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DEPARTMENT: Anatomy

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COURSE: Animal Handling & Comparative Mammalian Gross Anatomy

1. What is Comparative Anatomy?

Comparative anatomy is the study of the structural similarities and differences of organisms. The systematic study of the comparative anatomy of various types of animals began in earnest with the researches of the ancient Greek Aristotle. Comparative anatomy involves comparing the body structures of two species. 'Comparative' means to look at the similarities between two things, and 'anatomy' has to do with the structure of the body. Scientists can look at anatomical structures of seemingly unrelated animals to tell how related they are.  Similar body parts may be homologies or analogies. Both provide evidence for evolution. Homologous structures are structures that are similar in related organisms because they were inherited from a common ancestor. These structures may or may not have the same function in the descendants. While Analogous structures are structures that are similar in unrelated organisms. The structures are similar because they evolved to do the same job, not because they were inherited from a common ancestor.

1. Highlight the criteria necessary to caring for laboratory animals.

* Control of Temperature and Humidity

Maintenance of body temperature within normal circadian variation is necessary for animal well-being. Animals should be housed within temperature and humidity ranges appropriate for the species, to which they can adapt with minimal stress and physiologic alteration. To maintain body temperature under a given environmental temperature animals adjust physiologically (including their metabolism) and behaviorally (including their activity level and resource use).

* ProperVentilation and Air Quality

The primary purpose of ventilation is to provide appropriate air quality and a stable environment. Specifically, ventilation provides an adequate oxygen supply; removes thermal loads caused by the animals, personnel, lights, and equipment; dilutes gaseous and particulate contaminants including allergens and airborne pathogens; adjusts the moisture content and temperature of room air; and, where appropriate, creates air pressure differentials (directional air flow) between adjoining spaces. Importantly, ventilating the room (i.e., the macroenvironment) does not necessarily ensure adequate ventilation of an animal’s primary enclosure (i.e., the microenvironment), that is, the air to which the animal is actually exposed. The type of primary enclosure may considerably influence the differences between these two environments—for example, differences may be negligible when animals are housed in open caging or pens, whereas they can be significant when static isolator cages are used.

#### Illumination

Light can affect the physiology, morphology, and behavior of various animals. Numerous factors can affect animals’ needs for light and should be considered when an appropriate illumination level is being established for an animal holding room. These include light intensity and wavelength as well as the duration of the animal’s current and prior exposure to light, and the animal’s pigmentation, circadian rhythm, body temperature, hormonal status, age, species, sex, and stock. More recent studies in rodents and primates have shown the importance of intrinsically photosensitive retinal ganglion cells (distinct from rods and cones) for neuroendocrine, circadian, and neurobehavioral regulation. These cells can respond to light wavelengths that may differ from other photoreceptors and may influence the type of lighting, light intensity, and wavelength selected for certain types of research.

#### Noise and Vibration control

Noise produced by animals and animal care activities is inherent in the operation of an animal facility and noise control should be considered in facility design and operation. Assessment of the potential effects of noise on an animal warrants consideration of the intensity, frequency, rapidity of onset, duration, and vibration potential of the sound and the hearing range, noise exposure history, and sound effect susceptibility of the species, stock, or strain. Similarly, occupational exposure to animal or animal care practices that generate noise may be of concern for personnel and, if of sufficient intensity, may warrant hearing protection.

Separation of human and animal areas minimizes disturbances to both human and animal occupants of the facility. Noisy animals, such as dogs, swine, goats, nonhuman primates, and some birds (e.g., zebra finches), should be housed away from quieter animals, such as rodents, rabbits, and cats. Environments should be designed to accommodate animals that make noise rather than resorting to methods of noise reduction.

* Investigators and other personnel shall be appropriately qualified and experienced for conducting procedures on living animals. Adequate arrangements shall be made for their in-service training, including the proper and humane care and use of laboratory animals. conduct of experimentation on living animals exclusively by and/or under the close supervision of qualified and experienced personnel
* provision of adequate veterinary care
* Access to species appropriate food and water.
* Where exceptions are required in relation to the provisions of these Principles, the decisions should not rest with the investigators directly concerned but should be made . . . by an appropriate review group such as an IACUC. Such exceptions should not be made solely for the purpose of teaching or demonstration
* Procedures involving animals should be designed and performed with due consideration of their relevance to human or animal health, the advancement of knowledge, or the good of society
* The animals selected for a procedure should be of an appropriate species and quality and the minimum number required to obtain valid results. Methods such as mathematical models, computer simulation, and in vitro biological systems should be considered.
* Proper use of animals, including the avoidance or minimization of discomfort, distress, and pain when consistent with sound scientific practices, is imperative. Unless the contrary is established, investigators should consider that procedures that cause pain or distress in human beings may cause pain or distress in other animals.
* Animals that would otherwise suffer severe or chronic pain or distress that cannot be relieved should be painlessly killed at the end of the procedure or, if appropriate, during the procedure. use of appropriate sedation, analgesia, and anesthesia.

1. Highlight the similarities and differences in the digestive system anatomy of amphibians.

**Differences in the digestive system anatomy**

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| Amphibians (Frog) | Humans |
| 1. Since frogs have shorter small intestine than humans, most of nutrient absorption occurs in the ileum after the proteins, carbohydrates, lipids and nucleic acid are already broken down in the duodenum. | Majority of nutrient absorption in humans occur in the jejunum. |
| 1. Frogs' teeth are only used to hold something in place or something, as they usually always just swallow their prey whole. | Humans use their teeth for all functions, including chewing things up, which frogs don't have the capacity to do. |
| 1. Only have cloacae, where elimination of undigested material occurs. | Rectum and urethra is present, where elimination of undigested material occurs. |
| 1. Human tongues are attached to the backs | Frogs' tongues are connected right where their mouths start. |
| 1. No presence of appendix | The appendix is present. |
| 1. Have maxillary teeth and vomerine teeth | Only one set of teeth is present. |
| 1. The tongue of a frog is sticky | The human tongue is not sticky. |
| 1. The tongue of the frog is attached to the starting point of the mouth. | The tongue of the human is attached to the back of the mouth. |
| 1. The tip of the tongue is folded backward | The tip of the tongue is straight. |
| 1. They swallow their prey without chewing. | Chewing is a type of mechanical digestion in humans. |

**Similarities in the digestive system anatomy of amphibians and man.**

1. Presence of mouth
2. Presence of oesophagus
3. Presence of tongue
4. Presence of teeth
5. Presence of small intestine
6. Presence of stomach
7. Presence of liver
8. Presence of gall bladder
9. Presence of large intestine