

Genetic relationships

How can we use genetics to build evolutionary relationships?

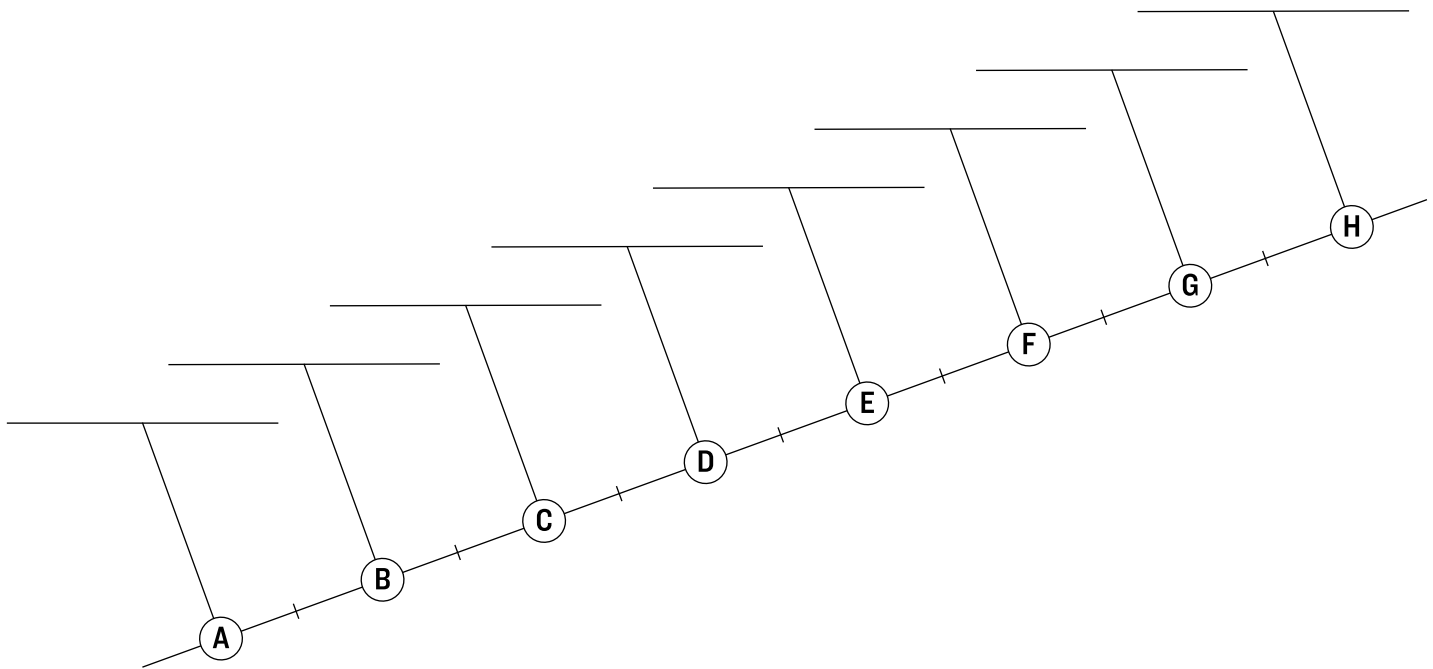
Cytochrome c is a protein with about 100 amino acids. It is present in almost all eukaryotic organisms. It has the same three-dimensional shape in all species, but only 30 of the amino acids are the same in all species. The amino acid sequence of cytochrome c can be used to construct evolutionary relationships between organisms.

1. Determine the number of amino acid differences between humans and all of the other organisms below on the amino acid sequence chart. Use the Cytochrome c amino acid protein table to gather the data to be added to the chart below.

DATA TABLE 2: DIFFERENCES IN AMINO ACID SEQUENCES FOR CYTOCHROME C PROTEIN

	Human	Horse	Dog	Rabbit	Chicken	Bullfrog	Rattlesnake	Screwworm fly	Wheat	Baker's yeast
Human	0									
Horse		0								
Dog			0							
Rabbit				0						
Chicken					0	10				
Bullfrog						0				
Rattlesnake							0			
Screwworm fly								0		
Wheat									0	
Baker's yeast										0

2. Cladograms help us by showing evolutionary trends in organisms over time. Create a cladogram based on the cytochrome c amino acid sequence differences in data table 2.



3. Based on the amino acid sequence data that you collected, which organism are humans most closely related to?
4. Which organism is the root of the cladogram (the one that humans are most distantly related to)?
How many amino acid sequences differed from a human?
5. What additional data or information can help you confirm your statement above?
6. Compare this cladogram to the original CER sequence you created based on observable traits for each organism. How are they similar and different?
7. How can genetic differences such as these amino acid sequences help us to infer patterns of evolutionary relationships?