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ABSTRACT

This course entitled "Anatomy External" is concerned with the dissection of the fetal pig, and is one of a series of instructional guides prepared by the teachers for the Sahuarita High School (Arizona) Career Curriculum Project. It consists of five units of study, and 13 behavioral objectives relating to these units are stated. The topics covered include the external anatomy of the fetal pig, the skeletal system, the muscular system, general internal anatomy, and the digestive system. The units provide a statement of the rationale, objectives, sources of information, and student activities including dissecting directions. For related units in this series see SE 016 635 - SE 016 644. (JR)

ANATOMY EXTERNAL

ROBERT ESSER

OBJECTIVES

1. Given a fetal pig be able to tell how old the fetus is within ten days.

2. Be able to locate and name all the external parts of the fetal pig.

3. When shown a bone on an articulated skeleton you must be able to name it in writing.

4. Identify the regions of the body, information sources.

5. Unit 1 and 2 will take 3 periods; the fourth will be review for the test on the fifth period.

6. Page 4 and put page 5 here as 6.

7. Locate and identify the muscles given in the activities and information sources.

8. Locate and name the attachment of muscles on the human skeleton.

9. Identify and locate these internal parts.

Heart; Right and left ventricle and atriums

Diaphram	Right and left umbilical arteries
Spleen	Urinary bladder
Small intestine	Liver
Large intestine	Thymus gland
Lungs	Thyroid gland

10. Locate and identify these parts. Subnaxillary gland, porotid gland, Stenseus (porotid) duct, External, Maxillary artery

OBJECTIVES (Cont.)

11. Identify parts and function of Pharynx

12. Discuss the functions of the Viscera of the Peritonal Cavity.

13. Name and give the functional purpose of the digestive gland.

UNIT ONE

ANATOMY EXTERNAL

MATERIAL

Review beginning rational for this quarter. This is the disection of the fetal pig. During this time we will study and compare the pig to man. (Homo sapiens) Time (1 period)

OBJECTIVES:

1. Given a fetal pig be able to tell how old the fetus is within ten days.

2. Be able to locate and name all the external parts of the fetal pig.

INFORMATION SOURCES

1. Lecture and films strips on human anatomy and physiology.
2. Flowlore material and disections of fetal pig.
3. Fetal pig.

ACTIVITIES:

Follow instructions and picture to locate external parts of your fetal pig.

UNIT TWO

RATIONALE:

We will use the articulated skeleton of man and the hand-out to go with it for the fetal skeleton has not completely developed. This is because many of the bones are soft and cartilaginous.

OBJECTIVE:

1. When shown a bone on an articulated skeleton you must be able to name it in writing.

2. Identify the regions of the body.
information sources.

1. Unit 1 and 2 will take 3 periods; the fourth will be review for the test on the fifth period.

2. Page 4 and put page 5 here as 6.

ACTIVITY:

1. Study and learn all the bones given.

Atlas	Ribs	Skull
oxis	ilium	Porietal
vertebrae	eschium	Orbit
scapula	coxal	Zygomatic arch
humerus	Femure	Nasal
ulna	Tibia	Fronals
radius	Fibula	Maxellony
corpals	Torsals	Pre-maxellony
metacorpals	Metatorsals	Mandille
phalanges	Phalanges	Sphenoid
	Patella	

2. Find these regions on the fetal pig, articulated skeletoan, and yourself.

skull	Thoracic	Sacral
cervical	Lumbar	Candal

CHAPTER II

Skeletal System

AXIAL SKELETON

A. SKULL

The primary difference between the skull of the pig and that of the cat or man is the elongation of the bones of the cranium and the great development of the mandible in the pig.

1. Cranial portion of the skull. The cranium is composed of 1 frontal, 2 parietals, 2 temporals, 1 occipital, 1 sphenoid, and 1 ethmoid bone. Observe that in the pig the occipital bone is posterior in position, whereas in man and the cat it is both posterior and ventral.

2. Facial portion of the skull. There are 14 bones in the facial skeleton of man; 19 in the pig. The most striking feature of the facial skeleton of the pig is the elongation of the bones. Compare the length of the maxilla and the nasal bones in the human skull with those of the pig. Note also that the pig has a premaxillary bone extending back between the maxilla and the nasals, a condition which does not exist in man. Identify and learn the parts of the maxilla, zygomatic, lacrimal, nasal, vomer palatine, and mandible.

B. VERTEBRAL COLUMN

The vertebral column of man is composed of 33 vertebrae, that of the pig 51-56 depending on the number of bones in the thoracic, lumbar and coccygeal regions which show some variation.

A typical vertebra consists of the body or centrum, neural arch with spine, and anterior and posterior articular facets. In some of the vertebrae there are modifications such as the transverse foramina in the cervical vertebrae, costal facets on the thoracic vertebrae for articulation with the ribs, massive spines on the lumbar vertebrae, and fusion of vertebrae in the sacral region.

1. Cervical vertebrae. Seven in number in both man and pig, with the first two modified as atlas and axis. Notice that in the pig, the seventh cervical vertebra has an extremely long neural spine and that an articular facet for the head of the first rib is present on the centrum.

2. Thoracic vertebrae. Twelve in number in man, 14-15 in the pig, characterized by prominent neural spines which in the human vertebrae are directed downward but in the pig are more or less erect. Observe the facets on the transverse processes and the centra for articulation with the ribs.

3. Lumbar vertebrae. Five in number in man, 6-7 in the pig.

UNIT II.
Pg. 2

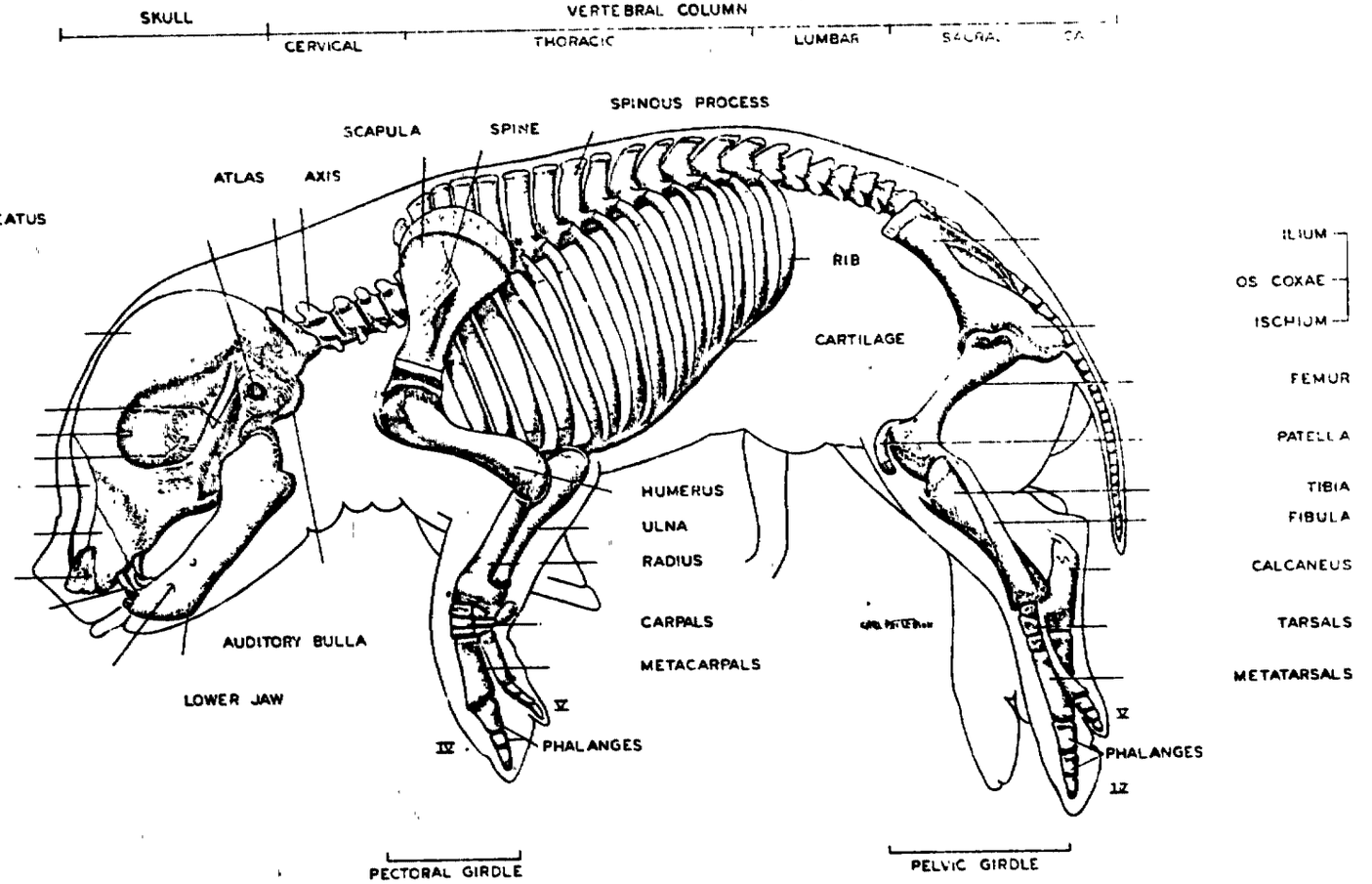

Fig. 2.—Fetal skeleton

Note the massive central, large spines, and well-developed transverse processes.

4. Sacral vertebrae. In man, these vertebrae are 5 in number and fused into a single bone, the sacrum. In the pig fetus, there are but 4 sacral vertebrae which are not fused.

5. Coccygeal vertebrae. Three to five in man which are usually fused into a single mass, the coccyx. In the pig fetus, the vertebrae in this region are separate and may number as many as 23, extending out into the tail.

C. RIBS

In man, there are 12 pairs of ribs, the first seven pairs which are called "true" ribs articulating with the thoracic vertebrae by means of head and a tubercle and with the sternum by means of costal cartilages. Of the next five pairs of ribs the first three pairs are called "false" ribs because they do not possess independent costal cartilages for attachment to the sternum; the last two pairs of ribs have no sternal connection of any kind and are known as "floating" ribs.

There are 14 or 15 ribs in the pig fetus, with the fifteenth consisting almost entirely of cartilage. The first seven pairs are joined to the sternum. Note the head, neck tubercle, anterior and posterior borders.

D. STERNUM

Very similar in both man and pig, consisting of three parts, the anterior manubrium, middle gladiolus or body, and posterior cartilaginous xiphoid process.

APPENDICULAR SKELETON

A. PECTORAL GIRDLE AND ANTERIOR APPENDAGE

For all the bones concerned with the girdle and appendage except those of the wrist and hand, be able to differentiate between the right and left bone.

1. Pectoral girdle. In man, this is composed of the scapula and the clavicle. In the pig, there is no clavicle. The scapula of the fetal pig consists of a great deal of cartilage which does not ossify until some time after birth. Even in the adult pig, the vertebral border of the scapula consists of a scapular cartilage which never ossifies except at its lower edge where it is in contact with the bone.

2. Anterior appendage. In man, this includes a humerus, radius, ulna, 8 carpal bones, 5 metacarpals, and 5 digits composed of 14 phalanges. In the pig, the humerus, radius, and ulna are short and thick with the proximal and distal ends cartilaginous. The wrist is composed of 8 carpal bones, there are 4 metacarpals present, and 4 digits each with 3 phalanges.

E. PELVIC GIRDLE AND POSTERIOR APPENDAGE

1. Pelvic girdle. Included here are the innominate bones consisting of a fused ilium, ischilum, [illegible]is in man and the same three bones, still unfused, in the fetal pig. Union of the elements of the innominate bone in the pig requires about one year. Note the elongated condition of the innominate in the pig.

2. Posterior appendage. Composed of the femur, patella, tibia, fibula, 7 tarsal bones, 5 metarsals, and 5 digits with 14 phalanges in man. In the pig fetus, the femur and tibia are short thich bones, the fibula somewhat more slender. The ankle is composed of 7 tarsals, and there are 4 digits each with 3 phalanges.

The following material has been deleted: Skeleton of adult pig. Superficial Muscles. Lateral view. External organs. Muscles, dorsal view. Ventral view. Muscles of shoulder, neck and arm. Muscles of chest and throat.

CHAPTER III

MUSCULAR SYSTEM

[illegible]

[illegible] the fetal pig make sure that you know what you are doing and how you are doing it. You will also be [illegible] the attachment of these muscles on man.

[illegible] including [illegible] tests

OBJECTIVE:

1. Locate and identify the muscles given in the activities and information sources.

2. Locate and name the attachment of muscles on the human skeleton.

I. DIRECTIONS FOR DISSECTION OF THE MUSCLES

Start the incision on the ventral side at the base of the throat, being sure that you are cutting only through the skin. Carry the cut back to the level of the hind legs and continue down the medial surface of the right hind leg. Notice whether there is any difference in the thickness of the skin between the anterior and posterior ends of the body. Now go back to the forelegs and carry the original mid-ventral incision down the medial surface of the leg to the hoof. Completely remove the skin from the left side of the body and from the left appendages. Notice the mammary tissue before it is removed.

As the skin is being removed, notice the very thin layer of superficial fascia which lies between the skin and the layer below. The latter is the cutaneous maximus, a sheet of muscle which underlies the skin of the trunk region. This must be removed before the muscles of the back and shoulder can be studied. Note the layer of fascia which lies between the cutaneous maximus and the trapezius group of muscles.

II. MUSCLES OF THE BACK AND SHOULDER

A. Latissimus dorsi. A broad muscle running downward and anteriorly around the sides of the thoracic region. If the muscle fibers are not immediately apparent, carefully pick

...the surface layer from the sides of the chest until the fibers come into view. Origin, from the lumbar and some of the last thoracic vertebrae and from the lumbodorsal fascia; insertion, by means of a tendon in to the proximal end of the humerus on its medial face; action, moves the forelimb dorsally and posteriorly.

...trapezius

...part of a broad muscle group anterior to the preceding and covering part of its posterior edge. Origin, spines of the cervical vertebrae; insertion, spines of the thoracic vertebrae back to about the tenth; insertion, by a broad thin tendon into the scapula; action, moves scapula dorsally and posteriorly.

C. Acromiotrapezius. A short broad fan-shaped muscle, rather thin, and working in part with the spinotrapezius. Origin, spines of the cervical vertebrae; insertion, spine of the scapula by means of a broad aponeurosis; action, pulls the scapula toward the mid-dorsal line.

D. Clavotrapezius. A long thick muscle band just anterior to the preceding muscle called the brachiocephalic; the ventral half of the brachiocephalic; is known as the clavobrachialis. The full length of the brachiocephalic, extending obliquely from skull to humerus, is most readily exposed by removing the fairly large mass of gelatinous and fibrous connective tissue at the side of the throat. Origin of the clavotrapezius, back of the skull and transverse processes of the first few cervical vertebrae; insertion, would ordinarily be the clavicle but since this structure is lacking in the pig, the clavotrapezius is continous with the clavobrachialis and inserts into the anterior surface of the distal end of the humerus; action, moves the forearm anteriorly.

E. Rhomboideus. Cut carefully through the bellies of the spinotrapezius and the acromiotrapezius muscles and reflect the cut ends. A rather large muscle, consisting of a number of separate slips, will be exposed. These slips extend from the upper edge of the scapula to the anterior part of the neck. Origin, spines of the cervical and thoracic vertebrae; insertion, into the scapula; action, moves the scapula dorsally. Note that one of the slips extends forward as a strap-like muscle to the back of the scull; this is the rhomboideus capitis.

[illegible] A thick mass of muscle readily seen underlying the [illegible] group. Origin, from the mid-dorsal line; insertion [illegible] the external occipital crest of the skull; action, raises the humerus.

C. Long deltoid. A long slender muscle running down over the anterior [illegible] of the shoulder to the forelimb. Origin from the scapular [illegible], insertion, into other shoulder muscles and into the proximal end of the humerus; action, raises the humerus.

H. Spinodeltoid. Somewhat larger than the preceding and just posterior to it. Origin, spine of the scapula; insertion, [illegible] to the proximal end of the humerus [illegible] with the acromiodeltoid.

I. Serratus anterior. This muscle originates as separate slips from the fourth to the eighth ribs, the fibers passing forward to insert into the dorsal medial edge of the scapula. It is best seen by first removing the latissimus dorsi muscle and then raising the forelimb away from the body wall.

III. MUSCLES OF THE CHEST AND ABDOMEN

A. Pectoralis major. A broad fan-shaped muscle. Origin, from the sternum; insertion, into the proximal end of the humerus; action, draws the forelimb toward the chest. Notice the deep layer of the pectoralis major which is an elongate muscle extending posteriorly whose fibers come into close association with the fibers of the rectus abdominis muscle.

B. External oblique. Part of the lateral abdominal wall. Observe that the fibers of the muscle run downward and backward. Origin, by slips from the lower ribs and from the lumbodorsal fascia; insertion, by means of an aponeurosis into the linea albe; action, constricts abdomen.

C. Internal oblique. Cut a small "window" in the external oblique, deepening the area gradually until you can see that the fibers now run upward, almost at right angles to those of the external oblique. Origin, from the lumbodorsal fascia; insertion, into the linea alba; action, like the external oblique.

D. Transversus. A very thin muscle whose fibers are oriented almost dorsoventrally. Carefully remove a small portion of the internal oblique near the linea alba in the posterio-lateral region of the abdomen. The thin-layered muscle which will be exposed is the transversus abdominis. Strip away a part of this muscle and notice the shiny peritoneum which is thus exposed. Origin of the transversus, [illegible] dorsal fascia; insertion, into the linea alba; action, [illegible] the obliques.

E. Rectus abdominis. Two long strips of muscle lying on either side of the mid-ventral line and covered by the aponeuroses of the obliques and transversus. Slit the aponeuroses to expose the muscle. Origin, from the pubic symphysis; insertion, into the sternum; action, constricts abdomen.

IV. MUSCLES OF THE UPPER FORELIMB

A. Triceps brachii. A large muscle mass covering almost the entire outer surface of the upper part of the forelimb. Origin, from the humerus; insertion, into the ulna; action, extends the forelimb.

B. Biceps brachii. A rather small spindle-shaped muscle mass lying along the anterior surface of the humerus and largely covered by the clavobrachialis muscle. Origin, from the glenoid area; insertion, into the radius; action, flexes the forelimb.

V. MUSCLES OF THE LOWER FORELIMB

There are a number of muscles of the lower forelimb most of which are concerned with movements of the foot; not all of these muscles will be identified. Beginning with the posterior edge of the forelimb, identify the following:

A. Extensor carpi ulnaris. Locate the olecranon process of the ulna to serve as a landmark. Now find a long slender muscle on the outer surface of the forelimb. Origin, lateral epicondyle of the humerus; insertion, by means of a long thin tendon into the fifth metacarpal.

B. Extensor digitorum lateralis. Similar in appearance to the preceding and lying just anterior to it. Origin, lateral surface

of the distal end of the humerus; insertion, by means of a divided tendon into the digits.

C. [illegible] digitorum communis. A long thin muscle similar to the [illegible] lying anterior to it along the lateral surface of the [illegible] origin, from the lateral surface of the distal end of the humerus; insertion, by means of a divided tendon into the digits; action, in commom with the two preceding muscles, extensor of the digits.

D. Extensor carpi radialis. Lying anterior to the preceding and sometimes partially covered by it. Origin, from the distal end of the humerus; insertion, into the distal end of the radius; action, rotation of the foot.

E. Brachioradialis. Anterior to the preceding muscle and often somewhat widely separated from it. Origin, on the humerus; insertion, lower part of the radius; action, rotation of forelimb.

VI. MUSCLES OF THE NECK AND THROAT

A. Sternohyoid. Two long flat muscles united to each other in the midline of the throat and extending from the sternum to the hyoid bone. Find the junction point of the muscles to each other and slit them apart. Notice the large masses of thymus gland lying below the muscles. Origin, from the first costal cartilage; insertion, into the body of the hyoid; action, moves the hyoid posteriorly.

B. Sternothyroid. Cut across the bellies of the sternohyoids and expose two small slender muscles. Notice that after taking origin from the sternum, the muscles each separate into two parts and insert at two points, the lateral and ventral surfaces of the thyroid cartilage of the larynx; action, moves the larynx posteriorly.

C. Sternomastoid. A rather thick narrow band of muscle running obliquely from the back of the skull to the sternum. Origin, from the sternum; insertion, into the lamboidal ridge and the mastoid process; action, turns the head.

VII. MUSCLES OF THE THIGH

1. Tensor fascia lata. A large, somewhat triangular muscle, thin in its upper muscular portion and with a long tendon proceeding ventrally onto the paella. Origin, from the line crest; insertion, into the patella by means of a long tendon; action, tightens fascia lata.

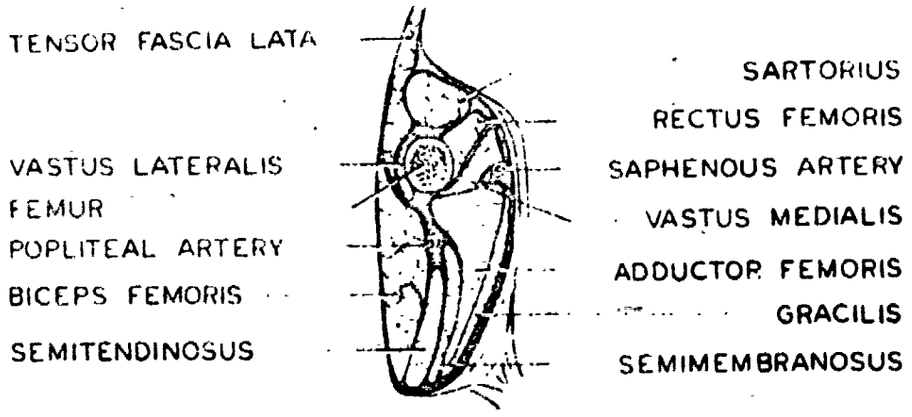

Fig. 7.—Muscles of thigh, cross section

The following material has been deleted: Muscles of thigh, lateral view.
General Internal Anatomy.
Digestive System.

UNIT FOUR

GENERAL INTERNAL ANATOMY

RATIONAL:

Follow instructions.
Time Two periods not including a one period test.
Total of three periods.

OBJECTIVE:

Identify and locate these internal parts.

Heart; Right and left ventricle and atriums

Diaphram

Spleen

Small intestine

Large intestine

Lungs

Right and left umbilical arteries

Urinary bladder

Liver

Thymus gland

Thyroid gland

ACTIVITIES:

Pages 26,21,22,23

UNIT FIVE

DIGESTIVE SYSTEM

(Time-10 periods including tests)

OBJECTI :

1. Locate and identify these parts. Subnaxillary gland, porotid gland, Stenseus (porotid) duct, External, Maxillary artery

2. Identify parts and function of Pharynx

3. Discuss the functions of the Viscera of the Peritonal Cavity.

4. Name and give the functional purpose of the digestive gland.

QUEST:

This unit is th final one for this quarter- if you have time do unit 5 on the Urogenital System.