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17/MHS01/074

ANATOMY

ANA 314

QUESTION 1

Comment on the relevance of comparative anatomy to evolution

There are many forms of evidence for evolution and one of the strongest form of evidence is comparative anatomy. Organisms with similar anatomical features are assumed to be relatively closely related evolutionarily and they are assumed to share a common ancestor.

Comparative anatomy is an important tool that helps determine evolutionary relationships between organisms and whether or not they share common ancestor. It assists scientists in classifying organisms based on similar characteristics of their anatomical structures. A common example of comparative anatomy is the similar bone structures in forelimbs of cats, whales, bats, and humans. All of these appendages consist of the same basic parts; yet, they serve completely different functions. The skeletal parts which form a structure used for swimming, such as a fin, would not be ideal to form a wing, which is better-suited for flight. One explanation for the forelimbs' similar composition is descent with modification. Through random mutations and natural selection, each organism's anatomical structures gradually adapted to suit their respective habitats.

QUESTION 2

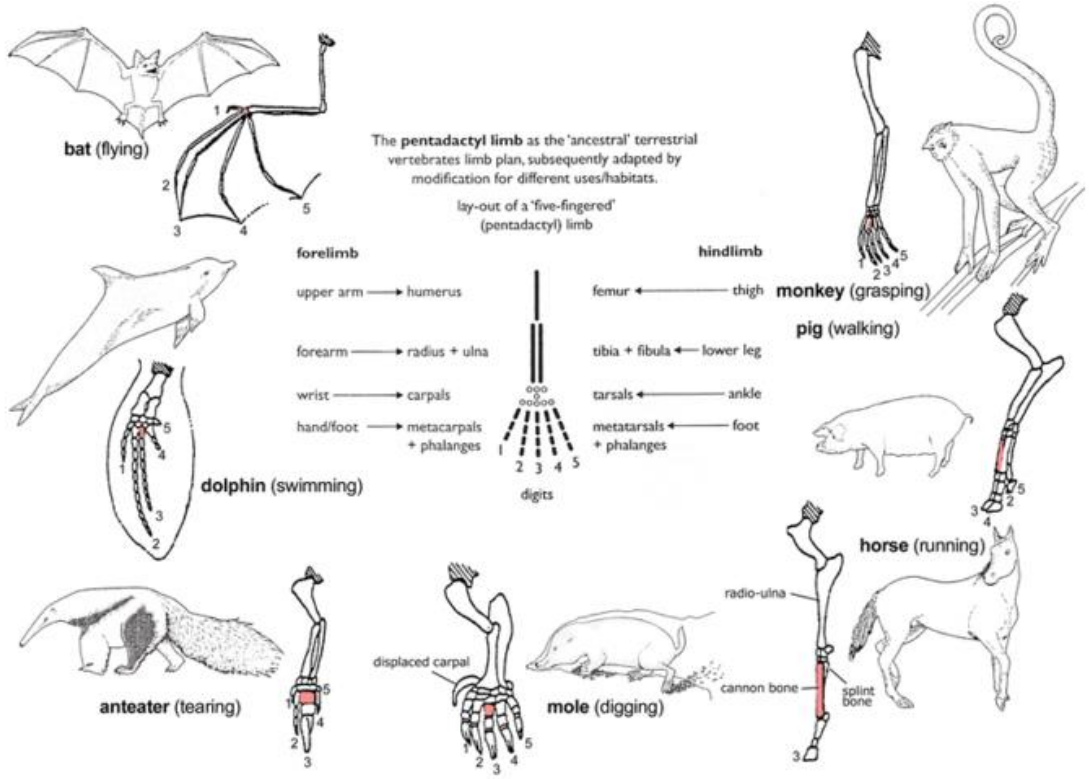
Discuss types of comparative anatomy with relevant examples

- Homologous structures
- Analogous structures
- Vestigial structures

Homologous structure: Theses are organs with similar structure but different functions. Homology is the relationship between structures or DNA derived from the most recent common ancestor. A common example of homologous structures in evolutionary biology are the wings of bats and the arms of primates. Although

these two structures do not look similar or have the same function, genetically, they come from the same structure of the last common ancestor. Homologous traits of organisms are therefore explained by descent from a common ancestor.

It's important to note that defining two structures as homologous depends on what ancestor is being described as the common ancestor. If we go all the way back to the beginning of life, all structures are homologous.



Homology in the forelimbs of vertebrates: The principle of homology illustrated by the adaptive radiation of the forelimb of mammals. All conform to the basic pentadactyl pattern but are modified for different usages. The third metacarpal is shaded throughout; the shoulder is crossed-hatched.

In genetics, homology is measured by comparing protein or DNA sequences. Homologous gene sequences share a high similarity, supporting the hypothesis that they share a common ancestor.

Homology can also be partial: new structures can evolve through the combination of developmental pathways or parts of them. As a result, hybrid or mosaic structures can evolve that exhibit partial homologies. For example, certain compound leaves of flowering plants are partially homologous both to leaves and shoots because they combine some traits of leaves and some of shoots.

Analogous structures: These are features of different species that are similar in function but are structurally different. Analogous structures are examples of convergent evolution, where two organisms separately have to solve the same evolutionary problem – such as staying hidden, flying, swimming, or conserving water – in similar ways. The result is similar body structures that developed independently.

In the case of analogous structures, the structures are not the same, and were not inherited from the same ancestor. But they look similar and serve a similar purpose.

For example, the wings of an insect, bird, and bat would all be analogous structures: they all evolved to allow flight, but they did not evolve at the same time, since insects, birds, and mammals all evolved the ability to fly at different times.

Vestigial structures: Many animals have structures in their body which are of no importance to them. These structures are called the vestigial structure.

Example of vestigial structures in humans are appendix, coccyx, hair, etc