

Chapter 12**GENETICS: Modern Applications**

OVERVIEW: Genetics problem-solving skills; multiple alleles, multiple genes, and other common heredity patterns; how genes and environment influence phenotype

BLUEPRINT: Continue in Chapter 12, by reading/study of pages 255-261. The content of pages 261-265 goes beyond the LEARNING GOALS below for which you are responsible, but read the latter pages sufficiently to attain those goals.

VOCABULARY:

incomplete dominance	multiple genes	X-linked genes
multiple alleles	population genetics	gene mutation
antigen	continuous variation	chromosomal abnormality
antibody		

LEARNING GOALS:

1. Explain the concept of “alleles” using the concept of “homologous chromosomes.”
2. Distinguish inheritance of traits by *multiple alleles* from inheritance by *multiple genes*.
3. Distinguish incomplete dominance from continuous variation by giving an example of each; then, explaining the manner in which the traits you have noted are inherited.
4. Use the example of ABO blood types to discuss the following concepts: *multiple alleles*, *incomplete dominance*, *antigen* and *antibody*, *population genetics*.
5. Name 2 traits that are inherited by X-linked genes. Explain how this type of inheritance is different.
6. Distinguish “gene mutation” from “chromosomal abnormality”, and give an example of each.
7. Explain how mutations and “jumping genes” give clues as to how genes are expressed in cells.
8. Complete the problems associated with four *skill levels*, in "Genetics Problems" at the end of Ch. 12.

APPLICATION: Consider the scriptural principles in Section 12-J as they relate to your uniqueness as a creature of God.

INTERNET: The “BIO 100 Web Links” Page for Assignment # 23 features the Human Genome Project.

LECTURE EMPHASIS:

1. Genetics problem-solving skills
2. Human inheritance – multiple alleles, multiple genes, X-linked inheritance
3. Mutations and understanding how genes are expressed
4. How genes and environment influence phenotype

MUTATIONS AND "JUMPING GENES"

A TRIBUTE TO BARBARA McCLINTOCK

HER OBSERVATION: CORN GRAINS HAVE PIGMENT STREAKS

HER HYPOTHESIS: DNA SEGMENTS "JUMP" INTO OTHER SEGMENTS
AND ALTER THEIR *EXPRESSION* IN PHENOTYPE

i.e. CAUSE *MUTATIONS* (WRONG SEQUENCES)

THEORY: [page 261]

DNA	--->	RNA	--->	PROTEIN	--->	METABOLIC ROLE
nucleotide sequence		nucleotide sequence		amino acid sequence		e.g. enzyme, membrane protein, or hormone

DEDUCTION:

Mutated	Change in	Affects	Affects
DNA -->	RNA -->	PROTEIN -->	METABOLISM -->
		(Pigment Synthesis)	PHENOTPYE ("Streaking")

RECESSIVE ALLELES:

- > OFTEN MUTATIONS OF DOMINANT (FUNCTIONAL) ALLELE
- > EXPRESSED WHEN DOMINANT ALLELE IS ABSENT
- > EXAMPLES:
 1. ALBINISM -- NONFUNCTIONAL GENE FOR MELANIN SYNTHESIS
 2. SICKLE-CELL ANEMIA -- DEFECTIVE GENE FOR HEMOGLOBIN
 3. SEE TABLE 12-3

METAGENIC AGENTS -- UV RAYS, VIRUSES, CARCINOGENIC CHEMICALS

- > CARCINOGENS -- UV RAYS and CHEMICALS WHICH CAUSE *CANCER*
-- MAY ACT BY "TURNING ON" *ONCOGENES*