

**Adventures in Medicine & Science (AIMS)
Practical Anatomy & Surgical Education
St. Louis University School of Medicine
Distance Learning Program**

**Sheep Brain Dissection
High School/ Middle School**

A guided sheep brain dissection for middle and high school students presented by a physician, medical, or graduate student. Students observe and dissect in pairs as they compare the sheep brain to the human brain.

Objectives:

The students will be able to:

1. Locate and identify the principal structures of a sheep brain;
2. Observe the internal and external structures of a sheep brain;
3. Reinforce their dissecting technique.

Lesson Objectives:

This lesson will:

1. Allow the observation of the differences and similarities between a sheep brain and a human brain;
2. Provide useful information about the function of the brain;
3. Allow the improvement and reinforcement of observation and analysis skills.

Materials:

One per pair or group:

Preserved sheep brain
A dissection pan
Scissors
Scalpel
Forceps
Probe
Gloves

Teacher Notes:

This lesson works best if students have already been introduced to the structures and function of the brain.

Caution the students about the dangers of dissecting and review safety procedures.

Procedure:

1. Obtain necessary materials.
2. Locate the following structures of the sheep brain externally, using textbooks and other reference materials:
 - dura mater (if intact)
 - arachnoid mater
 - pia mater
3. Observe the surface of the sheep brain. Locate the cerebrum. It is the most prominent region of the brain and is divided into two nearly symmetrical hemispheres by a deep longitudinal fissure.
4. Pull the two hemispheres apart slightly and observe the corpus callosum.
5. The surface of the brain is covered by large ridges called gyri (s. gyrus) and grooves between the gyri called sulci (s. sulcus). Deeper sulci are often referred to as fissures and are used as landmarks to divide the cerebrum into regions or lobes which roughly approximate the overlying skull bones.

Locate the following:

- frontal lobe
- parietal lobe
- occipital lobe
- temporal lobe

6. Turn the sheep brain over so that the ventral side is on the top. Locate the cerebellum. It is a small, rounded structure caudal to the cerebrum and dorsal to the brain stem. Notice that the gyri are smaller than those of the cerebrum and are roughly parallel to each other.
7. While still looking at the ventral side, locate the diencephalon. It is a region of the brain ventral to the cerebrum and cranial to the brain stem.
8. Locate the hypothalamus. The hypothalamus is connected to the pituitary gland or hypophysis via the infundibulum.
9. Attached to the hypothalamus is an X-shaped junction of fibers called the optic chiasma. The parts of the chiasma attached to the brain are the beginnings of the optic tract.
10. Holding the specimen with the dorsal aspect toward you, carefully pull apart the cerebrum and the cerebellum to locate the midbrain. You may have to tease away some of the connecting tissue with a probe. The midbrain is part of the brain stem and is found between the diencephalon and the spinal cord. The pineal body is a small, rounded body of the diencephalon located midline near the cerebrum.
11. Locate the pons. It is the portion of the brain stem just caudal to the midbrain.
12. Caudal to the pons is the medulla oblongata. The medulla looks as if it were a swollen region of the spinal cord. The midbrain, pons and medulla constitute the brain stem.
13. Looking at the ventral side of the specimen locate as many of the twelve pairs of cranial nerves that you can. Many will be too small or missing due to the preparation of the specimen.
14. Place the sheep brain in a dissecting tray. Using the longitudinal fissure as a guide, cut the specimen along the mid-sagittal plane with a scalpel.
15. Locate the corpus callosum, which had been connecting the two cerebral hemispheres. Using the infundibulum as a guide, cut a frontal section of one half. Locate the lateral ventricle(s). Just inferior to the lateral ventricle(s), along the midline, is a single third ventricle. The lateral walls of the third ventricle are formed by a mass of gray matter called the thalamus, a region of the diencephalon.
16. Locate the pineal body, optic chiasma, mammillary bodies and infundibulum in the sagittal section.
17. Identify the pons and medulla.

Discussion Questions:

1. Compare the relative sizes of the sheep and human cerebral hemispheres.
2. Compare the gyri and sulci in a sheep and human brain. How does the number differ?
3. What is the significance of your answers to questions 1 and 2?
4. What structural differences are there between the sheep and human cerebellum?
5. How does the size of the sheep olfactory bulbs compare to those of the human?
6. Based on their relative sizes, which of the cranial nerves seems to be most developed in the sheep brain?
7. What is the significance of your answers to questions 5 and 6?

National Science Education (NSES) Content Standards for grades 9-12

- Content Standard:K-12 ***Unifying Concepts and Processes*** :Systems order and organization; Evidence, models and explanation; Form and function
- Content Standard F, ***Science in Personal and Social Perspectives***: Personal and community health
- Content Standard C, ***Life Science***: Matter, energy and organization of living systems
- Content Standard A ***Science as Inquiry***

National Science Education (NSES) Content Standards for grades 5-8

- Content Standard A ***Science as Inquiry***
- Content Standard C, ***Life Science***: Structure and function in living systems; Diversity and adaptations of organisms
- Content Standard F, ***Science in Personal and Social Perspectives***: Personal Health

Show Me Standards (Science and Health/Physical Education)

- ***Science*** 3. Characteristics and interactions of living organisms
- ***Health/Physical Education*** 1. Structures of, functions of and relationships among human body systems

Vocabulary:

arachnoid mater- delicate membrane enclosing the brain and spinal cord

brain stem - The portion of the brain, consisting of the medulla oblongata, pons Varolii, and midbrain, that connects the spinal cord to the forebrain and cerebrum

pia mater- fine vascular membrane that encloses the brain and spinal cord under the arachnoid and the dura mater

cerebrum – the largest part of the brain and is the center of learning, voluntary movement and the interpretation of sensation.

cerebellum- part of the brain below the back of the cerebrum. It regulates balance, posture, movement, and muscle coordination

cranial nerves- Any of several nerves that arise in pairs from the brainstem and reach the periphery through openings in the skull. There are 12 such pairs in mammals, birds, and reptiles and usually 10 pairs in amphibians and fish.

corpus callosum – a large bundle of nerve fibers that connect the left and right cerebral hemispheres

diencephalons- The posterior part of the forebrain that connects the midbrain with the cerebral hemispheres, encloses the third ventricle, and contains the thalamus and hypothalamus

dura mater-tough fibrous membrane covering the brain and spinal cord and lining the inner surface of the skull.

frontal lobe- one of the four lobes of the brain-largest and most anterior

gyri- outward fold on the surface of the cerebral cortex

hypophysis –pituitary gland

hypothalamus- The part of the brain that lies below the thalamus functioning to regulate bodily temperature, certain metabolic processes and other autonomic activities.

infundibulum- The funnel-shaped, unpaired prominence of the base of the hypothalamus behind the optic chiasm, continuous below with the stalk of the pituitary gland.

mammillary bodies - one of two small round structures on the undersurface of the brain that form the terminals of the anterior arches of the fornix

medulla oblongata- The lowermost portion of the vertebrate brain, continuous with the spinal cord, responsible for the control of respiration, circulation, and certain other bodily functions.

Midbrain - the middle portion of the brain

occipital lobe –one of the four lobes of the brain- posterior lobe of each cerebral hemisphere

optic chiasma- A structure in the brain formed by the partial intersection or crossing of the optic nerve fibers on the underside of the hypothalamus

parietal lobe – one of the four lobes of the brain-middle portion of each cerebral hemisphere

pineal body - A small, unpaired, flattened glandular structure lying in the depression between the two superior colliculi of the brain and secreting the hormone melatonin.

Pons- a band of nerve fibers linking the medulla oblongata and the cerebellum with the midbrain

sulci- a groove or depression on the surface of the brain separating the gyri.

temporal lobe- one of the four lobes of the brain- contain sensory center of hearing

Related Websites:

The Exploratorium: Sheep Brain Dissection (The Anatomy of Memory)

<http://www.exploratorium.edu/memory/braindissection/1.html>

The Navigable Atlas of the Sheep Brain <http://www.msu.edu/user/brains/sheepatlas/>

Sheep Brain Dissection Guide:

<http://academic.uofs.edu/department/psych/sheep/>

<http://academic.scranton.edu/department/psych/sheep/newsheep/practice/>

The Secret Life of the Brain, 3-D Brain Anatomy

A three-dimensional tour of the brain using animation to focus on the major structures and functions that those structures carry out.

<http://www.pbs.org/wnet/brain/3d/index.html>

Neuroanatomy Tutorial

Interactive tutorial that presents several brain images. Move the cursor over the brain structure and it lights up, and then click on the structure and the name of the structure appears.

<http://www.gwc.maricopa.edu/class/bio201/brain/brshpx.htm>