

Phylum Chordata:

Subphylum Vertebrata - Mammals

Bio 1413: Ziser, 2008

[Exercise 22; p 331]

Classification:

Class Mammalia (mammals)

- mammary glands
- four chambered heart
- muscular diaphragm
- homeothermy
- hair derived from epidermis
- with claws, nails or hoofs
- viviparous with placental attachment to mother during development

Lab Activities:

1. Mammalian skin

Observe the slide of skin. Know: **epidermis, dermis. stratum corneum, hair follicle, hair shaft, oil glands, sweat glands, arrector pili muscle**

slide: mammal skin, sec

2. Modifications of Hair

a. Horns and Antlers.

Observe and distinguish between horns and antlers. **Horns** are produced mostly in hoofed animals and grow around a core of bone throughout the animals life. The tough, horny layer surrounding the bony core is *homologous* to the hair you saw under the microscope. In contrast, the **antlers** of deer, elk, caribou, etc are made of bone. As they first begin growing they are covered with a layer of "fuzzy" or hairy epidermis called **velvet**, which eventually falls away. Antlers are shed and regrown annually. They are not homologous to the keratinized horn above.

Misc. horns & antlers

b. Armor

The protective flexible carapace and scutes of the armadillo are formed from fused hairs.

armadillo illustration

c. Defensive hairs

Porcupines and hedgehogs have thick sharp hairs called **quills** that they use for defense. While the porcupine cannot "shoot" its quills, they do break off easily once embedded in the attacker.

porcupine quills

3. Skeletal System

a. Human & Cat (p 333, fig 22-2 & p 334, fig 22-4)

Know: **axial skeleton, skull, vertebrae, ribs, sternum, appendicular skeleton, pectoral girdle, shoulder blade, clavicle, humerus, radius, ulna, carpals, metacarpals, phalanges, pelvic girdle, femur, tibia, fibula, tarsals, metatarsals, phalanges**

**human skeleton
cat skeleton**

b. Bat wing

Identify the bones of the pectoral appendages of the bat and note how they have been modified to form the support for the wings.

bat skeleton

Compare the skeletal structure of the bat wing with that of the bird.

c. **Mole digging appendage**

mole skeleton

Compare the structure of the forelimb of a mole with that of the cat, human and bat. Moles spend their lives digging underground tunnels searching for food.

Be able to identify the bones and note the modifications for digging.

d. **secondary palate**

various skulls

Note how the bony extension of the **maxilla** bone forms a **secondary palate** in mammals which separates the **nasal passages** from the **mouth**. This makes respiration more efficient in these warmblooded animals which require plenty of oxygen.

Compare this with skulls from amphibians, reptiles and birds as available.

e. **Ear bones**

malleus, incus, stapes

In mammals the sense of hearing is well developed due partly to the presence of three **ear ossicles** the **malleus** (hammer), **incus** (anvil) and **stapes** (stirrup) instead of just one, the **columella** (homologous to the stapes) common in amphibians, reptiles and birds. These additional ear bones evolved from some of the extra jaw bones found in reptiles.

f. **feeding adaptations**

mammal skulls

Just as the beaks of birds are modified for various feeding types, the teeth of mammals are variously modified for various types of foods. Carnivorous mammals typically have large canines to hold onto prey, sharp incisors to cut pieces of flesh and pointed premolars to help chew meat. Herbivore typically have small canines or no canines, nipping incisors and broad flat premolars and molars for grinding the tough plant fiber before swallowing. Omnivores' teeth share some of the characteristics of both feeding types. Observe the teeth in the various skulls and determine whether the animal is a **carnivore** (a meat eater), an **herbivore** (a plant eater) or an **omnivore** (eats both plant and animal foods).

4. **The Fetal Pig**

preserved: fetal pig

READ the dissecting procedure in your lab manual beginning on page 344 (Exercise 22 C). Know the following structures

a. External anatomy: **head, trunk, thorax, abdomen, forelimbs (pectoral appendages), hindlimbs (pelvic appendages), mouth, eyes, ears, snout, nostrils, vibrissae, neck, umbilical cord, mammae, urogenital opening**

b. Internal anatomy

preserved: fetal pig

General Internal Anatomy: **salivary glands, hard palate, soft palate, pharynx, epiglottis, thymus gland, larynx, trachea, esophagus, bronchi, diaphragm, thoracic cavity, pericardial cavity, heart, lungs, peritoneal cavity, liver, gallbladder, stomach, pancreas, small intestine, large intestine**

Muscular System: skip

Urogenital System: **kidneys, ureter, bladder, ovary, uterus, vagina, genital papilla, testes, vas deferens, penis**

Circulatory System: **4-chambered heart, atria, ventricles, valves, pulmonary artery, aorta, vena cava**

5. Miscellaneous mammalian tissues and organs

a. **Alveoli**

the mammal lung is the most efficient of vertebrates. Million of microscopic sacs called alveoli combine to produce a large surface area for gas exchange.

slide: mammal lung, sec

b. **Heart**

the large size of the cow heart should make it relatively easy to find the **atria, ventricles, AV valves, semilunar valves, aorta, pulmonary artery, pulmonary veins and vena cava**

preserved: cow heart

c. **Vertebrate hearts**

compare the four chambered heart of mammals to the hearts of the other vertebrate classes already seen

**vertebrate heart
plastimount &
illustrations**

d. **Mammal nervous system**

Study the preserved cat nervous system and distinguish between the **central** and **peripheral nervous systems**

cat nervous system,

e. **Human brain**

Find: **cerebrum, cerebellum, brain stem, olfactory bulb, pituitary gland**

model: human brain

How is the human brain different from the brain of other mammals

Demonstrations:

- Various illustrations of mammalian diversity
- Mammalian anatomy.
- Internal anatomy of the cat
- Human evolution

Disposal:

Do not discard the fetal pigs, return them to the bucket