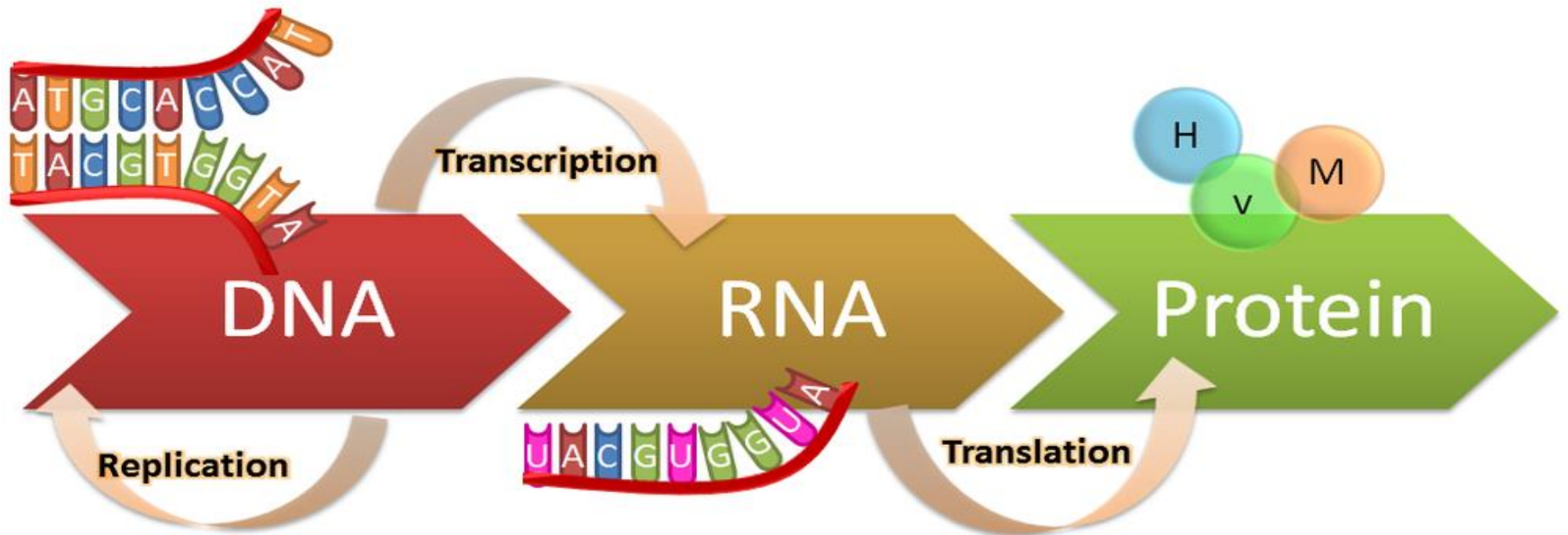


وراثة الأحياء الدقيقة Microbial Genetics

أساسيات في علم الوراثة
Fundamentals of Genetics
Lecture 6



Genetics

- Genetics was central to the development for many reasons:
 - The exchange of genetic information- cells or organisms.
 - The center of research in molecular biology and supports the study of the biochemistry of biological processes.
 - In the form of genetic engineering- the study of biological systems and in the physical studies of those systems.

Genetics

- **The study of genetics** for discovering the chemical basis of heredity.
- **Mutations:** Naturally, the existence of mutations was necessary to:
 - The execution of the classical experiments in genetics.
 - An understanding of mutations will facilitate our study of these experiments.
- An alteration in the nucleotide sequence of the DNA or RNA.

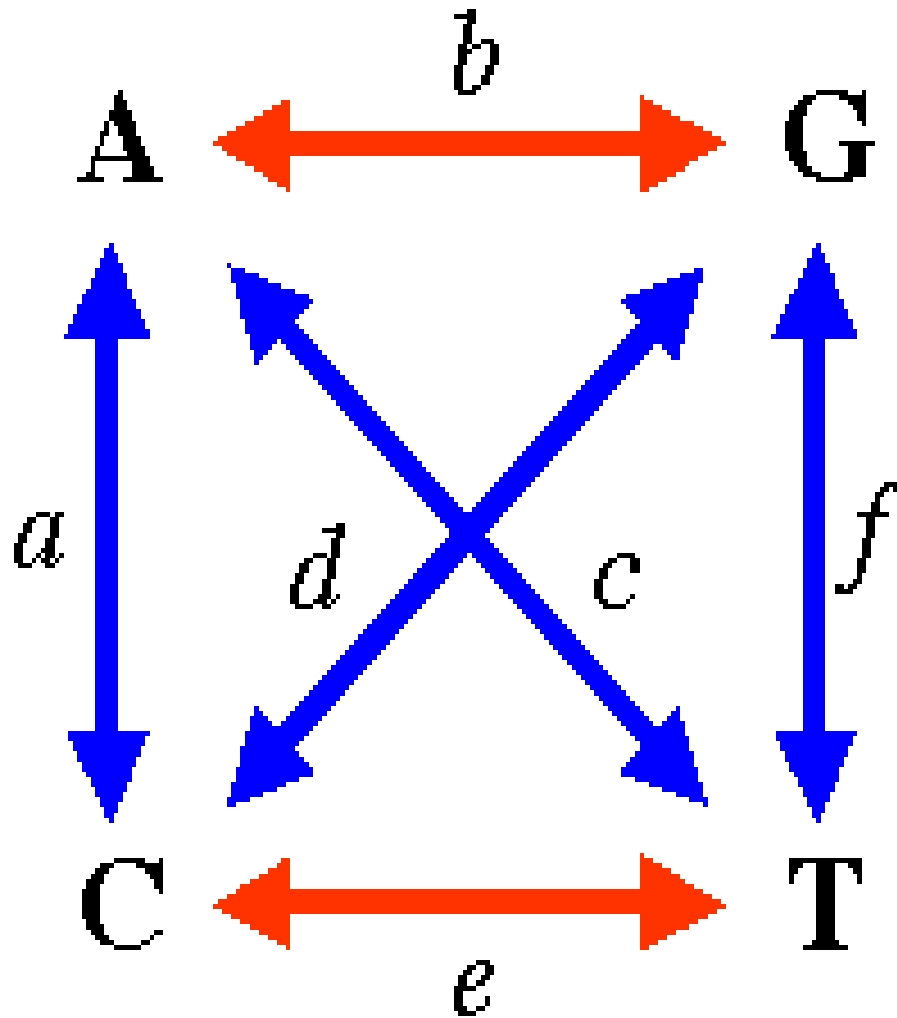
What is Mutation?

- Mutation is a process that changes a DNA sequence, and can be common natural as neutral variants “Polymorphisms”, Sporadic (first time), spontaneous (during binary fission), or acquired (caused by conditions).
- The terms "mutant" and "mutation" is used to describe something undesirable or broken. But mutation is not always bad.
- Most DNA changes fall in the large areas of the genome that sit between genes, and usually they have no effect.
- When variations occur within genes, there is more often a consequence, but even then mutation only rarely causes death or disease.
- Mutation also generates new variations that can give an individual a survival advantage. And most often, mutation gives rise to variations that are neither good nor bad, just different.

Genetics

- The terms wild-type, mutant, mutation, and allele are closely related
- Wild-type is a reference, usually found naturally. It can mean an organism, a set of genes, a gene, a gene product protein, or a nucleotide sequence.
- A mutant is the organism that carries the mutation.
- Easily studied biological effects of mutations in bacteria and viruses:
 - Changes in the colony or plaque morphology.
 - The inability of cells to grow at low or high temperatures.
 - The inability to grow- lacking specific chemicals in the growth medium.

- **The structure of DNA permits only three basic types of alteration or mutation at a site:**
 - The substitution of one nucleotide for another.
 - The deletion of one or more nucleotides.
 - The insertion of one or more nucleotides.
 - Deletion, insertion, or duplications - “A frame-shift mutation“.
- A nucleotide substitution at a point is called a “***transition***”- one purine substituted for the other or one pyrimidine is substituted for the other
- “***transversion***” if at a point, a purine is substituted for a pyrimidine or vice versa.



Transitions

Transversions

Transitions

TYPES OF MUTATIONS

1 Gene Mutation

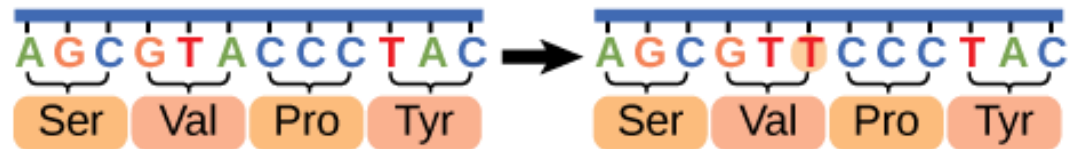
- Point Mutation
 - Silent
 - Missense
 - Nonsense
- Frameshift Mutation
 - Addition
 - Deletion

2 Chromosome Mutation

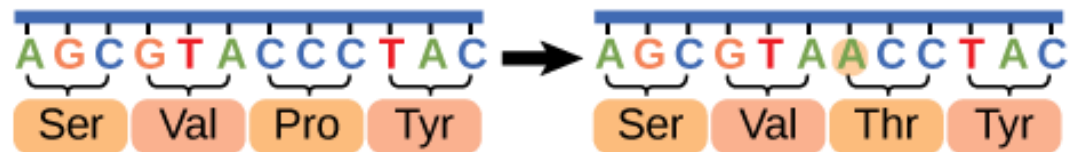
- Deletion
- Duplication
- Inversion
- Translocation

Point Mutations

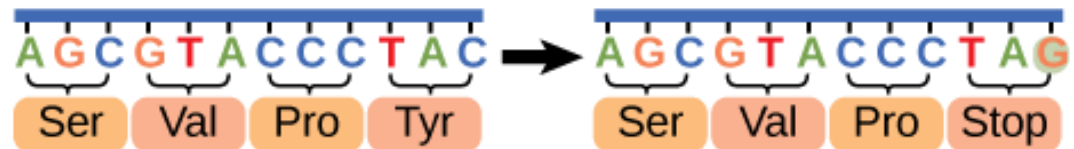
Silent: has no effect on the protein sequence



Missense: results in an amino acid substitution

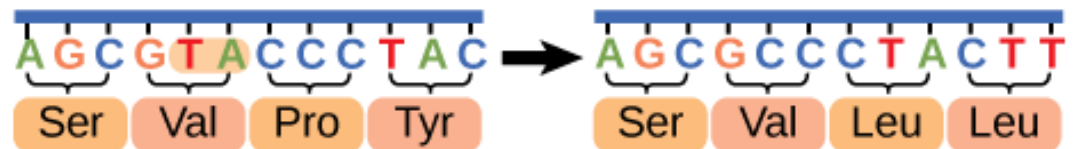


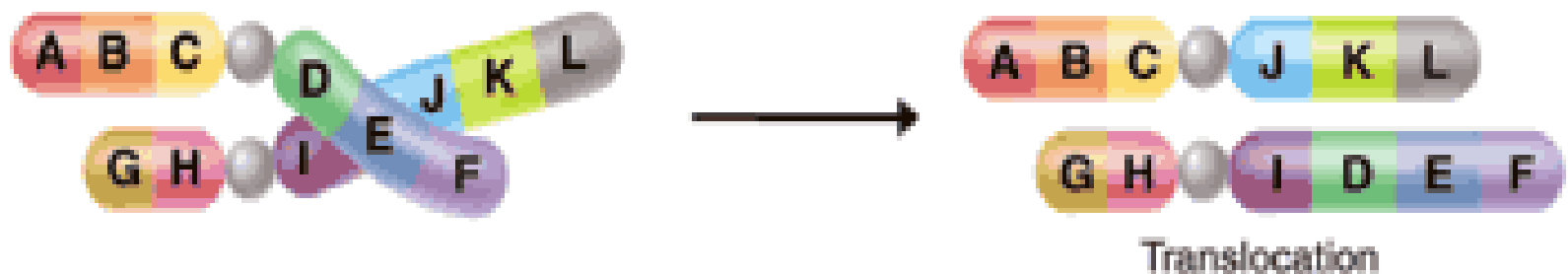
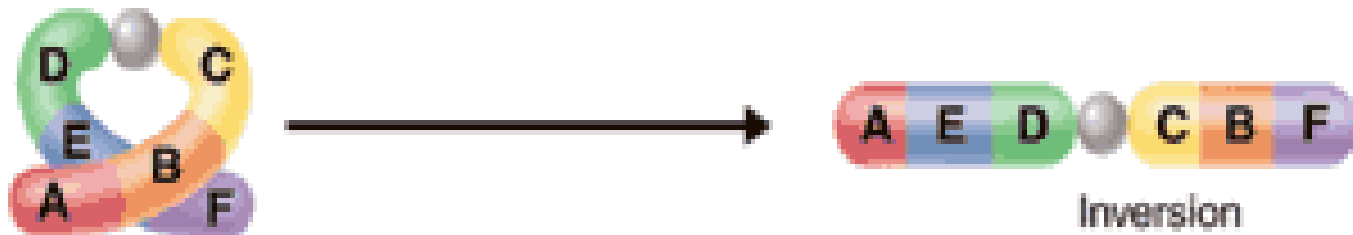
Nonsense: substitutes a stop codon for an amino acid




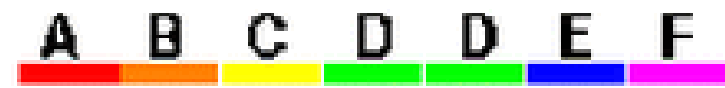
Frameshift Mutations

Insertions or deletions of nucleotides may result in a shift in the reading frame or insertion of a stop codon.





Chromosomal Mutations  Chromosomal mutations involve changes in whole chromosomes.



Inversion

Duplication

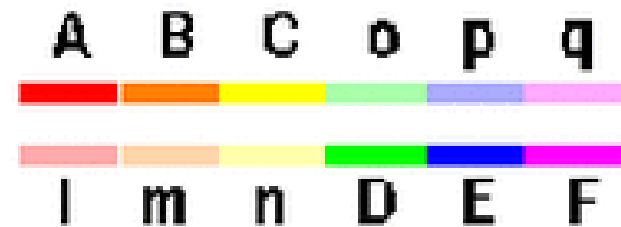


Deletion

Insertion



Translocation



The Different Types of Mutations

<https://www.youtube.com/watch?v=qxXRKVompI8>

QUESTIONS??

