

Biology Exam 2

1. Transcription

mRNA is made from a DNA template

mRNA is processed before leaving the nucleus

mRNA moves to the ribosomes to be read

Every 3 bases on the mRNA is called a codon and codes for a particular amino acid in translation

2. Translation

- 5 steps:
 1. The small ribosomal subunit attaches to mRNA and then the first tRNA binds to the first codon
 2. The large ribosomal subunit attaches and allows the second tRNA to pair up with the second codon
 3. Peptide bond forms, linking the two amino acids together
 4. The ribosome moves to the next codon and continues building the amino acid chain
 5. Finally, the ribosome reaches a stop codon, causing the ribosome to release from the mRNA

Processing of mRNA after transcription

Modifications of mRNA

One end of the RNA is capped

Poly-A tail is added

Introns removed

Exons kept

What did we learn from the human genome project (HGP)

- The human genome consists of about 3 billion bases and 25,000 genes
- Human genome sequenced in 2003
- There are many polymorphisms or small regions of DNA that vary among individuals
- Genome size is not correlated with the number of genes or complexity of the organisms

Mutations

Defined as a change in the DNA sequence

Point mutations

A single nucleotide has been replaced with another

Frame shift mutations

A nucleotide has been added or deleted

Biotechnology

Altering DNA to achieve a specific, desired result, 3 tech

1. Recombinant DNA

rDNA contains DNA from 2 or more different sources

requires a vector

what is a vector

a means to transfer foreign genetic material into a cell

what is a plasmid

accessory rings of DNA in bacteria

replicates independently of bacterial DNA

how do we transfer DNA

use restriction enzymes

cuts DNA at specific locations

produced by bacteria

restricts growth of viral DNA

- May leave "sticky ends"
 - Allows a portion of DNA to be incorporated into another sample of DNA (as long as it was cut with the same restriction enzyme)

DNA ligase is also required

Seals DNA fragments together

G₀ break from cell division

P53 detects damage

Activates repair enzymes (BRCA1) or

Activates enzymes that initiate apoptosis

What goes wrong in cancer cells?

Cancer is the result of uncontrolled cell division

Caused by gene mutations that no longer allow the cell to properly regulate the cell cycle

A single cell must accumulate several mutations before cell division is uncontrollable

Characteristics

1 cancer cells are not regulated by contact inhibition

2 cancer cells no longer appear differentiated

3 proto-oncogenes mutate

Referred to as oncogenes

Any gene that encodes a protein that promotes cell division at an inappropriate time

May encode a faulty receptor

May encode for a self stimulatory growth factor

4 TSGs mutate

Normally encode proteins that inhibit cell division or initiate apoptosis

In the absence of these proteins, cell division proceeds uncontrollably and cell death is absent

If the p53 gene mutates then the p53 protein can no longer function properly

Mistakes in DNA replication are not repaired leading to an increase in the accumulation of mutations

And apoptosis does not occur

Disastrous

TSGs also encode repressors that prevent RNA poly from transcribing a gene