



Developed with Ashley Holden, Animal Science Teacher & Animal Science Department Head at Smith Vocational & Agricultural High School, Northampton, MA

Livestock digestion

Volume 18 | Gr. 9-12

Time: 100 min. Classroom

Unit: Feed & Nutrition for Livestock & Poultry

Skill: Identify the name and function of Digestive Anatomy



Materials list

Digestive anatomy diagram for each different system:

- Equine Anatomical Wall Chart, Digestive System ([C23726](#))
- Cow Digestive System Model ([C33289](#))
- *Digestive Systems of Livestock: A Basic Look* DVD ([C29076](#)) (optional)

Poster-making supplies:

- PRANG® Washable Markers - Set of 96 ([9721322](#))
- Nasco White Budget Drawing Paper, 9" x 12", 50 lb., 500 sheet ream ([4100478](#))
- Pacon® Premium 65 lb. Tagboard 10 Bright Color Assortment, pkg. of 50, 8½" x 11" ([9735641](#))

- Presentation slides
- Rubrics for project and peer feedback

Comparable household items for demonstration such as:

- Reticulum — strainer or AC filter
- Rumen — XL trash bag to demonstrate capacity
- Omasum — large text; phone book or dictionary to demonstrate "many plies"
- Abomasum — 5-gallon bucket to demonstrate approximate capacity

AS.06.02.

Apply principles of comparative anatomy and physiology to uses within various animal systems.

AS.06.02.03.a.

Identify and summarize the properties, locations, functions and types of organs and body systems.

AS.06.02.03.b.

Compare and contrast animal cells, tissues, organs, body systems types and functions among animal species.

AS.06.02.03.c.

Apply knowledge of anatomical and physiological characteristics of animals to make production and management decisions.

Performance objective

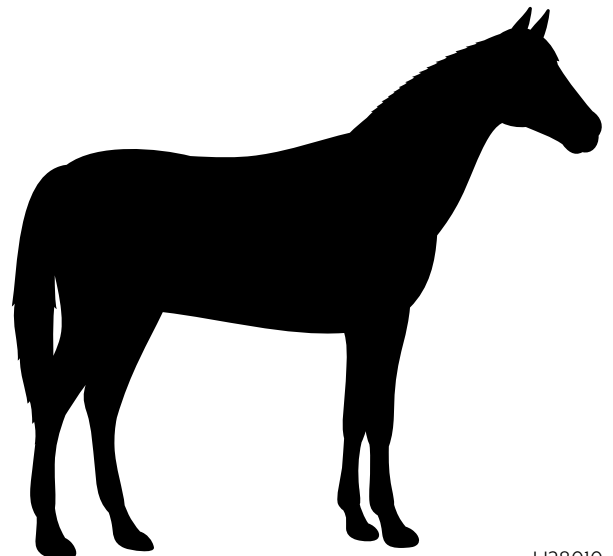
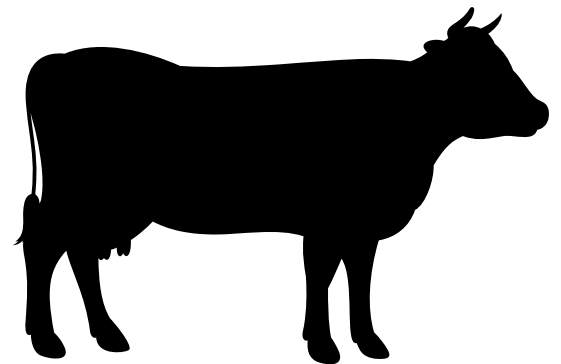
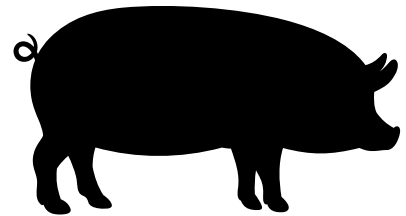
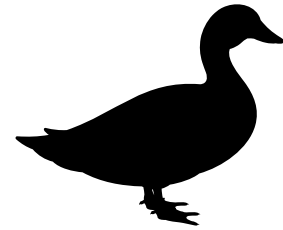
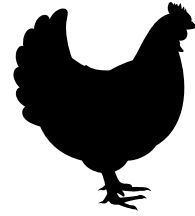
Students will understand and explain the main parts and functions of the digestive anatomy of cattle, pigs, horses, and poultry. Then, students will apply their understanding of the functions of various parts of the anatomy and select a household item to incorporate into their final poster project, making connections between the item and why it represents a particular part of the anatomy. Students will be evaluated by a rubric and present their work to their classmates.

Teaching methods

Direct instruction, hands-on project, student research, peer-to-peer feedback.

Activity

1. Do Now: Identify herbivore, omnivore, and carnivore and match the classification to animals at school and at home.
2. Introduce the terms polygastric, monogastric, ruminant, modified ruminant, and pseudo-ruminant.
3. Direct instruction using PPT. Walk students through the parts of the ruminant stomach and entire digestive system, making connections between the different systems for different species.
4. Discuss with the class how different feeds are more or less appropriate for livestock based on the type of digestion system they have.
5. Present the project rubric and explain the expectations for the students to focus on different parts of the digestive system and create a poster. Allow time for questions and for explaining the components of the rubric.
 - a. Break students into teams to “create” a system using household items to explain or demonstrate the different parts of the system; or
 - b. Assign 1–2 parts per student and then have them present in order that shows the digestive systems.
 - c. Explain to students they need to incorporate a household item, presented in the classroom, that would represent their part of the digestive system.
6. Allow time in class for creating the project. Supervise students and answer questions.
7. At the second class period, students will put finishing touches on projects and present. Use the second rubric, the student participation guide, for peer-to-peer feedback on presentations.



Assessments

The project will be graded per the project rubric. Peer-to-peer feedback rubric. Content questions about the digestive systems learned from student presentations will be asked on a future summative assessment.

Name: _____ Date: _____

Complete one rubric for each individual or team presenting in class. For team projects, the score will be shared for the whole group.

Name of student/team presenting:

Public Speaking/Presentation Skills (5 points)

Using the scale provided, identify the points that you felt the presentation earned:

| | | | | |
|--------------------------------|---|-------------------|---|----------------|
| 1 Needs much improvement | 2 | 3 Satisfactory | 4 | 5 Excellent |
| | | | | |

Feedback Sandwich

What went well?

What could be improved?

Positive statement about project:

Topic of Presentation:

Presentation Content (5 points)

Using the scale provided, identify the points that you felt the content of the presentation earned:

| | | | | |
|--------------------------------|---|-------------------|---|----------------|
| 1 Needs much improvement | 2 | 3 Satisfactory | 4 | 5 Excellent |
| | | | | |

Feedback Sandwich

What went well?

What could be improved?

Positive statement about project:

Name: _____ Date Assigned: _____ Date Due: _____

Junior Animal Science – Nutrition Unit

Livestock Digestion Posters & Presentations

Task: Students will create a poster that shows the various aspects of different species' digestion. Each team of students will create a class resource poster, and present their poster while also using household items to represent each part of the system.

Title, Names, and Purpose (5 points)

- _____ The project has a clear title, and student names are on the poster.
- _____ The purpose of the poster is clear to the viewer.

Content (60 points)

- _____ Student identified all relevant parts of the digestive system. (15 points)
Mouth, Esophagus, Pharynx, Stomach (Rumen, Reticulum, Omasum, Abomasum),
Small Intestines (Duodenum, Jejunum, Ilium), Cecum, Large Intestines.
- _____ Student, in own words, described the basic functions of each part. (30 points)
- _____ Students presented household items to represent the parts of the system. (15 points)

Class Presentation (25 points)

- _____ Student provided a high-quality presentation in class that was informative and answered student and teacher questions. (15 points)
- _____ Peer assessment. (10 points) — See separate rubric

Quality and Timeliness (10 points)

- _____ Student turned in a high-quality piece of work, of which he/she is proud.
- _____ The work is turned in on time.

Next Steps for Improvement:

Livestock Digestion

Introduction to livestock digestion systems

Objectives

I will be able to:

explain the main parts and functions of the digestive anatomy of cattle, pigs, horses, and poultry.

apply my understanding of the functions of various parts of the anatomy and create an informative presentation

Fairly evaluate my peers' presentations in class and provide useful feedback

Essential Questions

How do livestock convert plant material into edible protein?

What are the differences between the digestive systems of different farm animals?

How are the different systems similar?

Do Now

On a separate piece of paper, and in your own words, define the following:

Herbivore

Carnivore

Omnivore



Photo credit: Indiana State Dept of Agriculture

List examples of each, and think of the animals we have at school or you have at home.

What aspects of an animal's anatomy influence its diet?

Students share out examples such as teeth, size, beak vs. mouth...

What about an animal's organs influencing its diet?

Classification of Digestion Systems

Monogastrics

Simple system, single stomach - like dogs, cats, humans

Some have a cecum to aid in fiber digestion - rabbits, horses, pigs, rats

Carnivores and Omnivores have monogastric digestive systems

Polygastric aka Ruminants

More complex system with multiple chambers to stomach

Cattle, sheep, and goats are examples

Herbivores have polygastric digestive systems

The Steps to Digestion

Eating food and utilizing it in the body is simply a disassembly system!

Working with a class partner, and using classroom resources, define the terms provided. Then develop a livestock related sentence using the term.

Prehension

Mastication

Salivation

Deglutition

Regurgitation

Eructation

Absorption

Defecation

Micturition

Parts of the Digestive System

All livestock animals have...

Mouth

Esophagus

Stomach

Small Intestines

Large Intestines

Digestion is aided by these organs:

Liver

Gallbladder*

Pancreas

Cecum*

First...

Prehension: bringing food to the mouth

Limbs, beaks, lips, tongue and teeth all play a role in bringing food into the digestive system

Describe in detail on your poster how prehension works for your assigned specie

Mastication: Chewing food to make it possible to swallow

Ruminants and monogastrics have different types and sets of teeth based on the food they consume.

Describe in detail on your poster how your assigned animal's digestion is affected by its mouth and teeth

How does a chicken's prehension and mastication differ from a cow's or pig's?

Second....

Deglutition: Swallowing food; passing material from the mouth to the stomach through the esophagus

Muscle contractions - called peristalsis -
move food down into the stomach

In ruminant animals, we also see ***regurgitation***

This function allows ruminants to swallow feed and pull it back up into the mouth to re-chew and swallow until it is small enough to move through the stomach for digestion.

Rabbits will engage in cecotrophy - if you are assigned rabbits be sure to define and describe this process on your project!

Third...

The stomach varies between species, based on class and dietary needs of the animal.

The stomach is responsible for *physical*, *chemical* and *enzymatic* breakdown of the food.

Physical breakdown of the food is from the churning action of the stomach.

Chemical digestion occurs when hydrochloric acid denatures proteins.

Enzymes break down the food to prepare it for absorption

Anatomical Features of the Stomach

Ruminants have four compartments:

Reticulum - “honeycomb”; acts as a filter allowing only small pieces of food into the rumen for digestion

Rumen - “fermentation vat”; microbes assist the ruminant in chemical and physical breakdown of food

Omasum - “the butcher’s bible”; further grinds the food into a paste material

Abomasum - the “true stomach”; site for enzymatic digestion

The Differences for Poultry

Poultry are monogastrics, the difference is the absence of lips and teeth and the presence of a beak, gizzard and crop.

Crop - a dilation of the esophagus that provides food storage and acts as a moistening reservoir

If your project is poultry, make sure you explain the different functions of the crop in different species!

Proventriculus

The “true stomach” for poultry, the site for enzymatic digestion

Ventriculus

Also known as the **gizzard**, it grinds the food to further prepare it for absorption.

The Small Intestine - The site for nutrient absorption!

Duodenum

1st part of SI; bile and pancreatic secretions enter here. Main site of food breakdown.

Jejunum

2nd part of SI; longest portion. Continued absorption of carbohydrates, fatty acids, amino acids, some vitamins, most minerals.

Ileum

3rd part of SI; connects small to

Liver

Nutrients absorbed through the small intestinal wall first go through the liver for distribution throughout the body.

Gallbladder*

Holds digestive bile made in the liver, that is used for digestion in the duodenum.

**Does your assigned animal have a gallbladder? If not, how does their body function

The Cecum

The cecum (ceca, plural) has varying importance depending on the specie.

In your project, be sure to address how the ceca functions and the role it plays in digestion for your assigned specie.

The cecum is crucial for fiber digestion in most monogastric systems. It is the site for microbial digestion for some species, and is important for water absorption.

The cecum is considered part of the large intestines.

The Large Intestine -

The LI is shorter than the SI - but has a larger diameter. It is broken into two sections:

Rectum & Colon

Water absorption, some mineral absorption and waste reservoir.

Anus

The opening at the end of the digestive system that releases waste products.

Cloaca

The opening at the end of the digestive system for birds and reptiles. Feces and urine are mixed together and exit through the cloaca. This is also the pathway

The End!

Defecation

Pooping! Release of excess and waste food product from the body.

Micturition

Urination, release of excess fluid from the body.

Source

“Chapter 6 The Gastrointestinal Tract and Nutrition.” *Introduction to Animal Science: Global, Biological, Social and Industry Perspectives*, by W. Stephen Damron, Pearson, 2018, pp. 91-105.