Hands-On Four
Multiple Sequence Alignment

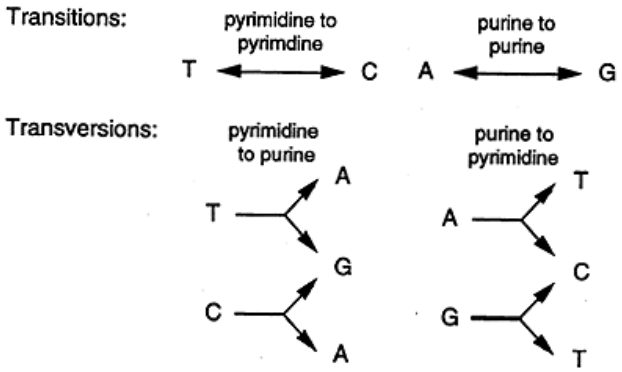
The figures on the next page represent part of the alignment of DNA and protein sequences of the BRCA1 gene of different organisms. The top figures give the DNA sequence alignment, while the bottom figure gives the alignment of the BRCA1 protein sequences for the same region of the gene.

1) Examine more carefully the first twelve columns of the DNA sequence alignment and the first 4 columns of the protein sequence alignment. What can we conclude about the kind of substitutions that have occurred in the DNA sequences? Have they had any effect on the first 5 amino acids of Figure 2?

2) Examine more carefully the columns of the DNA sequence alignment. Are there more transitions or transversions?

Transition: this occurs when a purine is substituted with another purine or when a pyrimidine is substituted with another pyrimidine.

Transversion: when a purine is substituted for a pyrimidine or a pyrimidine replaces a purine.



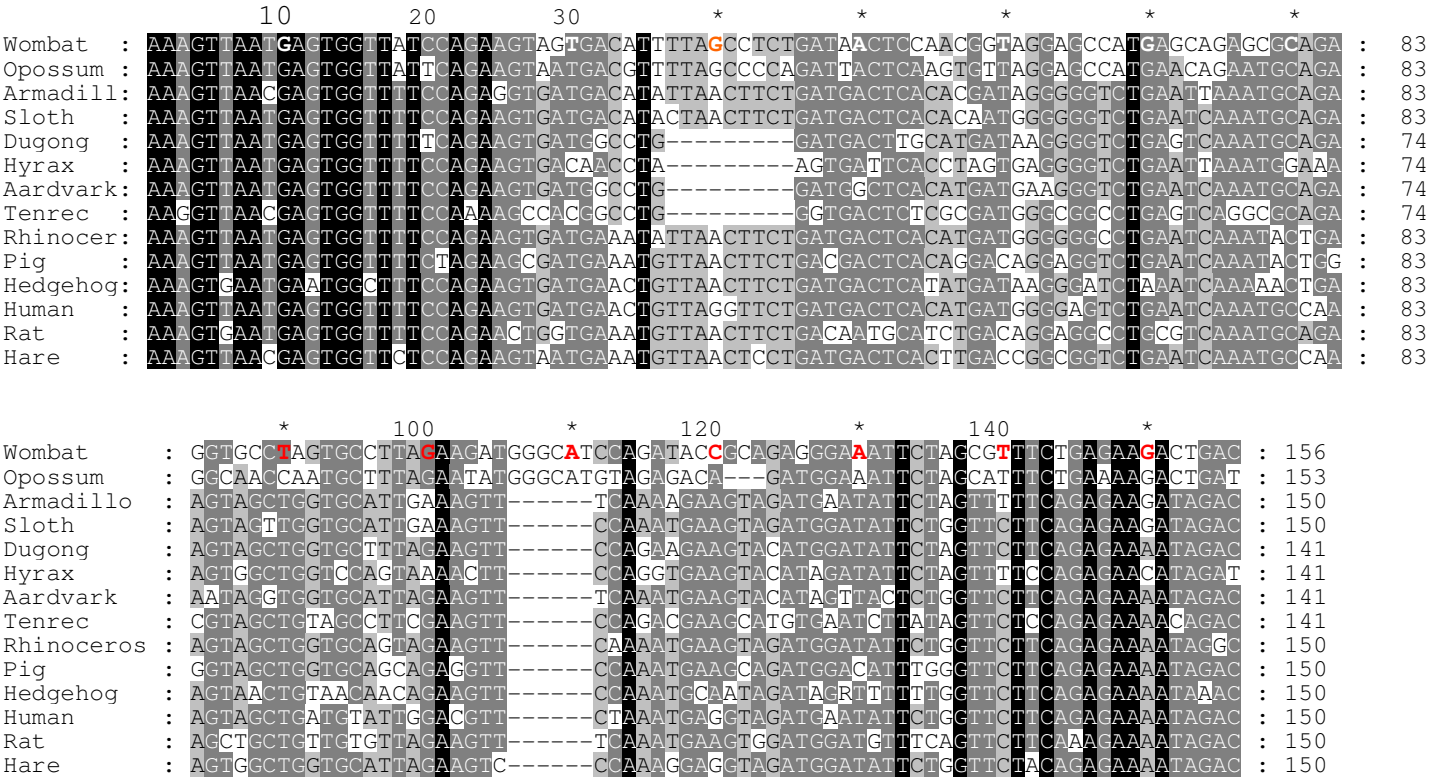
3) Examine more carefully columns 8 and 12 in the amino acid sequence alignment. What can you conclude from the substitutions in each column?

4) Examine more carefully the gaps that are found in both figures.

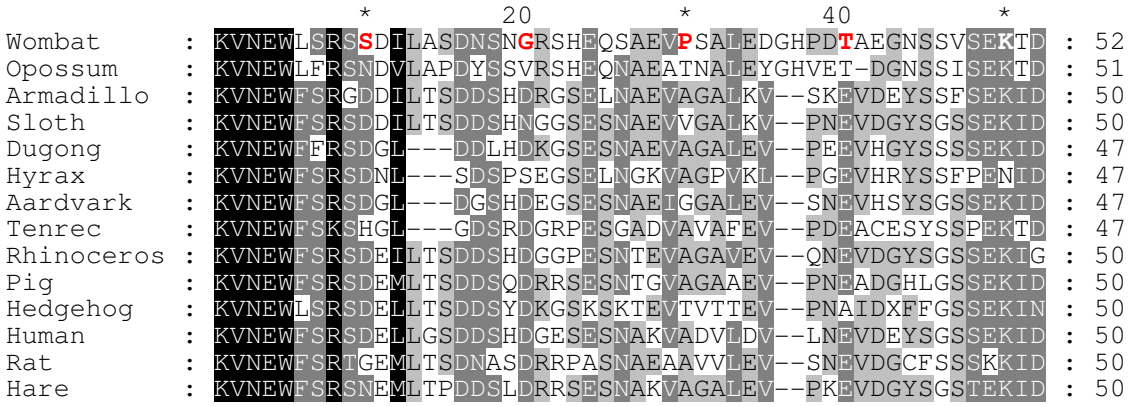
a) Can you explain in your own words the gap produced in columns 38 to 46 in the DNA sequence alignment figure (or equivalently, columns 13, 14 and 15 in the protein sequence figure)?

b) Can you explain in your own words the gap produced in columns 108 to 113 in the DNA sequence alignment figure (or equivalently, columns 37 and 38 in the protein sequence figure)?

Multiple Sequence Alignment



Part of the alignment of the DNA sequences of the BRCA1 gene



Alignment of BRCA1 protein sequences for the same region on the gene

From "Bioinformatics and Molecular Evolution" by Paul Higgs and Teresa Attwood