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Lecture 1: Genes and Mutations

-Central dogma

-Genetic code

Read:
Figs:

Reviewing basic terminology

Gene: a specific sequence of nucleotide pairs in a discrete region of DNA that acts as a functional unit, usually by encoding the instructions for making a particular protein

Transcription (where)

Translation (where)

Centrol dogma

Codon

ribosome

tRNA, rRNA, mRNA

Sense and antisense

- 5′ to 3′ direction of mRNA corresponds to N-terminal-to-C-terminal direction of polypeptide
  - One strand of DNA is a template
  - The other is an RNA-like strand
- Nonsense codons cause termination of a polypeptide chain
- – UAA (ocher), UAG (amber), and UGA (opal)

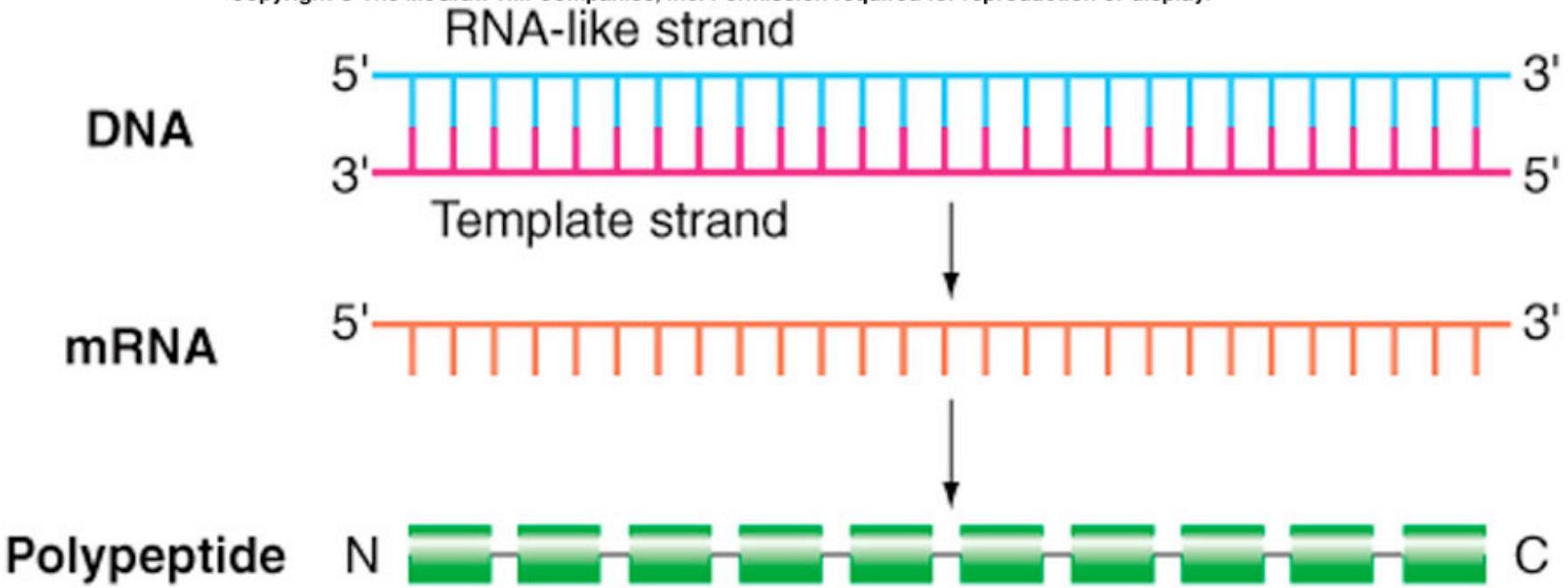

Fig. 8.9

The Genetic Code: 61 triplet codons represent 20 amino acids; 3 triplet codons signify stop

First letter	Second letter: U	Second letter: C	Second letter: A	Second letter: G	Third letter
U	UUU Phe UUC Phe UUA Leu UUG Leu	UCU Ser UCC Ser UCA Ser UCG Ser	UAU Tyr UAC Tyr UAA Stop UAG Stop	UGU Cys UGC Cys UGA Stop UGG Trp	U C A G
C	CUU Leu CUC Leu CUA Leu CUG Leu	CCU Pro CCC Pro CCA Pro CCG Pro	CAU His CAC His CAA Gln CAG Gln	CGU Arg CGC Arg CGA Arg CGG Arg	U C A G
A	AUU Ile AUC Ile AUA Ile AUG Met	ACU Thr ACC Thr ACA Thr ACG Thr	AAU Asn AAC Asn AAA Lys AAG Lys	AGU Ser AGC Ser AGA Arg AGG Arg	U C A G
G	GUU Val GUC Val GUA Val GUG Val	GCU Ala GCC Ala GCA Ala GCG Ala	GAU Asp GAC Asp GAA Glu GAG Glu	GGU Gly GGC Gly GGA Gly GGG Gly	U C A G

Summary of genetic code

- Codon consist of a triplet codon each of which specifies an amino acid
  - Code shows a 5' to 3' direction
- Codons are nonoverlapping
- Code includes three stop codons, UAA, UAG, and UGA that terminate translation
- Code is degenerate
- Fixed starting point establishes a reading frame
  - AUG in an initiation codon which specifies reading frame
- 5'- 3' direction of mRNA corresponds with N-terminus to C-terminus of polypeptide

Genotype vs. Phenotype

Phenotype depends on structure and abundance of a protein

Mutations: change in DNA, heritable, mostly devastating, few good. They alter protein structure and abundance, leading to changes of phenotype.

Alleles: different variations (genotypes) in a gene of different individuals