animal.

Learning More

- Know the functions of each chamber of the stomach.
- Study how food moves through the different chambers.
- Learn the difference between feed types (roughage/forages vs. concentrate).

Expanding Horizons

- Learn how enzymes play a role in digestion.
- Learn about the VFA (Volatile Fatty Acids) and the role they play in digestion.
- Learn how to build a feed ration for my project animal.

Inspire Kids to Do

Skill Building

- Learn about ruminants and their unique digestive system.
- Understand the importance of livestock feeding order.

Goals

- Learn the basic parts of the rumen and how they work to provide nutrition to the animal.

Project Ideas

- Collect samples of manure; screen manure to look for: feed breakdown; particle passage going through the animal that isn't digested; efficiency of digestive system.
- Study Fistulation — watch a video to understand the real life digestive system.

Self-Evaluation Before

Using the rating scale below, answer the following:

1 = not at all
2 = a little
3 = a lot

I know …

What a ruminant is..... 1 - 2 - 3

The different parts of the digestive system ..... 1 - 2 - 3

The function of each stomach chamber..... 1 - 2 - 3

The difference between feed types..... 1 - 2 - 3

The correct terminology for the ruminant digestive system .. 1 - 2 - 3

Livestock Challenge: Ruminants!

Challenge Instructions

- Review flash cards for key ruminant terms with photos.
- Take a look at the ruminant digestive system diagram to see how it all fits together.
- Watch the video and build your own rumen at home. https://www.youtube.com/watch?v=57GqrEW-gcb0

When finished, please visit www.tinyurl.com/KS4H-Challenge to tell us what you learned.

Helpful Tips

- If you do not have access to a sample of livestock feed, you can substitute items from your own kitchen.
- Be cautious of where you build your rumen as it can be messy!
- Working with other livestock members through this challenge can be fun.

Leadership

(Suggested for Intermediate and Advanced Levels.)

Teach someone what you have learned.

- This would make an excellent club talk or hands-on activity to share with younger livestock members.
- Share at the local science fair.
- Other _____
  _____
  _____

Curriculum and Resources

To learn more about Livestock projects, visit the Kansas 4-H project page: https://www.kansas4-h.org/projects/

- "Fertis the Fistulated Steer: Revealing the Rumen" at K-State Open House https://www.youtube.com/watch?v=-ban6fHArBU
- Holstein Foundation's "World of Dairy Cattle Nutrition" guide designed for youth http://www.holsteinfoundation.org/education/workbooks.html

Life Skills Learned (check all that apply)

☐ Positive Self-Concept
☐ Inquiring Mind
☐ Concern for Community
☐ Sound Decision-Making
☐ Healthy Interpersonal Relationships

Share

☐ Present the "build a rumen" demonstration to your 4-H club.
☐ Teach someone else how to make a poster or display.
☐ Other _____

Evaluate Your Experiences!

Which livestock species have a ruminant digestive system? _____
_____

What are the chamber names of the ruminant digestive system? _____
_____

What are the functions of each different part of the ruminant digestive system? _____
_____

What is the difference between a forage and a concentrate? And, how do they differ when they are in the rumen? _____
_____

How will you use the information you learned through completing this challenge with your livestock project(s)? _____
_____

To complete the Challenge, take a selfie while doing the activity. Upload the photo and take the survey about your Challenge experience. **www.tinyurl.com/KS4HChallenge**

Self-Evaluation After

Using the rating scale below, answer the following:

1 = not at all
2 = a little
3 = a lot

I know …

What a ruminant is..... 1 - 2 - 3

The different parts of the digestive system ..... 1 - 2 - 3

The function of each stomach chamber.....1 - 2 - 3

The difference between feed types.....1 - 2 - 3

The correct terminology for the ruminant digestive system ..1 - 2 - 3

Kansas Clover Classroom

Adapted from NW 4-H Advisory. Project Challenge created by Janet Harkness, 4-H Youth Development Agent, West Plains Extension District, Patsy Maddy, Robyn Trussel, and Jenilee Godsey, NW Extension Agents

Build a Rumen

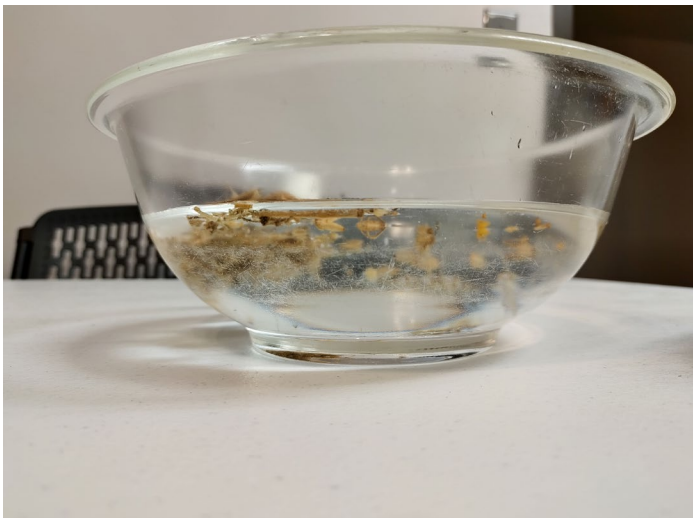
Gather the supplies and work along with the video to "Build a Rumen" at home! https://youtu.be/57GqrEWgcb0

Materials List

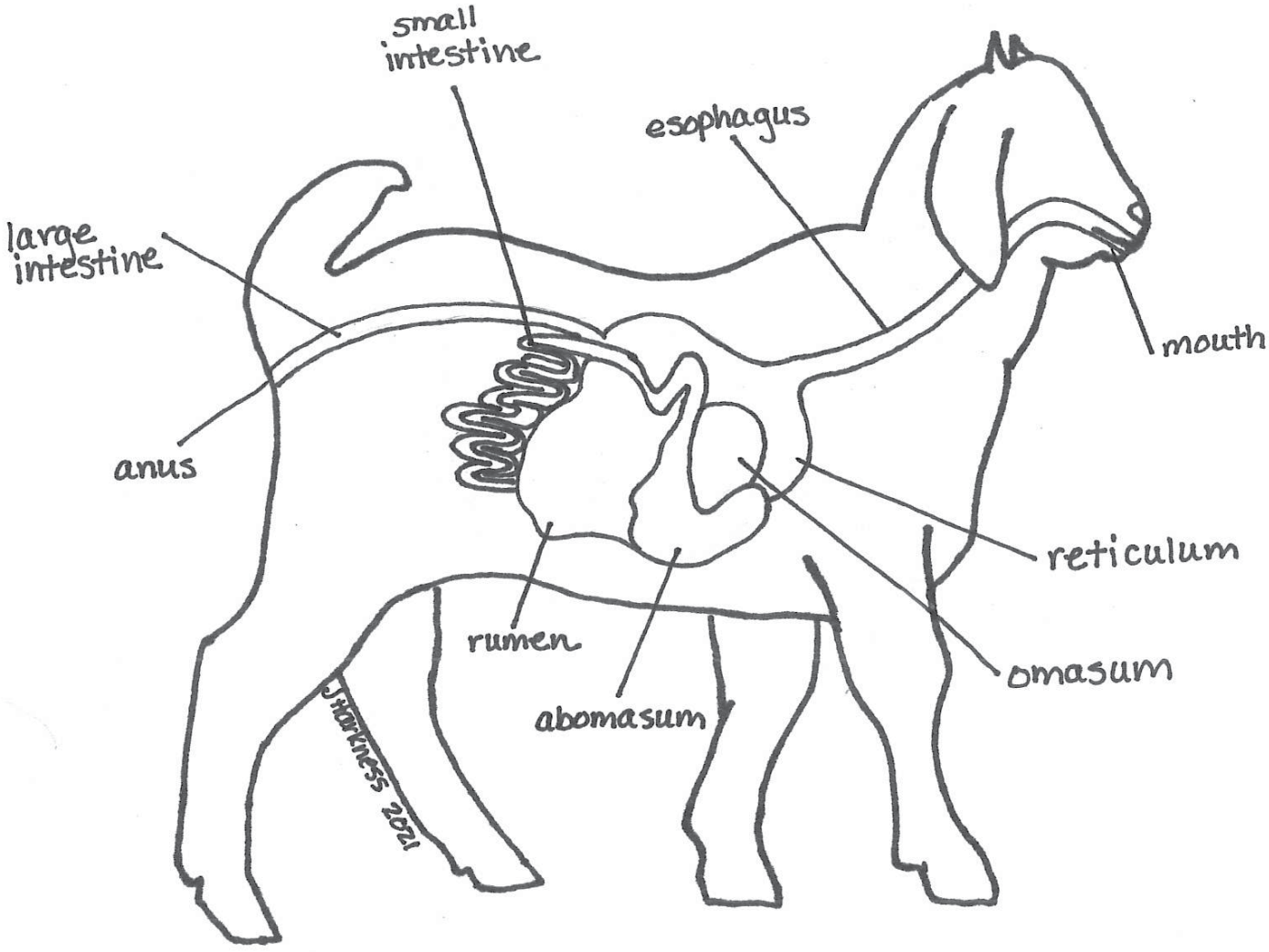
- Table covering, if created inside
- Clear plastic or glass bowl/tote/tub, filled ½ full of water
- Samples of livestock grains, hays, silages, pellets, total mixed ration (TMR), etc.
- If you don't have livestock feed samples, you can substitute different types of cereal, dried or canned beans and corn, fresh lettuce, grass clippings from your yard, etc.
- Optional: terry wash cloth/towel to line the inside of the rumen after it is filled. This will help to explain how rumen papillae operate.

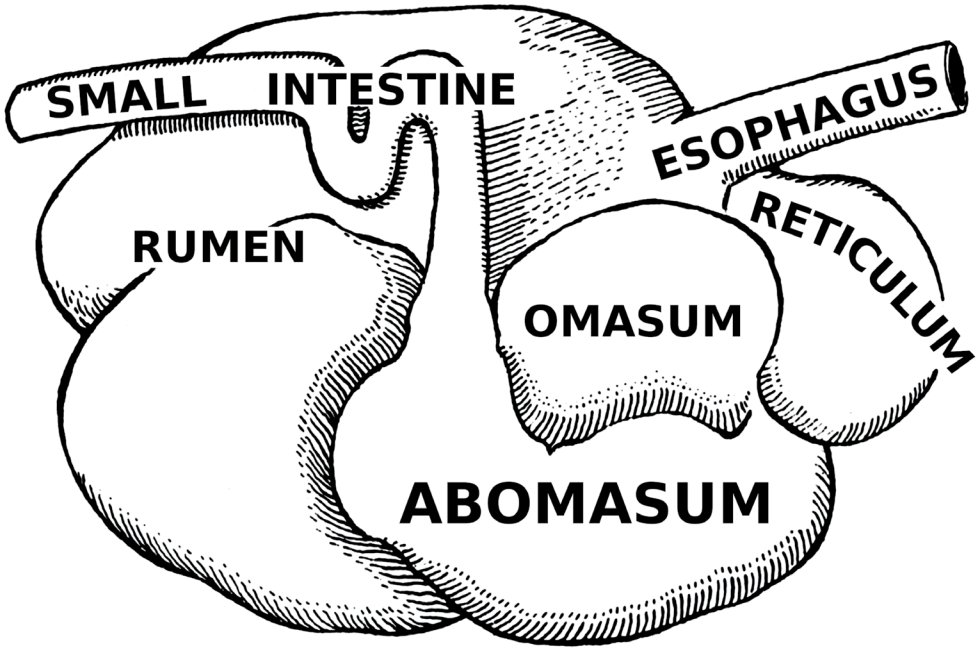
Instructions

1. Fill bowl halfway with water.
2. Begin "feeding" your rumen.
3. Experiment by beginning with either forages or concentrates.
4. View through the side of your rumen how the different feeds sink or float in your rumen.



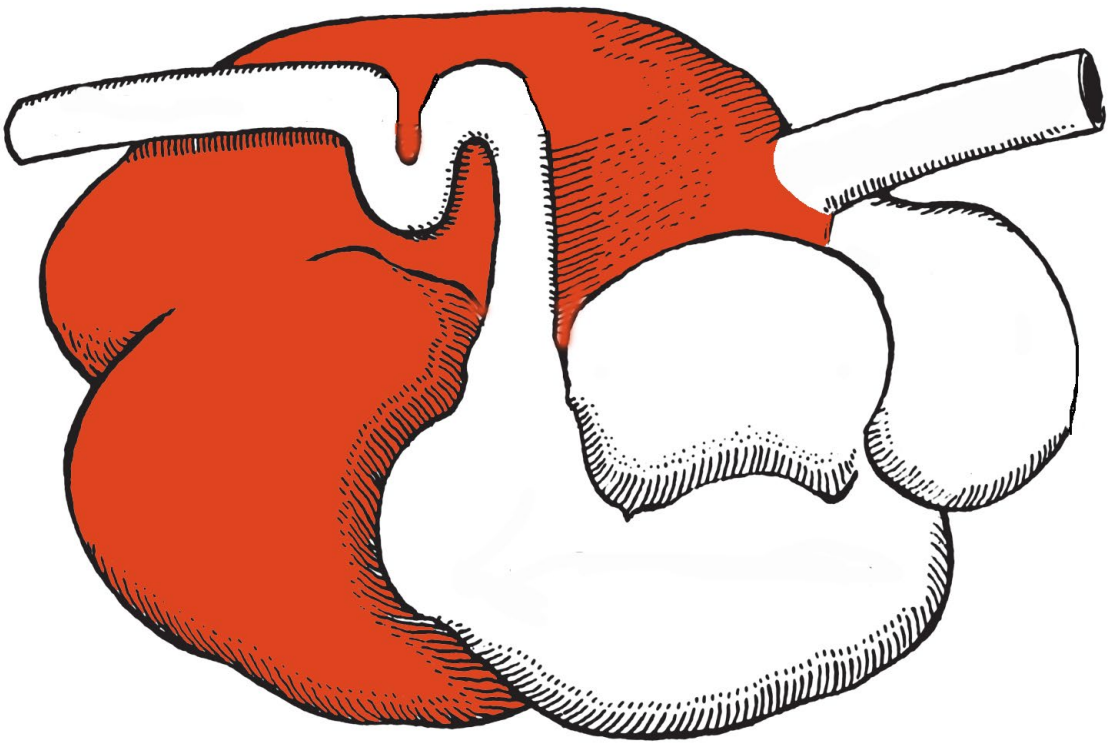
Ruminant Digestive System, Modeled on a Goat

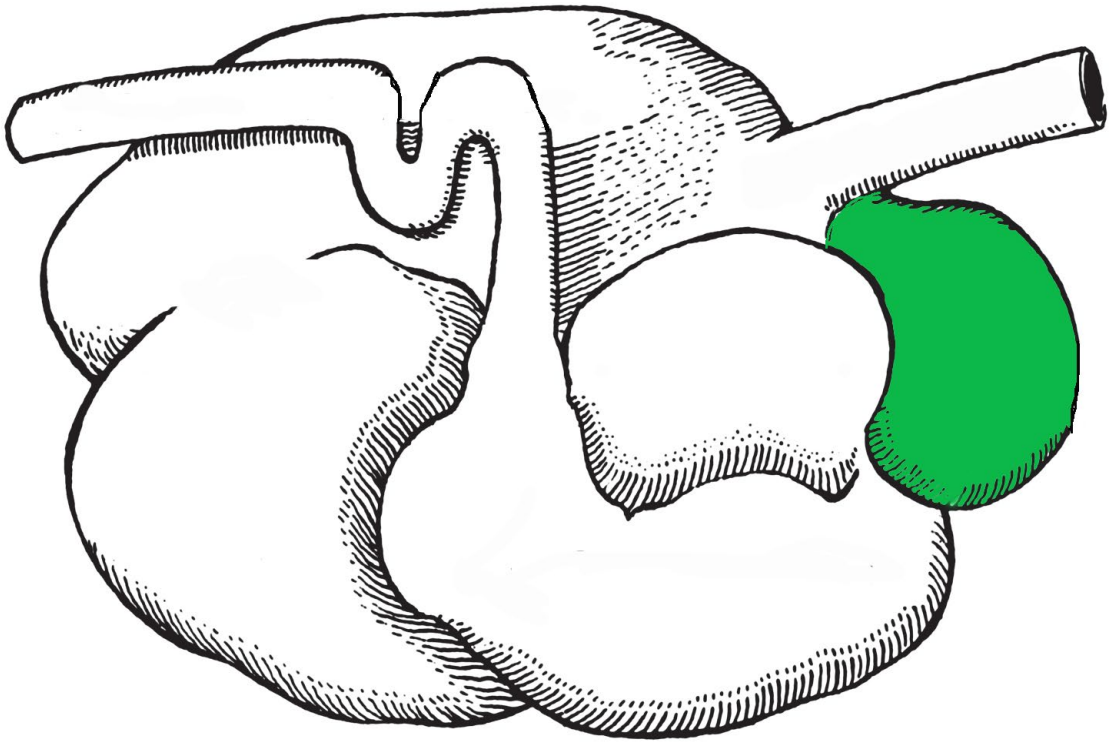




Ruminant Flash Cards

These Ruminant Flash Cards are arranged so the pictures are the front and the text for the pictures is the back page of each card in the set.





Rumen

The rumen (on the left side of the animal) is the largest stomach compartment and consists of several sacs. It can hold 25 gallons or more of material depending on the size of the cow. Because of its size, the rumen acts as a storage or holding vat for feed.

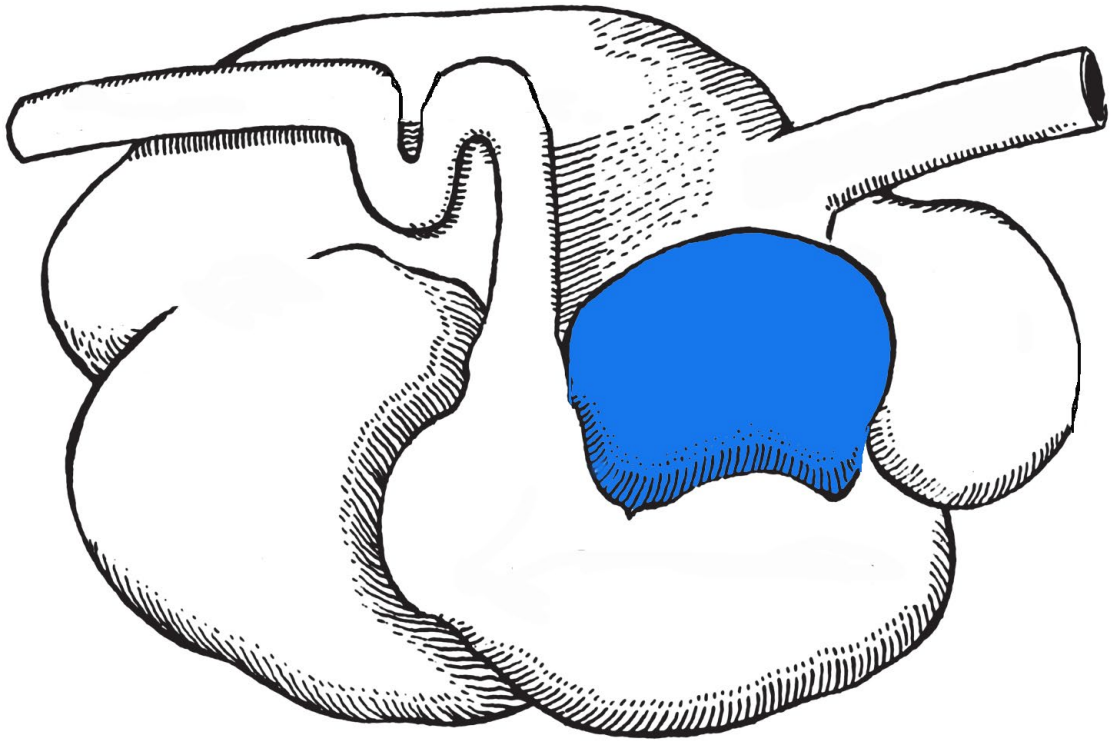
Aside from storage, the rumen is also a fermentation vat. The rumen's environment favors the growth of microbes. These microbes digest or ferment feed within the rumen and make volatile fatty acids (VFAs). The rumen absorbs most of the VFAs from fermentation.

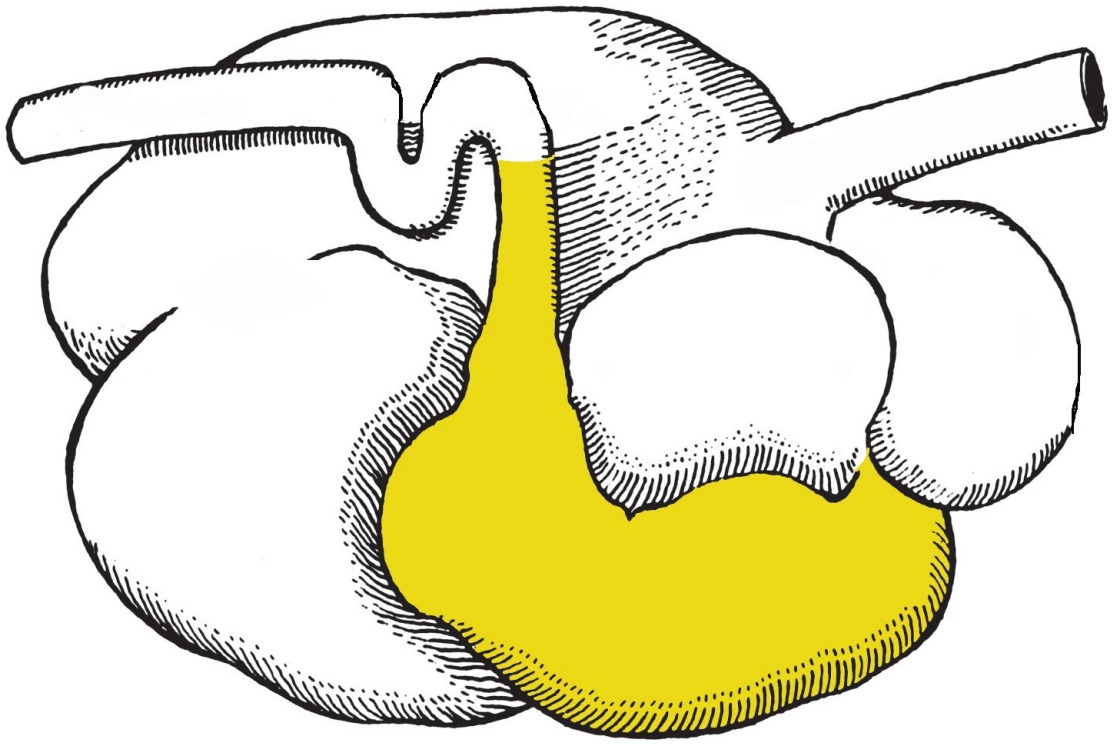
Tiny projections (papillae) line the rumen, which increases the rumen's surface area and the amount it can absorb.

Reticulum

The reticulum is a pouch-like structure in the forward area of the body, close to the heart. The tissues in the reticulum form a network similar to a honeycomb. A small tissue fold lies between the reticulum and rumen, but the two aren't separate compartments.

Heavy or dense feed and metal objects eaten by the cow drop into this compartment. Nails and other sharp objects may work into the tissue and cause "hardware disease." You can use magnets to prevent disease or correct the problem through surgery. Leaving it untreated may lead to infection and possibly death.



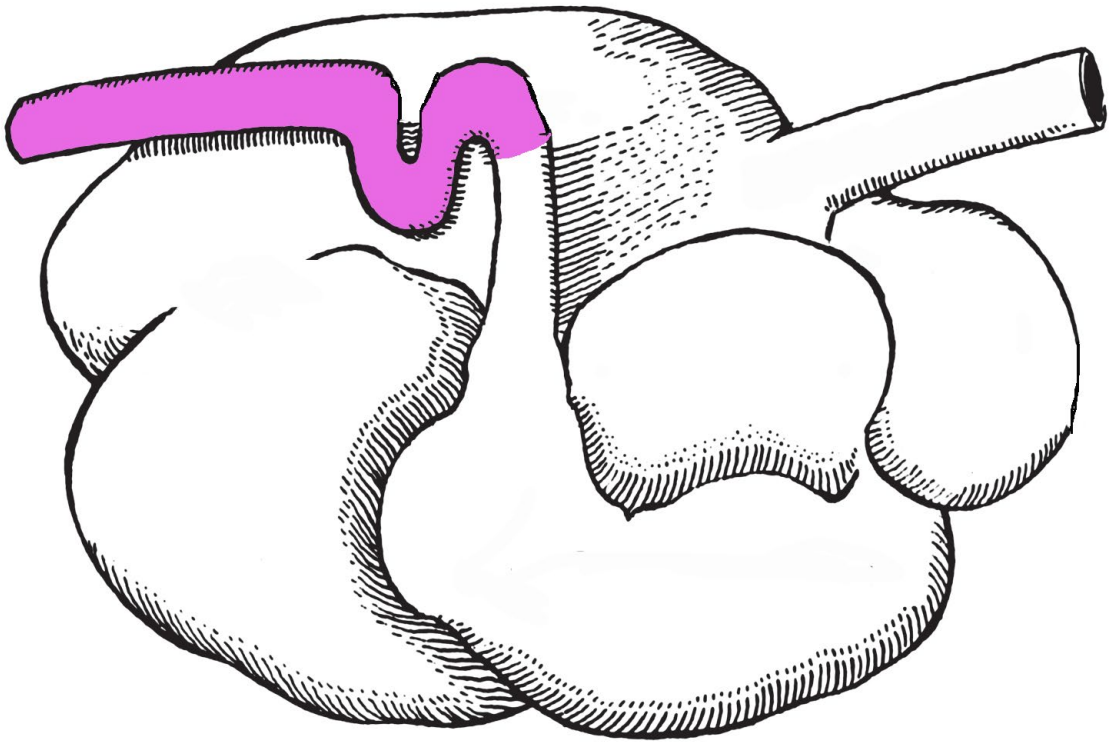


Omasum

The omasum is a globe-shaped structure containing leaves of tissue (like pages in a book) and is called many plies. It absorbs water and other substances from digestive contents. Feed material (ingesta) between the leaves will be drier than ingesta found in the other compartments.

Abomasum

The abomasum is the only compartment lined with glands. These glands release hydrochloric acid and digestive enzymes, needed to breakdown feeds. The abomasum is similar to a nonruminant stomach.



Small Intestine

The small intestine consists of three sections: the duodenum, jejunum and ileum. It measures about 20 times the length of the animal.

Secretions from the pancreas and gallbladder aid in digestion within the small intestine. The small intestine completes most of the digestive process and absorbs many nutrients through villi (small finger-like projections). From the villi the nutrients enter into the blood and lymphatic systems.

Cecum

The cecum is the large area where the small and large intestine meet. The cecum breaks down some previously undigested fiber, but the exact importance of the cecum remains unknown.

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Large Intestine

The large intestine is the last section of the tract that undigested feedstuffs pass through. Microbes digest some undigested feed here, but the main digestive function of the large intestine is to absorb water.

Notes

Local Contact Information

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

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