

Locating Common Bones*



Skill Level:

- ▶ Beginner to advanced

Life Skills:

- ▶ Communication, critical thinking, decision-making and teamwork

Setting:

- ▶ Room with chairs arranged in a half-circle with a white board, chalkboard or easel to hold the images at the head of the half-circle

Time:

- ▶ 20-30 minutes

Materials:

- “The Skeletal System” resource sheet
- One set of “Bone Label” cards
- Clear tape
- One “Unlabeled Dog Skeleton” enlargement (and, optionally, one original-sized version per participant)
- One “Unlabeled Dog Outline” enlargement (and, optionally, one original-sized version per participant)
- An overhead or computer projector (optional)
- Flipchart paper or other large paper
- Large markers
- A chalkboard, white board, easel or open wall space
- Masking tape
- “Labeled Dog Skeleton” (one per participant; optional)
- “Sheep Skeleton” photo (one per participant; optional)

Overview:

The *Anatomy and Physiology – Locating Common Bones* lesson is designed to teach young people about the location and function of a basic set of animal bones. In the interactive lesson, participants will learn how to identify the bones of an animal skeleton. They’ll also be asked to apply their knowledge by identifying bones and structures on paper or a live animal.

Objectives:

After completing this activity, participants will be able to:

- ▶ Identify and label common dog bones.
- ▶ Identify bones and relate them to different species.

PROCEDURE:

Before the meeting:

1. Review the lesson plan, make any photocopies and gather any supplies you will need. You may want to print a copy of “The Skeletal System” resource sheet to refer to during the lesson.
2. Make copies of the unlabeled dog outline and the unlabeled dog skeleton that are large enough for the whole group to see. (**Note:** If you don’t have access to a copier that can enlarge the images, you could use a computer or overhead projector to increase the image size so you can trace it onto flipchart paper. You may want to laminate the enlargements so you can use them repeatedly.) Hang the outlines where the whole group will be able to see them, but keep them covered until the appropriate point in the lesson.
3. Consider the ages and experience levels of your group members as you decide how many bones to include in the game. Cut apart a set of the “Bone Label” cards and lay aside the labels you won’t be using. (**Note:** You may want to laminate the labels so you can use them repeatedly.)
4. Place a piece of rolled tape (sticky side out) on the back of each label. Lay the labels face down on a flat surface in your meeting space.

During the meeting:

1. Introduce the activity by telling the group they’re going to play a game that will help them learn about the locations and functions of common bones.

*Adapted with permission from: Thomson, A. (2003). *Anatomy and Physiology: Unit C*. In E. A. Martinec (Ed.), *Veterinary Science Teacher’s Guide*. (pp. 8-51). Ithaca, NY: Cornell University.

2. Ask the group the following questions:

- ▶ ***What is a bone?*** (The hard parts of an animal's skeleton.)
- ▶ ***What are some of the main reasons animal bodies have bones?*** (To protect the body's vulnerable internal organs, to support the structure of the body, to enable animals to move.)
- ▶ ***Why is it important for you to know where the bones are located in an animal's body?*** (So you know where to check for broken bones and other injuries; to make sure that equipment such as harnesses, bridles, halters and saddles fit properly; to avoid using a potentially damaging brush such as a curry comb on a tender spot where the bone is close to the surface.)

Record their answers on flipchart paper and display the sheets where everyone can see them.

3. Next ask for volunteers to name some common bones that most animals have. As participants name a bone, describe its location and function, then place the correct label for it on the unlabeled dog skeleton enlargement. When the group can't think of any other bones, use the "Skeletal System" resource sheet to provide information about the locations and functions of any major bones they may have missed.
4. Now remove any labels you may have placed on the unlabeled dog skeleton enlargement and tell the group it's time to play the game.
5. Explain that they'll take turns coming to the front and choosing one of the "Bone Label" cards that are lying face down. Once they've chosen a label, they will try to place it on the right spot on the unlabeled dog skeleton.
6. After a player has finished a turn, have the next person come up and either move the previous player's label to what they think is the correct bone, or choose a new label to place. Have them continue this process until they've placed all of the labels on the skeleton.
7. Now work with the group to make sure that all of the labels are correct. If you have to move a label, explain why the correction was needed. (**Note:** You can use the labeled dog skeleton from the "Skeletal System" resource sheet if you need help making corrections.)
8. If you have enough meeting time and the group is still interested, play another round of the game using the dog skeleton, or play it using the dog outline instead.
9. Challenge the group to review the bones on their animals at home to help them continue to improve their bone identification skills. Show them the photo of the sheep skeleton from Michigan State University and explain that students and researchers at universities and private companies continue to study the structure, functions and locations of bones.

TALKING IT OVER:

Ask the group the following questions:

- ▶ What was the most challenging part of this activity?
- ▶ If you were to play this game again, what would you do differently?
- ▶ Why is it important to know where an animal's bones are located?
- ▶ How might knowing where its bones are affect how you care for an animal?

ALIGNMENT TO SCIENCE & ENGINEERING PRACTICES:

How does 4-H increase science literacy?

Nationally and in Michigan, 4-H has long enjoyed a reputation for engaging young people in positive, experiential (hands-on), and nonformal activities that are inquiry based. The activities in the *4-H Animal Science Anywhere* series can be used to enhance classroom science education. The activities are aligned with the eight Scientific and Engineering Practices from *A Framework for K-12 Science Education* (National Research Council, 2012, p. 42).

The activities in *4-H Animal Science Anywhere: Locating Common Bones* were evaluated for their alignment with the Science and Engineering practices by Michigan State University (MSU) Extension Educator Tracy D’Augustino in 2016.

Table 1. How This Lesson Aligns With the Science and Engineering Practices (National Research Council, 2012, p. 42)

Science & Engineering Practice	Action	Activity Step
▶ Asking questions and defining problems	Participants brainstorm what bones are and why animals have bones.	2-3
▶ Developing and using models		
▶ Planning and carrying out investigations		
▶ Analyzing and interpreting data	Participants learn about bones and about where the major bones are located in dogs and sheep.	4-7
▶ Using mathematics and computational thinking		
▶ Constructing explanations and designing solutions	<ul style="list-style-type: none"> ▶ Participants discuss why it is important to know where bones are in an animal. ▶ Participants discuss why knowing where an animal’s bones are may affect how we care for the animal. 	2 Talking It Over
▶ Engaging in argument from evidence	Participants discuss why it is important to know where bones are in an animal.	2
▶ Obtaining, evaluating, and communicating information	Participants learn about basic mammal bones and their locations, and share this information with others.	Whole lesson

ADAPTATIONS & EXTENSIONS:

- ▶ **For Younger or Less Experienced Participants:** Consider having them play the game in two-person teams.
- ▶ **For Older or More Experienced Participants:** Consider bringing a live animal to the meeting that participants can paint bones onto with washable colors. If your group has done a muscle lesson before this meeting, they could compare muscle and bone locations while painting in different colors.
- ▶ Blindfold the players as they try to place labels on the dog skeleton. Have their teammates guide the blindfolded player to the correct spot using directional terminology.
- ▶ Time individual players or teams to see how long it takes them to correctly identify all the bones selected.
- ▶ Have the participants identify the locations of the bones on a live animal. Then have them relate the bone location to the animal's structure.
- ▶ Divide the group into teams and give them copies of the "Skeletal System" resource sheet to use as they work through the lesson together.
- ▶ Copy one set of "Bone Label" cards, labeled and unlabeled dog skeletons and dog outlines for each participant to use during the lesson and to take home and review.

REFERENCES & RESOURCES:

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academies Press.

Thomson, A. (2003). Anatomy and physiology: Unit C. In E. A. Martinec (Ed.), *Veterinary science teacher's guide* (pp. 8–51). Ithaca, NY: Cornell University.

ACKNOWLEDGMENTS:

Author: Julie Thelen, 4-H Livestock and Veterinary Science Educator, Michigan State University Extension

This bulletin was produced by ANR Communications and Marketing (anrcom.msu.edu) for MSU Extension (msue.anr.msu.edu).

MICHIGAN STATE UNIVERSITY | Extension

Anatomy & Physiology – Locating Common Bones
© 2016 by Michigan State University Board of Trustees. 4-H and Cooperative Extension System groups and other nonprofit educational groups may print up to 25 hard copies of this material for noncommercial, educational use, provided that attribution is given to Michigan State University. All other rights reserved. For information, contact 4-H Youth Development, 108 Agriculture Hall, 446 West Circle Drive, East Lansing, MI 48824.

MSU is an affirmative-action, equal-opportunity employer, committed to achieving excellence through a diverse workforce and inclusive culture that encourages all people to reach their full potential. Michigan State University Extension programs and materials are open to all without regard to race, color, national origin, gender, gender identity, religion, age, height, weight, disability, political beliefs, sexual orientation, marital status, family status or veteran status. Issued in furtherance of MSU Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Jeffrey W. Dwyer, Director, MSU Extension, East Lansing, MI 48824. This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by MSU Extension or bias against those not mentioned. The 4-H Name and Emblem have special protections from Congress, protected by code 18 USC 707. 1P-1R-Web-09:2017-RM

The Skeletal System*

The skeleton is a framework of bones and cartilage structures that supports and protects an animal's body.

Skull – Consists of many bony plates that are fused together.

Ribs – These are curved arches of bone extending from the spine toward the sternum. Most animals have 13 or more pairs of ribs (humans only have 12).

Spine – The spine is made up of bones called “vertebra” (the plural is “vertebrae”) and has five distinct regions:

- ▶ **Cervical** – The vertebrae of the neck region.
 - a. **Atlas** – Often called “C1,” this is the first cervical vertebra. It forms the joint that lets you nod “yes.”
 - b. **Axis** – Often called “C2,” this is the second cervical vertebra. It forms the joint that lets you shake your head “no.”
- ▶ **Thoracic** – The vertebrae of the body region that always have a rib attached to them and a vertebrae on top of them.
- ▶ **Lumbar** – The vertebrae of the lower back.
- ▶ **Sacral** – The vertebrae of the pelvic region.
- ▶ **Coccygeal** – The vertebrae of the tail region. Many animals use them for balance.

Forelimbs

- a. **Scapula** – The “shoulder blade” attached with muscle.
- b. **Humerus** – Forms the upper arm.
- c. **Ulna** – Forms the elbow joint, fused with the radius in herbivores.
- d. **Radius** – Forms the forearm.
- e. **Carpus** – Commonly called the “knee” in horses and the “wrist” in dogs and humans.

- f. **Olecranon** – A projection from the ulna that forms the point of the elbow.
- g. **Metacarpals** – Commonly called the “cannon region” of the forelimb. The number of metacarpals depends on the species.
 1. Humans: 5 (the bones that connect the fingers with the wrist)
 2. Horses: 1 plus 2 accessory metacarpals that are called “splint bones”
 3. Dogs and cats: 4 plus the dewclaw
 4. Cattle: 1 that splits at bottom into a cloven hoof and 2 dewclaws
 5. Pigs: 4 (2 toes and 2 dewclaws)
- h. **Phalanges** – The bones of the fingers and toes (located on the forelimb and the hind limb). Most commonly associated with the pastern.
- i. **Sesamoids** – The small bone at the base of the phalanges (located on the forelimbs and the hind limbs).

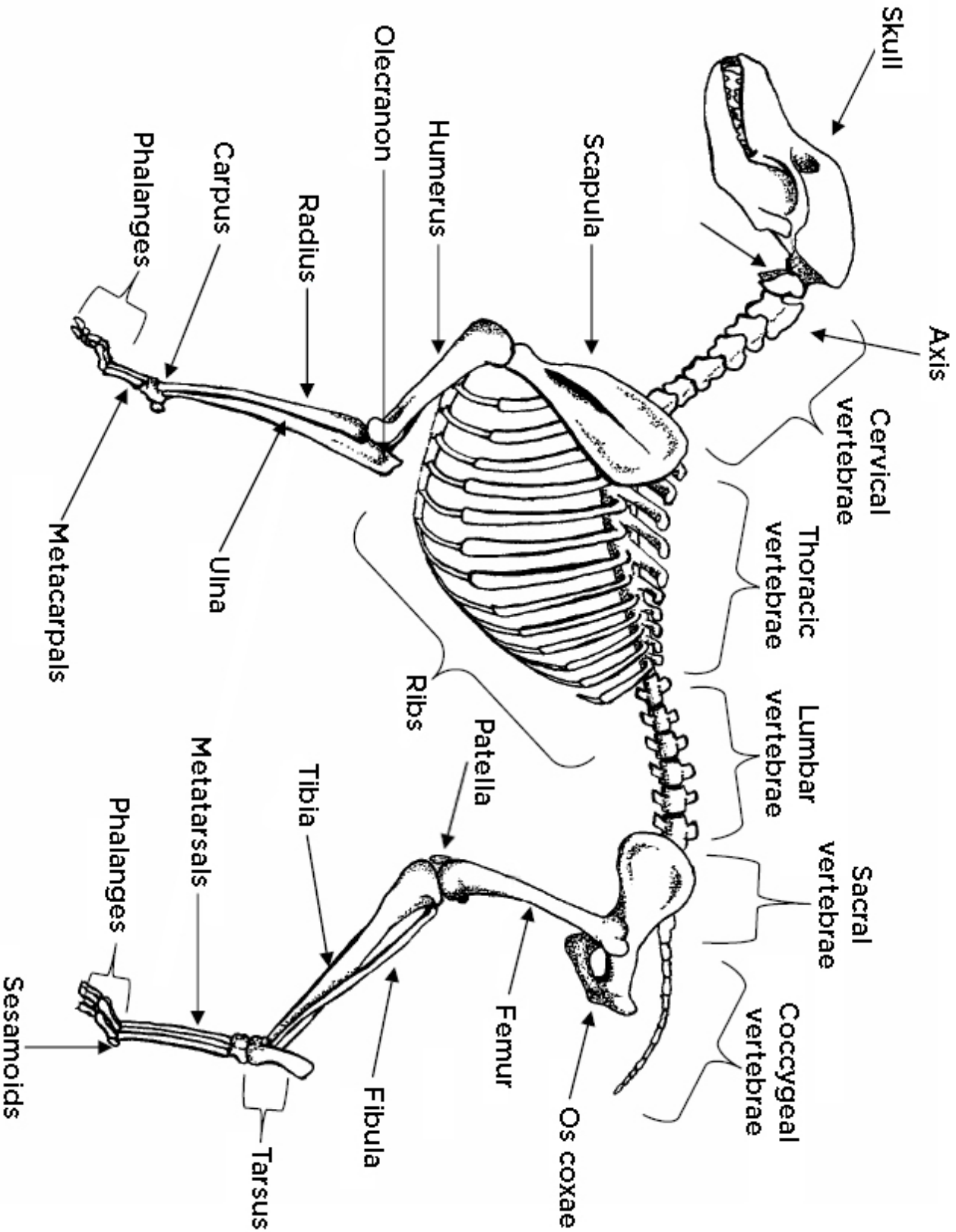
Hind limbs

- a. **Os coxae** – The hipbone; forms the pelvis.
- b. **Femur** – The largest and longest bone; provides stability and strength.
- c. **Patella** – Forms the “stifle” joint in horses, and is equivalent to the human knee.
- d. **Tibia** – The main bone above the hock.
- e. **Fibula** – Fused with the tibia and considered vestigial (functionless) in herbivores.
- f. **Tarsus** – Commonly called the “hock,” and is equivalent to the human ankle.
- g. **Metatarsal** – The cannon region in the hind limb.

*Adapted with permission from: Thomson, A. (2003). Anatomy and Physiology: Unit C. In E. A. Martinec (Ed.), *Veterinary Science Teacher's Guide*. (pp. 8-51). Ithaca, NY: Cornell University.

Labeled Dog Skeleton

Image from the 2003 *Veterinary Science Teacher's Guide* reproduced with permission.



Sheep Skeleton

Photo courtesy of author.



Bone Labels

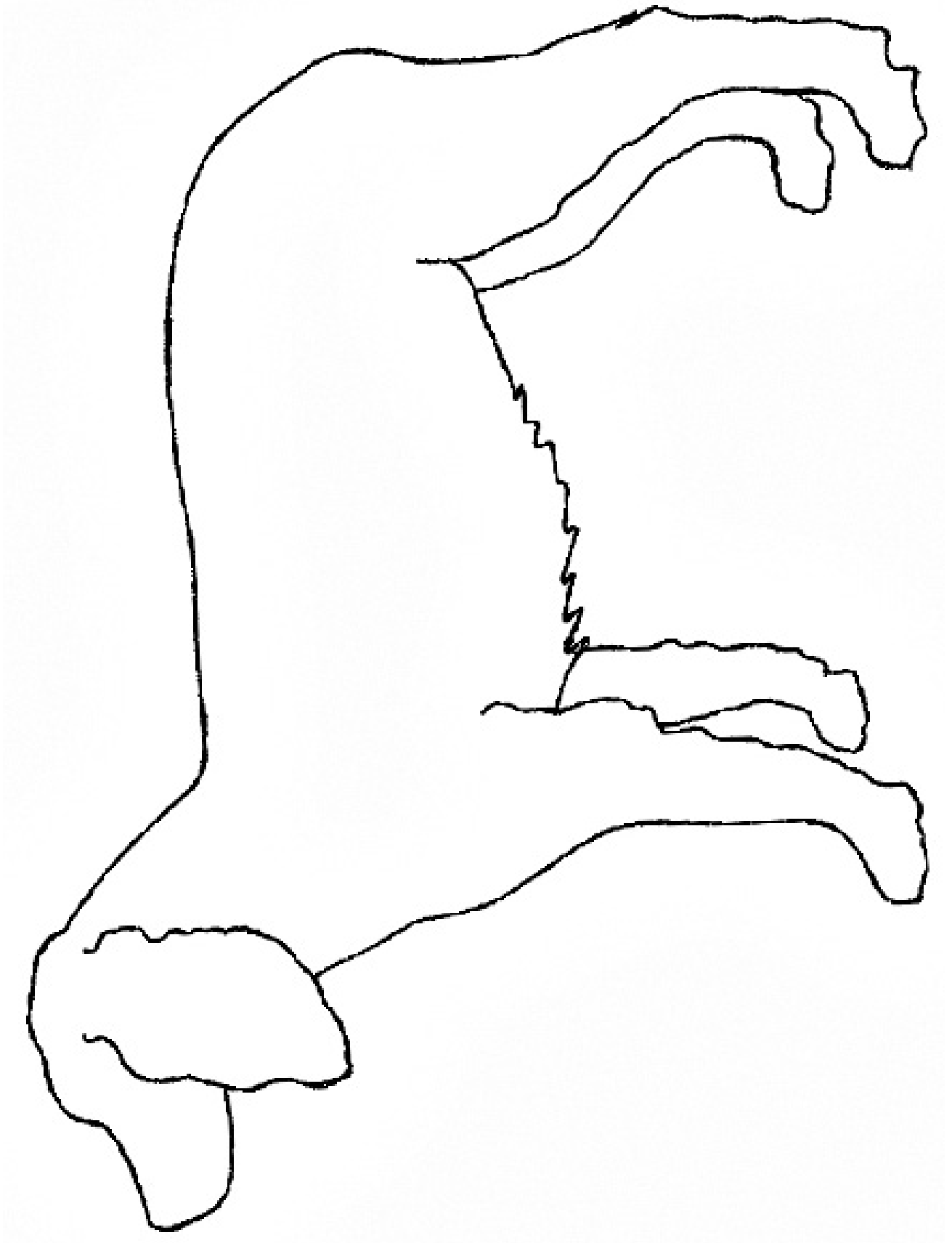
Print out and cut apart a set of labels. You may want to laminate the labels to make them sturdier so they last longer.



Atlas	Lumbar vertebrae	Sacral vertebrae
Axis	Metacarpals	Scapula
Carpus	Metatarsals	Sesamoids
Cervical vertebrae	Olecranon	Skull
Coccygeal vertebrae	Os coxae	Tarsus
Femur	Patella	Thoracic vertebrae
Fibula	Phalanges	Tibia
Humerus	Radius	Ulna
	Ribs	

Unlabeled Dog Outline

Image from the 2003 *Veterinary Science Teacher's Guide* reproduced with permission.



Unlabeled Dog Skeleton

Image from the 2003 *Veterinary Science Teacher's Guide* reproduced with permission.

