



Exploring Epigenetics

Teacher Notes: The Genetic Code

Overview

This exercise aims to consolidate knowledge on the structure of DNA, mRNA and a polypeptide chain, as well as the mechanisms of transcription and translation, prior to the teaching of epigenetics.

In order to learn about epigenetics, students need to recall the structure of DNA, mRNA and a polypeptide chain, as well as the mechanisms of transcription and translation. This task requires students to interpret DNA sequence from scientific data, in the form of Sanger-sequenced DNA, then link this to mRNA sequence and finally the amino acid sequence of the polypeptide chain.

Students' ability to complete this task can be easily assessed by whether they successfully decode the message in the polypeptide chain and complete basic research on epigenetics.

Learning objectives

Recall:

- (1) The structure of DNA, mRNA, tRNA and the polypeptide chain
- (2) The mechanisms of transcription and translation
- (3) How the Sanger method can determine DNA sequence

These are given in greater depth in the student document.

Preparation

This activity provides a stand-alone recap of the knowledge required prior to teaching epigenetics. These sheets can therefore be printed and set as 'flipped learning', to be completed before the lesson on epigenetics, or used in class as a summary of the knowledge required.

SCoPE



Expected outcomes

On the student sheets, underneath the Sanger sequencing data, students should be able to complete:

- The sequence of the strand to be transcribed
- The sequence of the mRNA strand for translation
- The amino acid sequence in the polypeptide
- The single letter version of the amino acid sequence in a polypeptide

The expected answers are shown on the next 2 pages. After completing the task students should have the message:

'NNERAK-EPIGENETICSCHANGESTHEWAYGENESAREEKRESSED.W'

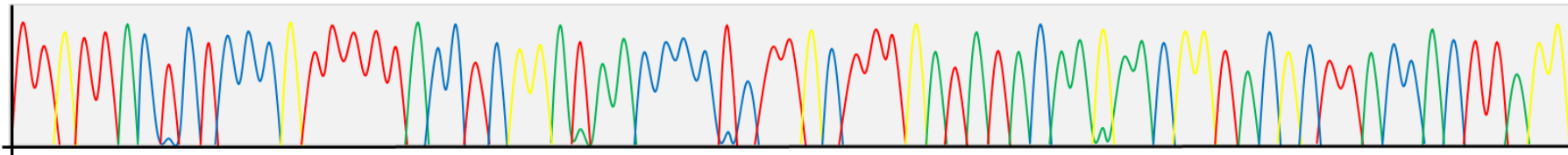
Advanced students should have found this message and researched the meaning of it in preparation for learning about gene regulation. (NOTE: there is no X in the single letter designations for amino acids, so the spelling of 'expressed' is incorrect.)





From DNA sequencing to amino acid sequence

Sheet 1



TTG	TTA	CTC	TCC	CGT	TTT	TAC	CTC	GGA	TAA	CCC	CTC	TTG	CTT	TGA	TAT	ACA	AGA	ACG	GTA	CGC	TTA	CCA	CTT	AGG
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AAC	AAU	GAG	AGG	GCA	AAA	AUG	GAG	CCU	AUU	GGG	GAG	AAC	GAA	ACU	AUA	UGU	UCU	UGC	CAU	GCG	AAU	GGU	GAA	UCC
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Asparagine	Asparagine	Glutamate	Arginine	Alanine	Lysine	Methionine	Glutamate	Proline	Isoleucine	Glycine	Glutamate	Asparagine	Glutamate	Threonine	Isoleucine	Cysteine	Serine	Cysteine	Histidine	Alanine	Asparagine	Glycine	Glutamate	Serine
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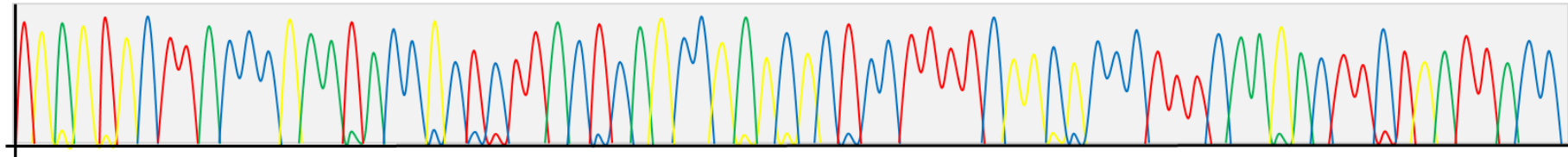


N	N	E	R	A	K	-	E	P	I	G	E	N	E	F	I	C	S	C	H	A	N	G	E	S
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From DNA sequencing to amino acid sequence

Sheet 2



TGA	GTG	CTT	ACC	CGA	ATA	CCG	CTC	TTA	CTC	AGC	CGA	GCG	CTC	CTT	TTC	GGC	GCC	CTT	TCA	AGA	CTT	CTG	ATT	ACC
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ACU	CAC	GAA	UGG	GCU	UAU	GGC	GAG	AAU	GAG	UCG	GCU	CGC	GAG	GAA	AAG	CCG	CGG	GAA	AGU	UCU	GAA	GAC	UAA	UGG
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Threonine	Histidine	Glutamate	Tryptophan	Alanine	Tyrosine	Glycine	Glutamate	Asparagine	Glutamate	Serine	Alanine	Arginine	Glutamate	Glutamate	Lysine	Proline	Arginine	Glutamate	Serine	Serine	Glutamate	Aspartic acid	Stop	Tryptophan
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T	H	E	W	A	Y	G	E	N	E	S	A	R	E	E	K	P	R	E	S	S	E	D	.	W
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