

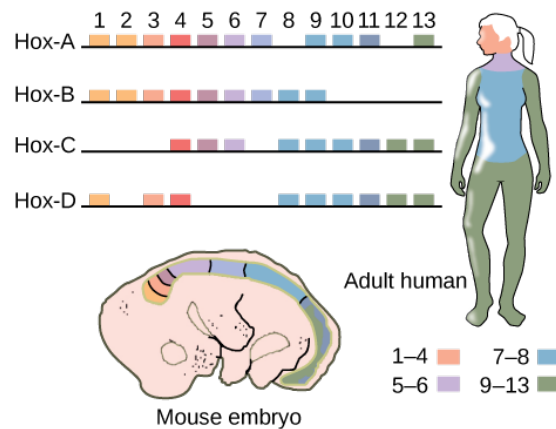
Biology 2e

Unit 5: Biological Diversity

Chapter 27: Introduction to Animal Diversity

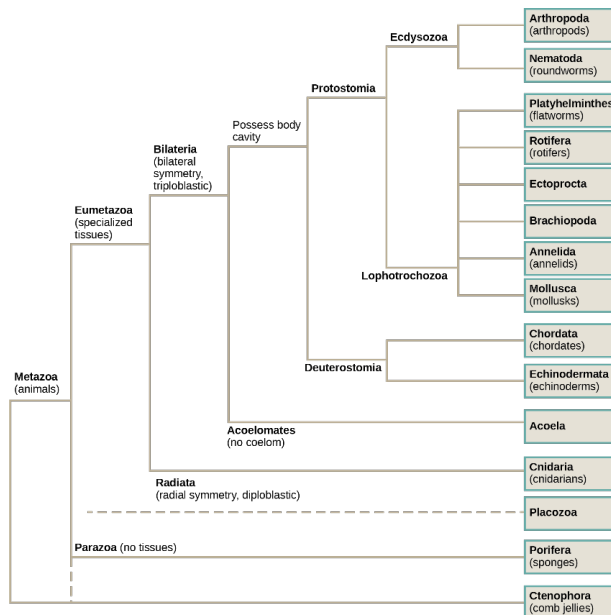
Visual Connection Questions

1. If a *Hox 13* gene in a mouse was replaced with a *Hox 1* gene, how might this alter animal development?



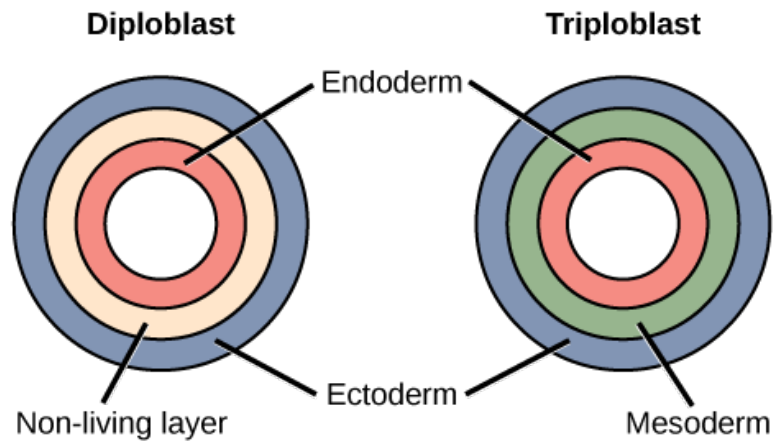
The animal might develop two heads and no tail.

2. Which of the following statements is false?



c. Acoela and Cnidaria both possess radial symmetry.

3. Which of the following statements about diploblasts and triploblasts is false?



d. The mesoderm gives rise to the central nervous system.

Review Questions

4. Which of the following is not a feature common to most animals?

b. asexual reproduction

5. During embryonic development, unique cell layers develop and distinguish during a stage called _____.

c. the gastrula stage

6. Which of the following phenotypes would most likely be the result of a *Hox* gene mutation?

d. two fewer appendages than normal

7. Which of the following organism is most likely to be a diploblast?

c. jellyfish

8. Which of the following is not possible?

b. diploblastic eucoelomate

9. An animal whose development is marked by radial cleavage and enterocoely is _____.

a. a deuterostome

10. Consulting the modern phylogenetic tree of animals, which of the following would not constitute a clade?

c. Parazoa

11. Which of the following is thought to be the most closely related to the common animal ancestor?

b. protist cells

12. As with the emergence of the Acoelomorpha phylum, it is common for ____ data to misplace animals in close relation to other species, whereas ____ data often reveals a different and more accurate evolutionary relationship.

d. morphological : molecular

13. Which of the following periods is the earliest during which animals may have appeared?

d. Cryogenian period

14. What type of data is primarily used to determine the existence and appearance of early animal species?

b. fossil data

15. The time between 542–488 million years ago marks which period?

a. Cambrian period

16. Until recent discoveries suggested otherwise, animals existing before the Cambrian period were believed to be:

c. small and soft-bodied

17. Plant life first appeared on land during which of the following periods?

b. Ordovician period

18. Approximately how many mass extinction events occurred throughout the evolutionary history of animals?

d. more than 5

Critical Thinking Questions

19. Why might the evolution of specialized tissues be important for animal function and complexity?

The development of specialized tissues affords more complex animal anatomy and physiology because differentiated tissue types can perform unique functions and work together in tandem to allow the animal to perform more functions. For example, specialized muscle tissue allows directed and efficient movement, and specialized nervous tissue allows for multiple sensory modalities as well as the ability to respond to various sensory information; these functions are not necessarily available to other non-animal organisms.

20. Describe and give examples of how humans display all of the features common to the animal kingdom.

Humans are multicellular organisms. They also contain differentiated tissues, such as epithelial, muscle, and nervous tissue, as well as specialized organs and organ systems. As heterotrophs, humans cannot produce their own nutrients and must obtain them by ingesting other organisms, such as plants, fungi, and animals. Humans undergo sexual reproduction, as well as

the same embryonic developmental stages as other animals, which eventually lead to a fixed and motile body plan controlled in large part by *Hox* genes.

21. How have *Hox* genes contributed to the diversity of animal body plans?

Altered expression of homeotic genes can lead to major changes in the morphology of the individual. *Hox* genes can affect the spatial arrangements of organs and body parts. If a *Hox* gene was mutated or duplicated, it could affect where a leg might be on a fruit fly or how far apart a person's fingers are.

22. Using the following terms, explain what classifications and groups humans fall into, from the most general to the most specific: symmetry, germ layers, coelom, cleavage, embryological development.

Humans have body plans that are bilaterally symmetrical and are characterized by the development of three germ layers, making them triploblasts. Humans have true coeloms and are thus eucoelomates. As deuterostomes, humans are characterized by radial and indeterminate cleavage.

23. Explain some of the advantages brought about through the evolution of bilateral symmetry and coelom formation.

The evolution of bilateral symmetry led to designated head and tail body regions, and promoted more efficient mobility for animals. This improved mobility allowed for more skillful seeking of resources and prey escaping from predators. The appearance of the coelom in coelomates provides many internal organs with shock absorption, making them less prone to physical damage from bodily assault. A coelom also gives the body greater flexibility, which promotes more efficient movement. The relatively loose placement of organs within the coelom allows them to develop and grow with some spatial freedom, which promoted the evolution of optimal organ arrangement. The coelom also provides space for a circulatory system, which is an advantageous way to distribute body fluids and gases.

24. Describe at least two major changes to the animal phylogenetic tree that have come about due to molecular or genetic findings.

Two new clades that comprise the two major groups of protostomes are called the lophotrochozoans and the ecdysozoans. The formation of these two clades came about through molecular research from DNA and protein data. Also, the novel phylum of worm called Acoelomorpha was determined due to molecular data that distinguished them from other flatworms.

25. How is it that morphological data alone might lead scientists to group animals into erroneous evolutionary relationships?

In many cases, morphological similarities between animals may be only superficial similarities and may not indicate a true evolutionary relationship. One of the reasons for this is that certain morphological traits can evolve along very different evolutionary branches of animals for similar ecological reasons.

26. Briefly describe at least two theories that attempt to explain the cause of the Cambrian explosion.

One theory states that environmental factors led to the Cambrian explosion. For example, the rise in atmospheric oxygen and oceanic calcium levels helped to provide the right environmental conditions to allow such a rapid evolution of new animal phyla. Another theory states that ecological factors such as competitive pressures and predator-prey relationships reached a threshold that supported the rapid animal evolution that took place during the Cambrian period.

27. How is it that most, if not all, of the extant animal phyla today evolved during the Cambrian period if so many massive extinction events have taken place since then?

It is true that multiple mass extinction events have taken place since the Cambrian period, when most currently existing animal phyla appeared, and the majority of animal species were commonly wiped out during these events. However, a small number of animal species representing each phylum were usually able to survive each extinction event, allowing the phylum to continue to evolve rather than become altogether extinct.