

Protein synthesis

Transcription

Protein synthesis

Base pairing in transcription

Protein synthesis

Why must DNA templates be stable?

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Why is transcription a key stage of gene expression?

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Translation

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Where do mRNA and tRNA bind on the ribosome?

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Codon vs anticodon

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How does the polypeptide grow during elongation?

Template A pairs with RNA U; T with A; C with G; G with C. Held by hydrogen bonds.

The synthesis of RNA using a DNA template, carried out by RNA polymerase.

It is the first stage, so genes can be switched on or off by controlling transcription.

In non-dividing somatic cells the same sequences are transcribed for the life of the cell, so transcription must not change them.

mRNA binds to the small subunit; two tRNAs can bind simultaneously to the large subunit.

The synthesis of a polypeptide from mRNA: the mRNA base sequence is translated into an amino acid sequence.

A peptide bond links the next amino acid to the chain, then the ribosome moves one codon along the mRNA.

Codon: three bases on mRNA coding for one amino acid. Anticodon: complementary three bases on tRNA.

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Why is the genetic code a triplet code?

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Degeneracy and universality

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Start codon and stop codons

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Sickle-cell mutation

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Effect of haemoglobin S

Degeneracy: more than one codon per amino acid. Universality: the same codons code for the same amino acids in almost all organisms.

4 bases and 20 amino acids: pairs give 16 combinations (too few); triplets give 64.

Base substitution in the haemoglobin beta-chain gene: codon GAG → GUG, glutamic acid → valine at the sixth amino acid.

Start: AUG (methionine). Stop: UAA, UAG, UGA.

At low oxygen it forms long fibres that distort red blood cells into rigid sickle shapes.