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Dept: Anatomy

Matric no: 17/MHS01/026

1. Comment on the relevance of comparative anatomy to evolution

* There are many forms of evidence for evolution. One of the strongest forms of evidence is comparative anatomy; comparing structural similarities of organisms to determine their evolutionary relationships. Organisms with similar anatomical features are assumed to be relatively closely related evolutionarily, and they are assumed to share a common ancestor. As a result of the study of evolutionary relationships, anatomical similarities and differences are important factors in determining and establishing classification of organisms.

Some organisms have anatomical structures that are very similar in embryological development and form, but very different in function. These 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 all are very similar in structure. Each possesses 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 in form are striking. By comparing the anatomy of these organisms, scientists have determined that they share a common evolutionary ancestor and in an evolutionary sense, they are relatively closely related.

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 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 dragonfly both serve the same function; they help the organism to fly. However, when comparing the anatomy of these wings, they are very different. The bird wing has bones inside and is covered with feathers, while the dragonfly wing is missing both of these structures. They are analogous structures. Thus, by comparing the anatomy of these organisms, scientists have determined that birds and dragonflies do not share a common evolutionary ancestor, nor that, in an evolutionary sense, they are closely related. 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. When comparing anatomy of two organisms, presence of a structure in one and a related, although vestigial structure in the other is evidence that the organisms share a common evolutionary ancestor and that, in an evolutionary sense, they are relatively closely related. Whales, which evolved from land mammals, 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. Humans have more than 100 vestigial structures in their bodies. Comparative anatomy is an important tool that helps determine evolutionary relationships between organisms and whether or not they share common ancestors. However, it is also important evidence for evolution. Anatomical similarities between organisms support the idea that these organisms evolved from a common ancestor. Thus, the fact that all vertebrates have four limbs and gill pouches at some part of their development indicates that evolutionary changes have occurred over time resulting in the diversity we have today.

2. discuss the types of comparative anatomy with relevant examples

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