Genetics

Biology Dept.3rd stage

Asst. Professor. Dr. Kazhal M. Sulaiman

Lec-3-

What Is a Gene?

Each cell in the human body contains about 25,000 to 35,000 genes, which carry information that determines your **traits** (say: **trates**). Traits are characteristics you inherit from your parents; this means your parents pass some of their characteristics on to you through genes. For example, if both of your parents have green eyes, you might inherit the trait of green eyes from them. Or if your mom has freckles, you might inherit that trait and wind up with a freckled face. And genes aren't just in humans — *all* animals and plants have genes, too.

Genes hang out all lined up on thread-like things called **chromosomes** (say: **kro**-moh-somes). Chromosomes come in pairs, and there are hundreds, sometimes thousands, of genes in one chromosome. The chromosomes and genes are made of DNA, which is short for **deoxyribonucleic** (say: dee-**ox**-see-ri-bo-nyoo-**clay**-ik) **acid**.

Chromosomes are found inside cells, the very small units that make up all living things. A cell is so tiny that you can only see it through the lens of a strong microscope, and there are *billions* of cells in your body. Most cells have one **nucleus** (say: **noo**-clee-us).

In humans, a cell nucleus contains 46 individual chromosomes or 23 pairs of chromosomes (chromosomes come in pairs, remember? 23 X 2 = 46). Half of these chromosomes come from one parent and half come from the other parent. But not every living thing has 46 chromosomes inside of its cells. For instance, a fruit fly cell only has four chromosomes!

How Do Genes Work?

Each gene has a special job to do. It carries blueprints — the instructions — for making proteins (say: pro-teens) in the cell. Proteins are the building blocks for everything in your body. Bones and teeth, hair and earlobes, muscles and blood, all are made up of proteins (as well as other stuff). Those proteins help our bodies grow, work properly, and stay healthy. Scientists today estimate that each gene in the body may make as many as 10 different proteins. That's over 300,000 proteins!

Like chromosomes, genes come in pairs. Each of your biological parents has two copies of each of their genes, and each parent passes along just one copy to make up the genes you have. Genes that are passed on to you determine many of your traits, such as your hair color and skin color.

Take the gene that helps the body make **hemoglobin** (say: **hee**-muh-glow-bin), for example. Hemoglobin is an important protein that is needed for red blood cells to carry oxygen throughout the body. If parents pass on altered hemoglobin genes to their child, the child may only be able to make a type of hemoglobin that doesn't work properly. This can cause a condition known as anemia (say: uh-**nee**-mee-uh), a condition in which a person has fewer healthy red blood cells.

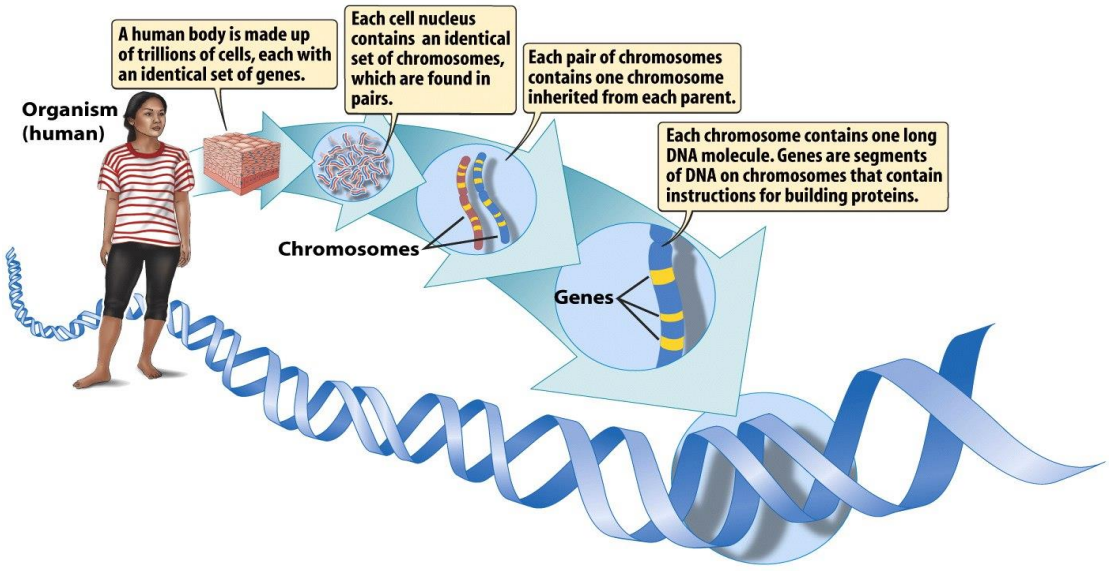


Figure 10-2 Discover Biology 3/e

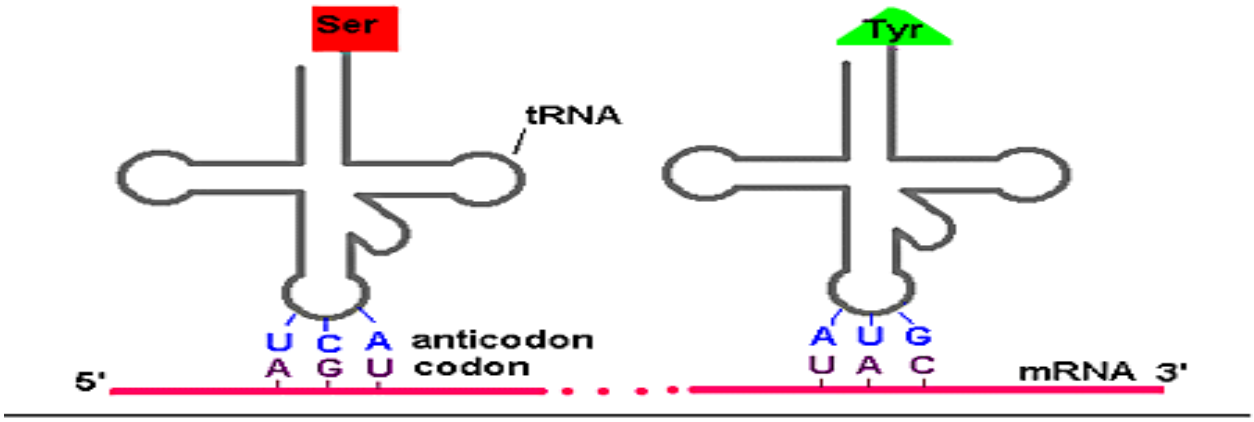
Genetic code

One of the first questions about the genetic code to be addressed was: How many nucleotides are necessary to specify a single amino acid? This basic unit of the genetic code—the set of bases that encode a single amino acid—is a codon

The **genetic code** is the set of rules by which information encoded in genetic material (DNA or mRNA sequences) is translated into proteins (amino acid sequences) by living cells. The code defines a mapping between tri-nucleotide sequences, called **codons, and amino acids**

The Genetic Code

DNA
(in nucleus) ↓ ***transcription***
mRNA
(in cytoplasm) ↓ **translation**
Protein



2nd base in codon

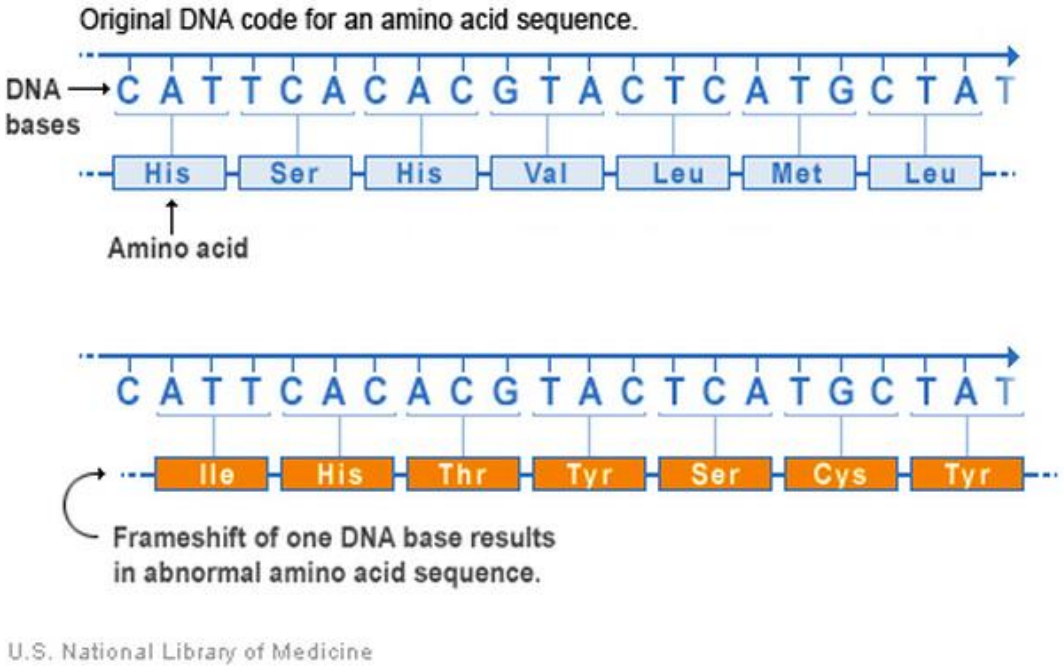
1st base in codon	U	C	A	G	3rd base in codon
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	STOP	STOP	A
	Leu	Ser	STOP	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

DNA provides the information that ultimately codes for a specific protein to be produced.

2- Frameshift read:

Evidently, the genetic message once initiated at a fixed point is read in a definite frame in a series of three letter words. The framework would be disturbed as soon as there is a deletion or addition of one or more bases.

When such frame shift mutations were intercrossed, then in certain combinations they produce wild type normal gene. It was concluded that one of them was deletion and the other an addition, so that the disturbed order of the frame due to mutation will be restored by the other



U.S. National Library of Medicine