

Allele variants and ADH enzyme activity

Adh-S and ***Adh-F*** are two alternative forms of the same gene, *Adh*. These are known as **alleles**, and code for the enzyme alcohol dehydrogenase (ADH) in natural populations of *Drosophila melanogaster*. *Adh* is said to be **polymorphic**.

Answer the questions below to identify where *Adh-S* and *Adh-F* differ at the genetic level and determine what effect this may have at the protein level.

1. The coding DNA strand below represents a section of the nucleotide sequence that codes for the ***Adh-S*** allele of the *Adh* gene.

DNA (coding strand)	C A C A A G T T C A A C T C C T G G
DNA (template strand)	
mRNA strand	
Amino acid sequence	

- a. Determine the mRNA sequence from the coding DNA strand. Divide the sequence into triplet bases to help you.
- b. Using the genetic code table, write out the sequence of amino acids for which the mRNA codes.
- c. State the name of the process occurring in the cytoplasm that gives rise to a polypeptide chain.

2. The coding DNA strand below represents the same section as above, but this time coding for the ***Adh-F*** allele of the *Adh* gene.

DNA (coding strand)	C A C A C G T T C A A C T C T T G G
DNA (template strand)	
mRNA strand	
Amino acid sequence	

- a. How do the nucleotide sequences coding for ADH-S and ADH-F differ? Underline the differences on the DNA coding strand.
- b. Do these base changes affect the reading frame? What type of mutation is this?
- c. Write out the sequence of amino acids for which the mRNA codes. What effect does the first mutation have on the polypeptide chain? How about the second mutation?

3. Suggest what effect the allele variants (***Adh-S*** and ***Adh-F***) may have on the final protein product.

The Genetic Code

	U	C	A	G	
U	UUU Phenylalanine UUC Phenylalanine UUG Leucine UUA Leucine	UCU Serine UCC Serine UCA Serine UCG Serine	UAU Tyrosine UAC Tyrosine UAA Stop UAG Stop	UGU Cysteine UGC Cysteine UGA Stop UGG Tryptophan	U C A G
C	CUU Leucine CUC Leucine CUA Leucine CUG Leucine	CCU Proline CCC Proline CCA Proline CCG Proline	CAU Histidine CAC Histidine CAA Glutamine CAG Glutamine	CGU Arginine CGC Arginine CGA Arginine CGG Arginine	U C A G
A	AUU Isoleucine AUC Isoleucine AUA Isoleucine AUG Methionine	ACU Threonine ACC Threonine ACA Threonine ACG Threonine	AAU Asparagine AAC Asparagine AAA Lysine AAG Lysine	AGU Serine AGC Serine AGA Arginine AGG Arginine	U C A G
G	GUU Valine GUC Valine GUA Valine GUG Valine	GCU Alanine GCC Alanine GCA Alanine GCG Alanine	GAU Aspartic acid GAC Aspartic acid GAA Glutamic acid GAG Glutamic acid	GGU Glycine GGC Glycine GGA Glycine GGG Glycine	U C A G

