SECTION FOUR

CONCEPTS OF GENETICS

KEY TERMS

- Allele
- Chromosome
- Dominance
- Gene
- Genotype
- Germ cell
- Heterozygous
- Lethal
- Mutation
- Qualitative Trait
- Quantitative Trait

- GENETICS - The study of the way animals & plants pass on to their offspring such as:
  - eye color, hair color, height, body build, blood types, intelligence, gender, etc.
- HEREDITY - passage of genetic traits from one generation to the next
  - It’s controlled by the chromosomes in the nucleus of cells

FUNDAMENTALS OF HEREDITY

- There are billions of microscopic cells inside each animal body
- Cell
  - Nucleus
    - 32 pairs of Chromosomes (64 total)
      - Genes - basic hereditary material
- What are traits determined by?
  - Traits are determined by the genes on the chromosomes. A gene is a segment of DNA that determines a trait.

GENES

- Located on chromosomes
- Control inherited characteristics
  - Color
  - Growth rate
  - Disposition
- Paired genes (alleles) may or may not be identical
  - If the paired genes are identical
    - Then the individual is considered to be homozygous
    - If not, heterozygous

GENES

- Dominant
  - Gene that prevents the other gene from “showing”
  - Black color in light horse breeds is a dominant gene
    - The gene is represented by a capital letter
- Recessive
  - Gene that does not “show” even though it is present
  - The gene is represented by a lower case letter

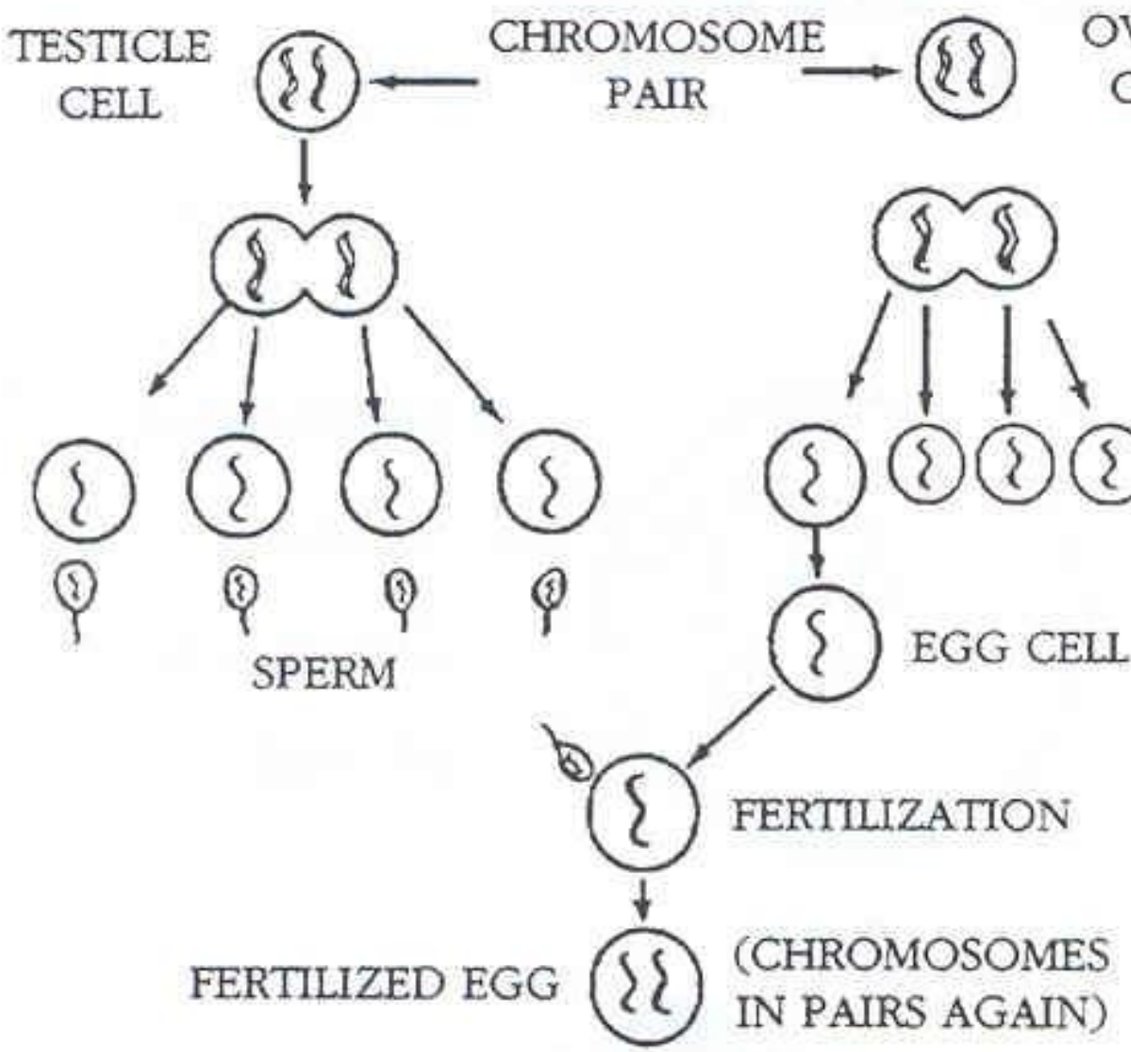

Figure 3 — Source: 4-H 195

GENETICS

- Two basic types of genetic action:
  - Qualitative
  - Quantitative
- Qualitative:
  - Particular trait influenced by single pair of genes
  - Or maybe 2 or 3
- Quantitative:
  - Influenced by a number of genes

QUALITATIVE

- Three primary types of gene action that affect qualitative gene action:
  - Dominance
  - Co-dominance
  - Partial Dominance

DOMINANCE

- One dominant gene is required to
  - Display a particular trait
- Two recessive genes are required to
  - Display a recessive trait
- Example: Combined Immune Deficiency
  - Two recessive traits being exhibited

CO-DOMINANCE

- Results in an intermediate state
  - Between two parents
  - Example: blood type
    - Each blood type is different and known and thus indicates the genotype

PARTIAL DOMINANCE

- Also results in an intermediate state but
  - Not necessarily an exact intermediate state
    - Ex: Dilution gene affecting color
- When one dilution gene is present, the base color is altered to?
  - Buckskin or Palomino
- Two are present?
  - Cremello or Perlino

QUANTITATIVE

- Most traits in horses are influenced by quantitative gene action: Example?
- What are some factors that might affect speed?
  - Size and length of leg
  - Efficiency of heart, lungs, and legs
  - Mental traits: desire and determination

HEREDITY VS. ENVIRONMENT

- What factors are affected primarily by environment?
  - Nutrition, Training, Reproductive Ability
- What factors are affected primarily by genetics?
  - Color
- What factors are affected by both?
  - Mature Size, Longevity, Racing Speed

TEXT

GENES

- Genotype- specific genes it possesses on its chromosomes
- Phenotype- the physical appearance of an animal
- Punnett squares are used to predict genotypes and phenotypes of animals