Ch 17.1 Notes

---------------------------------------------------------------------------------------------------------------------Vocab

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Transcription: DNA -> RNA

Messenger RNA (mRNA): Carries info from transcription so it can RNA -> Protein

Translation: RNA -> Protein

Primary Transcript: The product of transcription

Triplet Code: The genetic instructions for a polypeptide chain are written in the DNA as a series of nonoverlapping, three-nucleotide words

Template Strand: Provides the pattern, or template, for the sequence of nucleotides in an RNA transcript.

Codons: A sequence of three nucleotides which together form a unit of genetic code in a DNA or RNA molecule.

Coding Strands: The DNA strand whose base sequence is identical to the base sequence of the RNA transcript produced

Reading Frame: A way of dividing the sequence of nucleotides in a nucleic acid (DNA or RNA) molecule into a set of consecutive, non-overlapping triplets

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Inherited traits determined by genes

Information in genes is in the form of nucleotide sequences in DNA

Inherited DNA leads to specific traits BECAUSE it determines what RNA and proteins get synthesized

* PROTEINS are the link between genotype and phenotype

Gene expression: process by which DNA directs synthesis of proteinsTranscription

* Translation
* One gene-one enzyme hypothesis
  + A gene dictates the production of a specific enzyme

Mutation in DNA= mutation in enzyme (inability to produce enzyme)

Experiment to induce mutation

X-Ray spores= mutations

Grow on nutrient medium

* Which ones have different needs
  + WT= minima medium (salt, glucose, biotin)
  + ID which mutants lacked which amino acid
  + Which step in making the amino acid was mutated

Beadle and Tatum experiment cont’d

Genes act by regulating definite chemical event

* Gene dictates production of a specific enzyme

Support one gene-one enzyme hypothesis

The products of gene expression

Issues with one gene-one enzyme

* Not all proteins are enzymes

Change to one gene-one PROTEIN

* Problem= some proteins are the result of more than one polypeptide
  + One gene makes one polypeptide

Finally: one gene-one POLYPEPTIDE

* Still not perfect

The Role of RNA

RNA is ANOTHER kind of nucleic acid (macromolecule) that is a long chain made up of nucleotides (same as DNA)

RNA helps get the information from DNA into a form the cell can actually use (proteins)

DNA vs RNA

Similarities

* Made of nucleotides

Differences

* Uses ribose sugar instead of deoxyribose
* One nucleotide is different (Uracil instead of Thymine)
* Single stranded vs DNA is double stranded
* Function is different

Three kinds of RNA

* mRNA
  + messenger RNA
  + Used as the instructions to make proteins
  + Carries genetic message from nucleus to cytoplasm
  + Only make this if you are trying to express a gene
* rRNA
  + ribosomal RNA
  + Used to make up the ribosome, help form chemical bonds between amino acids in protein production
* tRNA
  + transfer RNA
  + Used to carry amino acids during protein production
    - Splicing can result in various polypeptides from one gene sequence

Using the DNA strands

DNA is double stranded, the two strands are separated

ONE strand is used as the template, the one that is used to “copy” and make the RNA strand (green)

BECAUSE base pairing is complementary, the RNA made looks A LOT like the OTHER strand (blue), therefore, we call that one the coding strand

Directionality of strands

RNA synthesized by adding to 3’ side

Ribosome reads RNA from 5’ to 3’

Transcription

The process of making mRNA from DNA

* Eukaryotes- in nucleus
* Prokaryotes- in cytoplasm

Basic Steps

* Separate double stranded DNA (use DNA as a template)
* RNA polymerase pairs RNA nucleotides to exposed nitrogen bases (on DNA)
* Primary transcript removes itself from DNA template and gets modified before moves to cytoplasm

Translation

First step to making proteins is transcription

* DNA 🡪 RNA
* These are both made of nucleotides= same language

Next step to make proteins is translation

* Proteins are made of amino acids, not nucleotides= different language
* Instead of just four options for nucleotides, there are 20 options for amino acids!

Translation is basically decoding the RNA into protein

* Think of every 3 nucleotides in RNA as making a “word” that codes for an amino acid.
  + The 3 nucleotide words are called codons, and that is what the ribosome understands how to read

Ribosome is the site of translation

Transcription and translation are two separate steps for eukaryotes, but can happen simultaneously for prokaryotes

How to read codons

Three nitrogen bases in mRNA is called a codon (there are 4 nucleotides)

* 64 possible codons but only 20 amino acids
  + More than one codon codes for the same amino acid
* One codon signals the start of translation= AUG
* Three different codons signal for the stop of translation
  + Theses do not code for an amino acid
  + UAA, UGA, UAG
* The order of the bases determines the order of the amino acids