

5/11/15

DNA, RNA + Genes

Parts of the eukaryotic gene

① Structural gene: transcribed into mRNA, contains exons + introns

exons = nucleotide sequence that remains present in mature mRNA to code for proteins

introns = non-coding sequences that are removed.

② regulatory gene = regulates (controls) transcription, contains the promoter

③ termination sequence = sequence of bases that stops coding

④ initiation signal = sequence of bases that begin coding

Processes:

Replication: DNA replication, semi-conservative (only 50% new) - yields two DNA molecules that are identical.

Transcription: Sequences of DNA are recorded as sequences of RNA  
(Complimentary, C≡G, A=U)

Translation: protein synthesis

① initiation = assembly of the components needed:

ribosomal subunits

mRNA

tRNA (amino acids)

GTP or ATP

AUG codon signals the start

② Elongation: Addition of amino acids to complete the polypeptide chain

③ Termination: Occurs when the 3 codon sequence signals stop.

Regulation of Translation:

- Prevention of phosphorylation

- blocking translation by binding to the mRNA

Phosphorylation occurs on the hydroxyl group of serine, threonine + tyrosine  
it can increase or decrease the functional activity of a protein

Chargaff's Rule: in any sample of double stranded DNA

A=T the amt. of cytosine = amt. of guanine

C=G the amt. of adenine = amt. of thymine

the amt. of purines = the amt. of pyrimidines

## Important Enzymes:

Helicase - unwinds the double helix

DNA polymerase - replication on leading strand ( $5' \rightarrow 3'$ )

RNA polymerase - synthesize new RNA

Primase - primer for DNA synthesis, created by RNA

DNA ligase - catalyzes the phosphodiester bonds (linkages)

Nucleases - enzymes that can hydrolyze the phosphodiester bonds

Peptidyl transferase - promotes the formation of peptide bonds between the amino acids during translation

## RNA - types

messenger RNA - mRNA - transcribed in the nucleus, carries the genetic sequence to the ribosome for translation

transfer RNA - tRNA - carries the amino acid to the ribosome

ribosomal RNA - rRNA - components of the ribosome

Codons - protein synthesis is based on three base sequences called Codons. There are  $4^3$  possible combinations; 61 code for common amino acids & three code for the termination process.

### Possible Mutations:

- ① Silent mutation: altered codon still codes for the same amino acid
- ② Missense mutation: altered codon codes for a different amino acid
- ③ Nonsense mutation: altered codon codes for a termination sequence

ATP + GTP are both used as energy sources for translation.