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ANA314 Animal Handling and Comparative Mammalian Gross Anatomy Assignment

1. What is comparative anatomy?

**Answer**

Comparative anatomy is defined as the study of similarities and differences in the anatomy of different species.

It can also be defined as the comparative study of the body structures of different species of animals in order to understand the adaptive changes they have undergone in the course of evolution from common ancestors. Comparative anatomy is closely related to evolutionary biology and phylogeny which is the evolution of species.

Some organisms have anatomical structures that are very similar in embryological development and form, but very different in function. These structures are called **Homologous Structures.** since these structures are so similar, they indicate an evolutionary relationship and a common ancestor of the species that possess them. A clear example of homologous structures is the forelimb of mammals. When examined closely, the forelimbs of humans, whales, dogs and bats are very similar in structure. Each possess the same number of bones, arranged in almost the same way. While they have different external features and they function in different ways, the embryological development and anatomical similarities are striking.

Other organisms have anatomical structures that function in very similar ways, however, morphologically and developmentally these structures are very different. These are called **Analogous Structures.** Since these structures are so different, even though they do not have the same function, they do not indicate an evolutionary relationship nor that two species share a common ancestor. For example, the wings of a bird and a dragonfly both serve the same function; they help the organism to fly. However, when comparing the anatomy of these wings, they are very different. Analogous structures are evidence that these organisms evolved along separate lines.

**Vestigial Structures** are anatomical features that are still present in an organism (although often reduced in size) even though they no longer serve a function. Whales which evolved from land animals, have vestigial hind leg bones in their bodies. While they no longer use these bones in their marine habitat, they do indicate that whales share an evolutionary relationship with land mammals. Human have more than hundred vestigial structures in their bodies e.g. the coccyx, the appendix, the male breast.

Comparative anatomy is important because;

* It has long served as evidence for evidence for evolution now joined in that role by comparative genomics. It indicates that organisms have a common ancestor.
* It also assists scientists in classifying organisms based on similar characteristics of their anatomical structures.

1. Highlight the criteria necessary for caring for laboratory animals

**Answer**

The guide for the care and use of laboratory animals establishes standards for laboratory animals’ environment in regard to; room temperature, humidity, ventilation, illumination and light schedule.

1. **Room Temperature**: Animal room temperatures should be continuously monitored and checked at least once daily. Temperatures of 65-75 0F (18-23 0C) with 40-60% humidity are recommended. Temperatures within the cages will be higher than room temperature. If bedding material is present, the animal can manipulate its own immediate environment and provide a warm nest. If an animals’ thermoregulatory ability has been affected by anesthesia or other scientific procedure, a higher room temperature or more bedding material should be provided.
2. **Humidity:** Extreme variations in relative humidity can have adverse effects on the wellbeing of animals and by affecting the rate of heat loss, can influence activity and food intake. The relative humidity in animal rooms should be kept at should normally be maintained at 40-60% irrespective of the stocking density. Prolonged periods below 40% or above 70% should be avoided.
3. **Ventilation:** The ventilation rate of the room should be related to its stocking density and to the heat generated by equipment in the room. The functions of the ventilation system are;

* to regulate within prescribed limits temperature and humidity,
* to reduce the levels and spread of odors, noxious gases, dust and infectious agents,
* to provide sufficient air of an appropriate quality.

1. **Illumination and Light Schedule:** Most laboratory mammals are either crepuscular or nocturnal, therefore, for practical considerations due to common work hours, researchers should be aware of the lighting schedules used in the rodent housing rooms (commonly 12hr dark: 12hr light or 10hr dark: 14hr light). Disruption of light schedules may cause the animals to be perturbed, which may have effects on breeding performance and on circadian rhythms.
2. Highlight the similarities and differences in the digestive system of amphibians

**Answer**

**Similarities in the Digestive System of Amphibians and Mammals**

|  |  |  |
| --- | --- | --- |
| **Amphibians e.g. frog** | **Mammals e.g. man** | |
| 1. Presence of tongue | Presence of tongue | |
| 1. Presence of teeth | Presence of teeth | |
| 1. Presence of esophagus which moves food into the body. | Presence of esophagus which moves food into the body | |
| 1. Has gall bladder which holds bile from the liver | Has gall bladder which holds bile from the liver | |
| 1. Small intestine works to absorb all the nutrients into the blood stream | Small intestine works to absorb all the nutrients into the blood stream | |
| 1. Large intestine is the waste collector of the body. | Large intestine is the waste collector of the body. | |
| 1. Stomach functions to process food | Stomach functions to process food | |
| 1. Their liver functions to secrete substances that break ingested substances down | Their liver functions to secrete substances that break ingested substances down |
|  |  |

**Differences in the Digestive System of Amphibians and Mammals**

|  |  |
| --- | --- |
| **Amphibians e.g. frog** | **Mammals e.g. man** |
| 1. They possess sticky tongues | Do not possess sticky tongues. |
| 1. Food is swallowed without chewing. | Chew before swallowing. Chewing is mechanical in mammals. |
| 1. The top of their tongue is folded backwards. | The top of their tongue is straight. |
| 1. They have two sets of teeth (the maxillary teeth and the vomerine teeth). | They have one set of teeth. |
| 1. When swallowing, frogs blink or close their eyes | This is not seen in man |
| 1. Their teeth are majorly used to hold prey. Possess weak teeth. | Their teeth are used to chew food as well as hold prey. Possess strong teeth. |
| 1. Their intestines are shorter and have only two parts (the duodenum and the ileum). | Have longer intestines with three parts (the duodenum, ileum and the jejunum). |
| 1. Their tongue is attached to the starting point of their mouth. | Their tongue is attached to the back of their mouth. |
| 1. Absorption of nutrients takes place in the ileum. | Absorption of nutrients mostly occurs in the jejunum. |
| 1. Elimination of food substances occurs through the cloaca. | Elimination of undigested food substances occurs through the rectum. |
| 1. Do not possess an appendix. | Possess appendix. |