

Heredity

Chapter 5

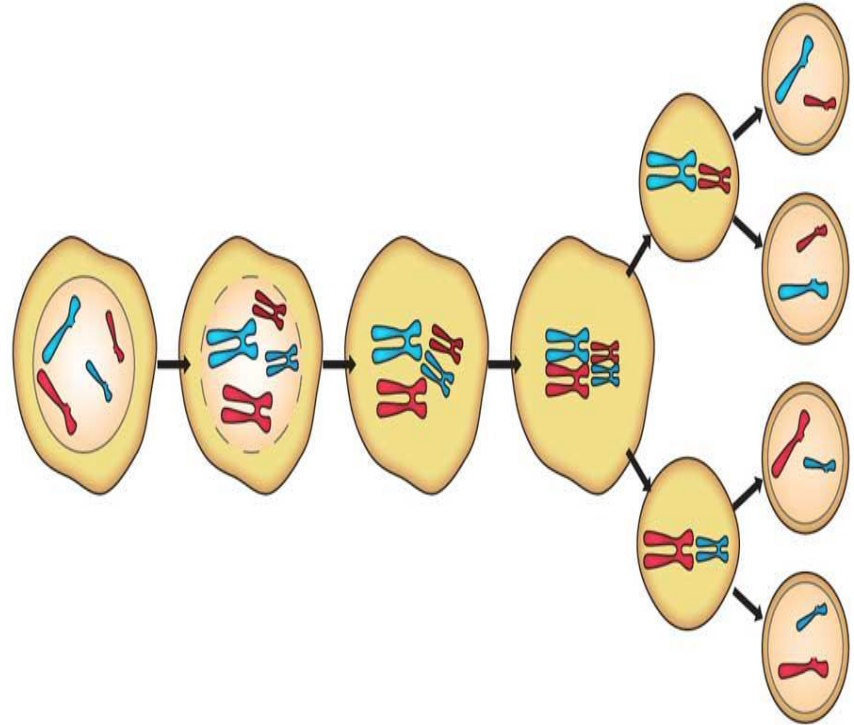
Vocabulary

- Meiosis
- Heredity
- Allele
- Genetics
- Hybrid
- Dominant
- Recessive
- Punnett Square
- Genotype
- Phenotype
- Homozygous
- Heterozygous

What are Traits?

Inheriting Traits

- Genes on chromosomes control an organism's traits
- Alleles are the different forms of a trait on a chromosome
- When chromosomes split during meiosis, alleles for each trait also separate into different sex cells
 - Every sex cell has one allele for each trait



Dominant and Recessive

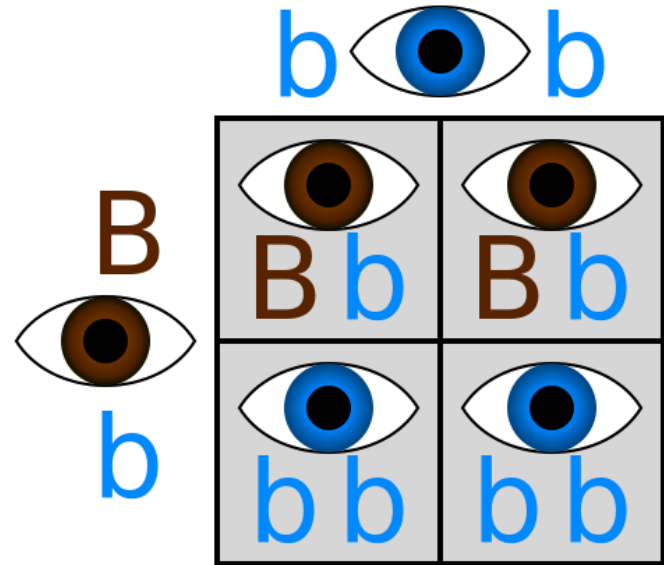
- Genes work together to determine individual traits.
- Dominant Trait – A trait that will appear in the offspring if one of the parents contributes it.
 - In humans, brown eyes is a dominant trait. If one parent contributes an allele for brown eyes, and the other parent contributes an allele for blue eyes, the offspring will have brown eyes.

Dominant and Recessive

- Recessive Trait – An allele that must be contributed by both parents in order to appear in the offspring.
- Recessive traits can be carried in a person's genes without appearing in that person.
 - A brown-eyed person may have one gene for brown eyes, which is a dominant trait, and one gene for blue eyes, which is recessive.
 - Because of this, it is possible for two brown-eyed parents to have a blue-eyed child
 - Both parents would have had to pass on their recessive allele to the child

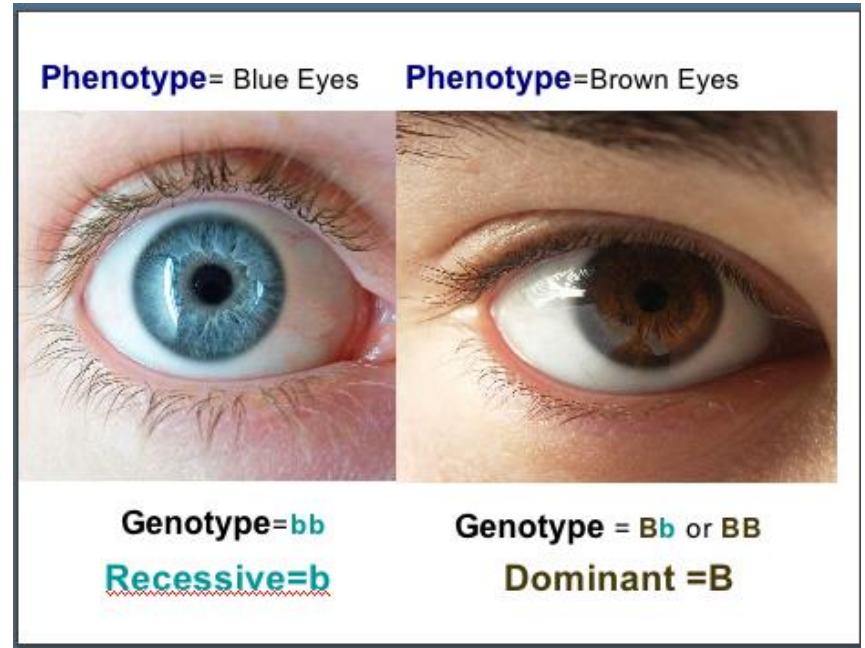
Punnett Square

- Letters represent dominant and recessive alleles
- Dominant alleles are represented by a capital letter
- Recessive alleles are represented by a lower-case letter



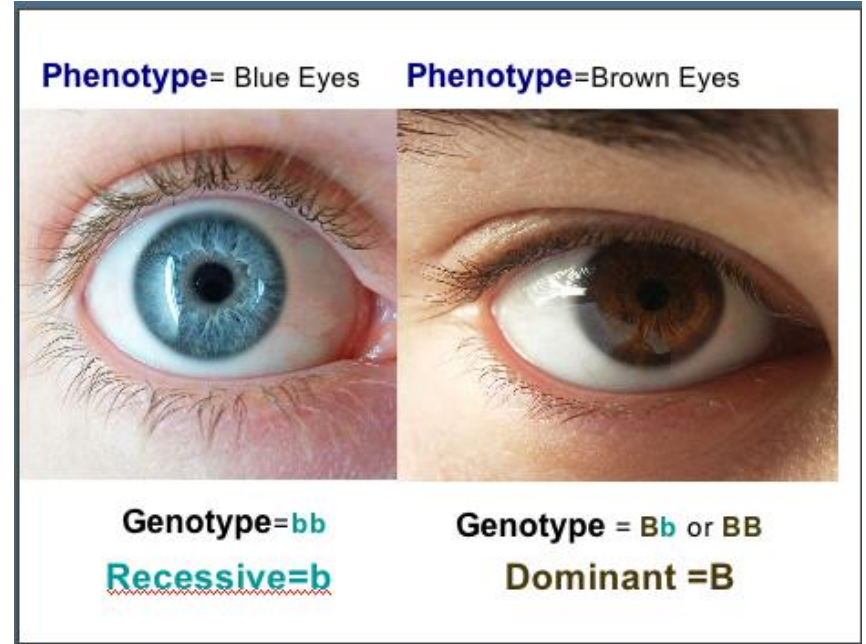
Genotype & Phenotype

- Genotype – The alleles that are present
 - BB, Bb, bb
- Phenotype – The trait exhibited
 - Brown eyes, blue eyes



Homozygous & Heterozygous

- Homozygous – Both alleles are the same
 - BB or bb
- Heterozygous – Each allele is different
 - Bb



Genetics Since Mendel

Chapter 5, Section 2

Vocabulary

- Gene
- Incomplete Dominance
- Polygenetic Dominance
- Sex-Linked Gene

Incomplete Dominance

- The offspring of two homozygous parents show a trait that is in between the parents' phenotype
- Neither gene is dominant



Multiple Alleles

- Many traits are controlled by more than two alleles
- Traits controlled by multiple alleles produce more than 3 phenotypes
- Blood type- A, B, AB and O

father	mother		
	A	B	O
A	AA	AB	AO
B	BA	BB	BO
O	OA	OB	OO

alleles blood type

$$A+A = A$$

$$A+O = A$$

$$A+B = AB$$

$$B+B = B$$

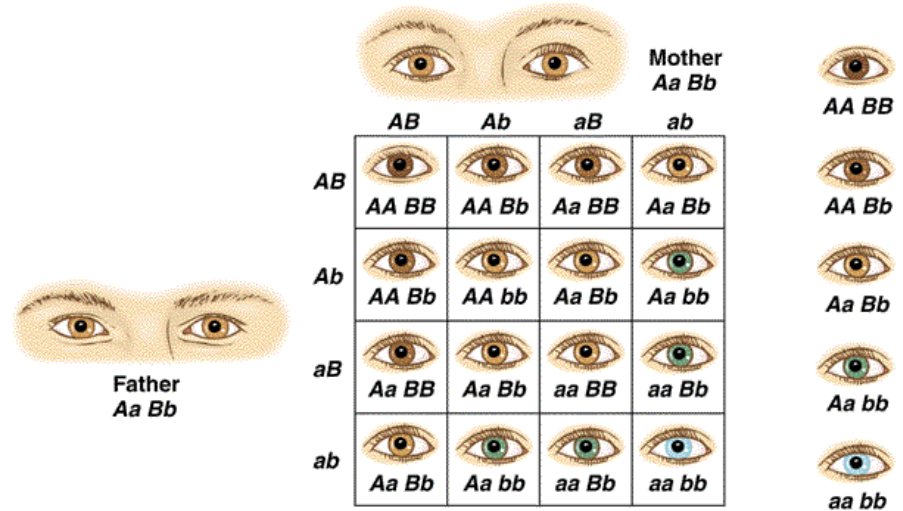
$$B+O = B$$

$$O+O = O$$

Polygenic Inheritance

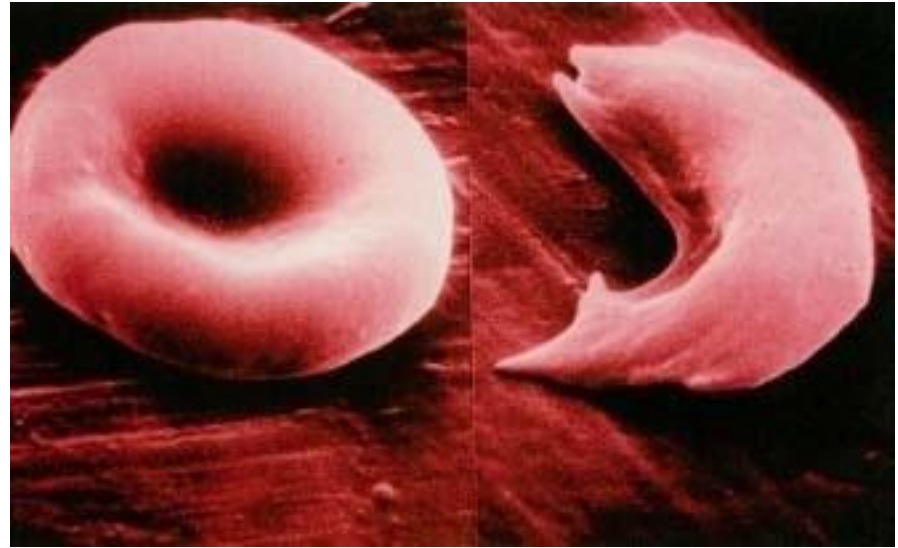
- A trait that is produced by a combination of many genes
- Height, eye color, hair color, skin color, etc. are all polygenic traits

Tobin/Dusheck, Asking About Life, 2/e
Figure 16.4



Genetic Disorders

- Many genetic disorders are caused by recessive genes
 - Sickle cell anemia, cystic fibrosis, albinism
- Some genetic disorders are caused by other chromosomal abnormalities
 - Down's Syndrome – 3 copies of chromosome 21

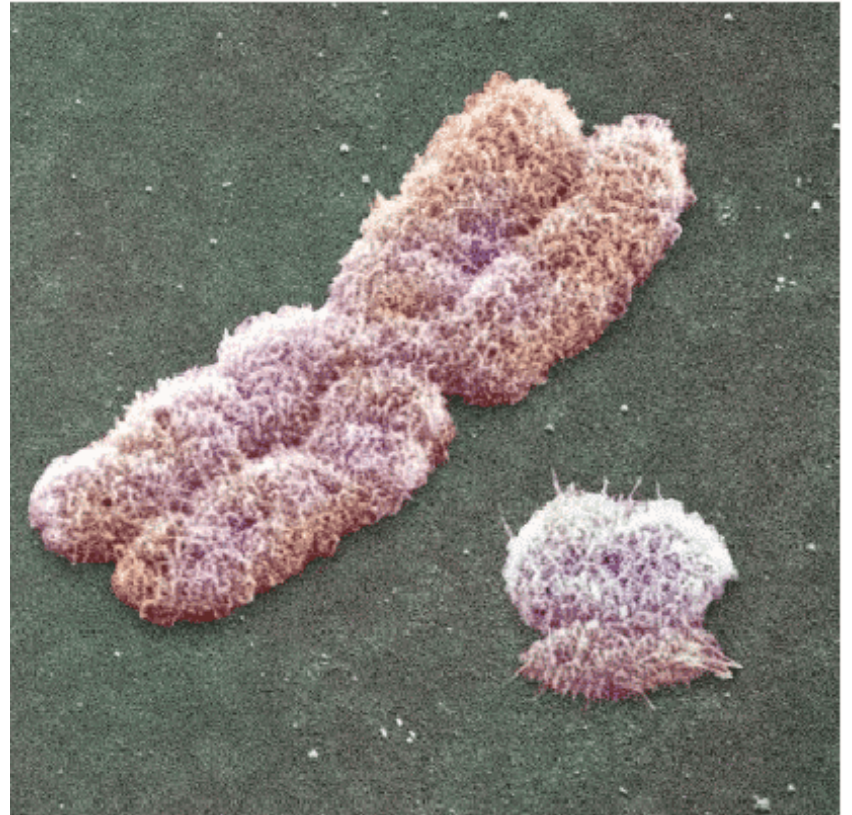


Gender Determination

- The female chromosome is referred to as the X chromosome
- The male chromosome is referred to as the Y chromosome
- All egg cells carry an X chromosome
- Sperm cells determine if the offspring will be male or female
 - Carry an X chromosome or Y chromosome
 - XX is a female offspring, XY is male

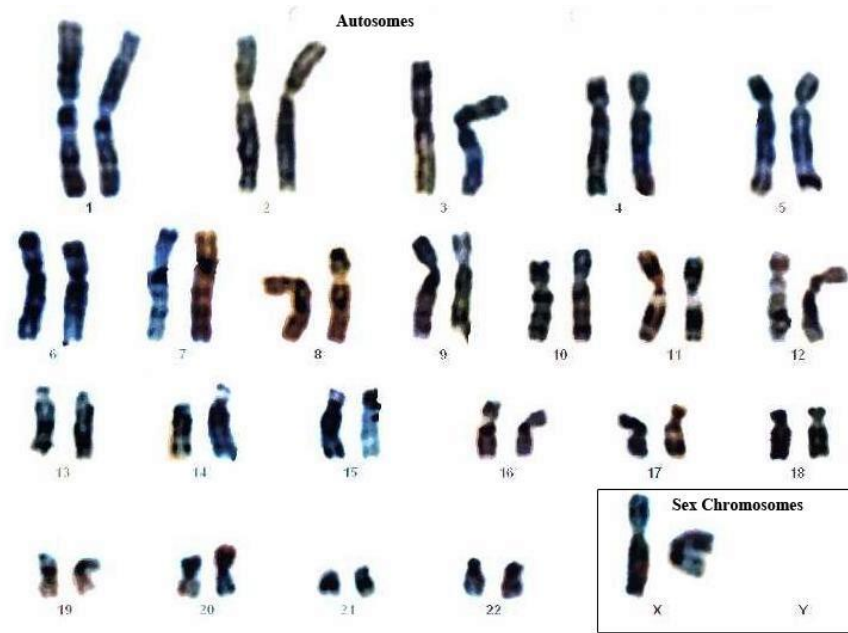
Sex Linked Disorders

- Some inherited conditions are carried on the X or Y chromosome
 - Color blindness is recessive, and on the X chromosome



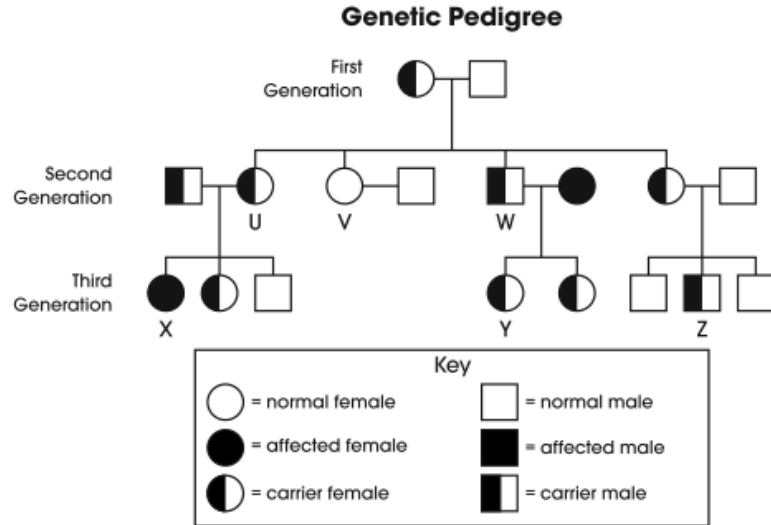
HUMAN KARYOTYPE

- Biologists can analyze human chromosomes by looking at a karyotype.
- A karyotype is a picture of the chromosomes from a cell arranged in homologous pairs.
- Humans have 46 chromosomes.
- Two of these chromosomes, X and Y, are the sex chromosomes.
- Females have two X chromosomes (XX). Males have one X and one Y chromosome (XY).
- The other 44 chromosomes are called autosomes.

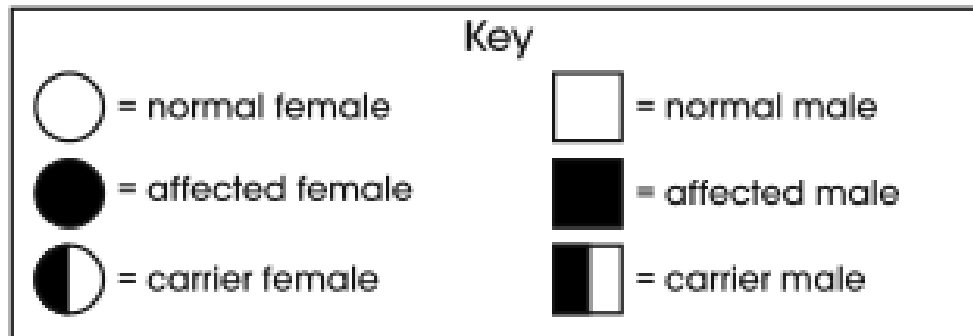
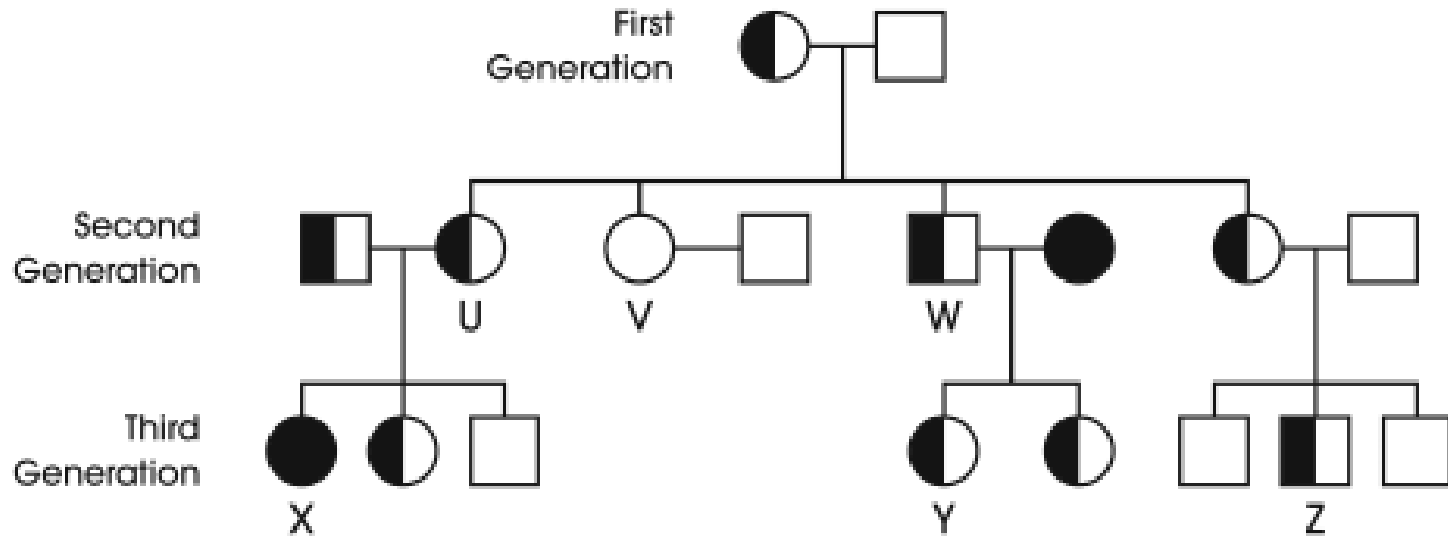


PEDIGREE CHARTS

- To study the inheritance of human traits, biologists use a pedigree chart.
- A pedigree shows the relationships within a family.
- The inheritance of a certain trait in a family can be traced using a pedigree.
- From this, biologists can infer the genotypes of family members.



Genetic Pedigree



DNA FINGERPRINTING

- Biologists can use techniques in molecular biology to read, analyze, and even change the DNA code of human genes.
- Genetic tests are available to test parents for the presence of recessive alleles for genetic disorders.
- In a process called DNA fingerprinting, individuals can be identified by analyzing sections of DNA that have little or no known function. These sections of DNA vary widely from one person to the next.

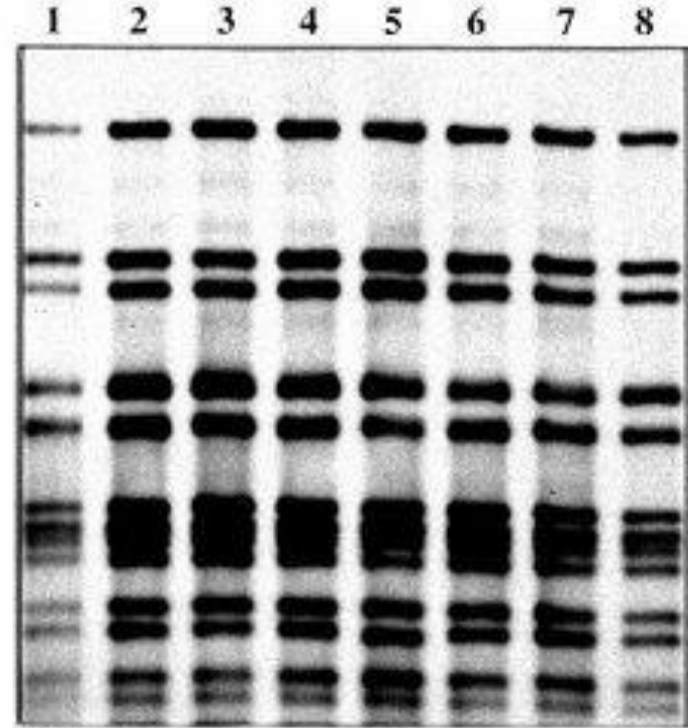


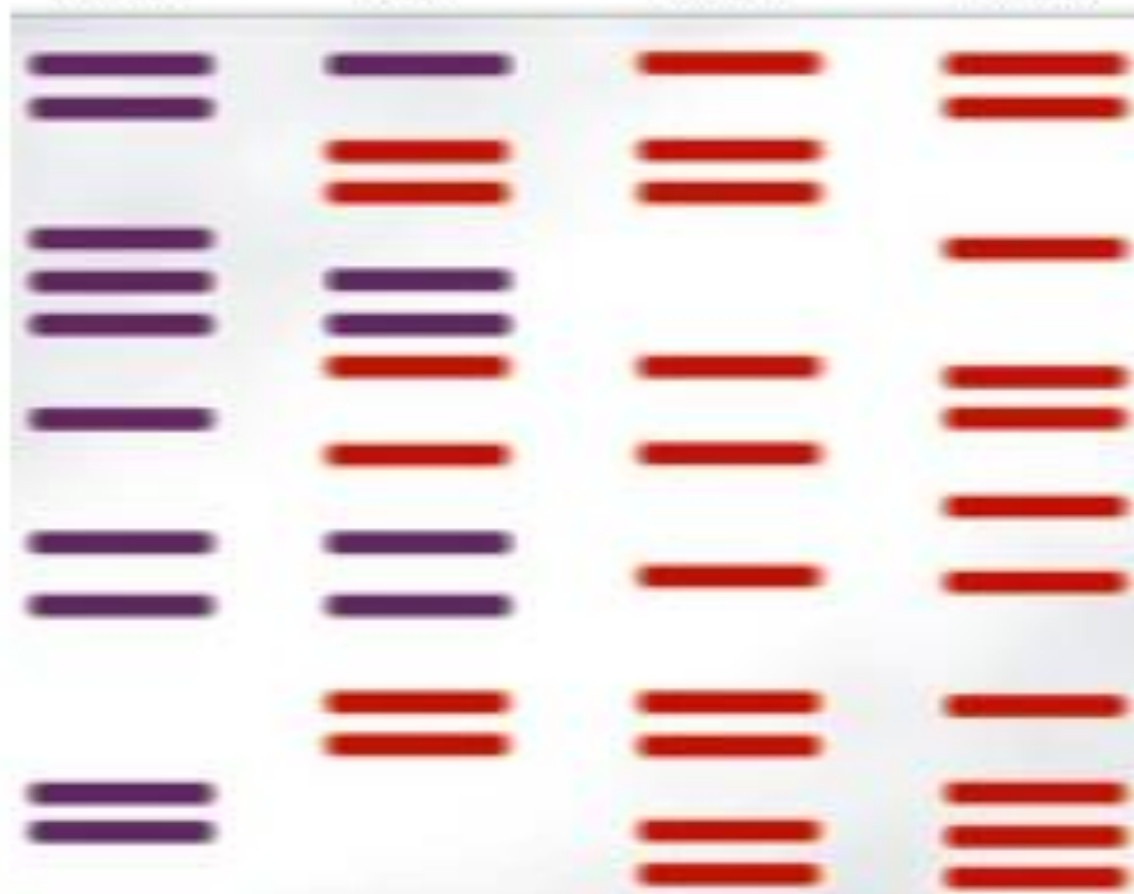
Figure 4.

Mother

Child

Male 1

Male 2



Advances in Genetics

Chapter 5, Section 3

Genetic Engineering

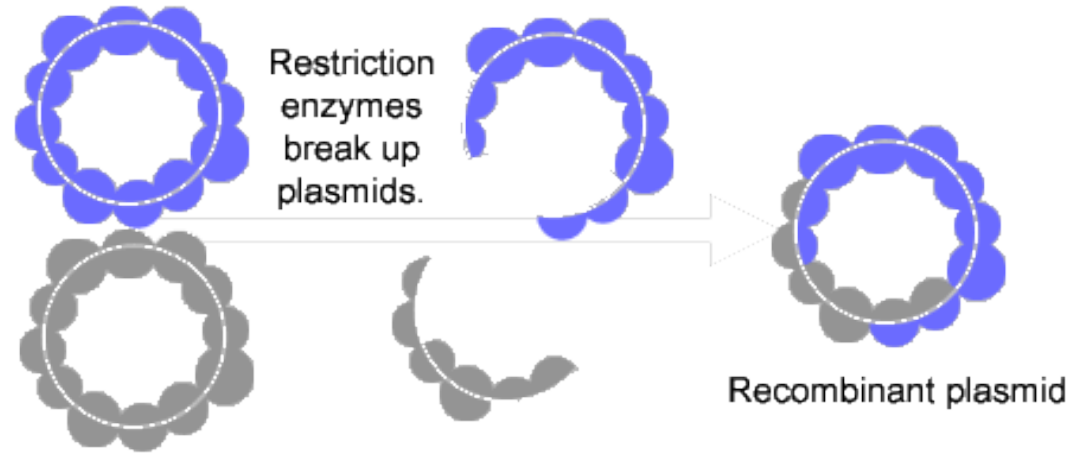
- Recombinant DNA
 - Also called Gene Splicing
 - Inserting useful segments of DNA from one organism and putting them into another organism
 - Results in desirable traits



Genetic Engineering

- Gene Splicing

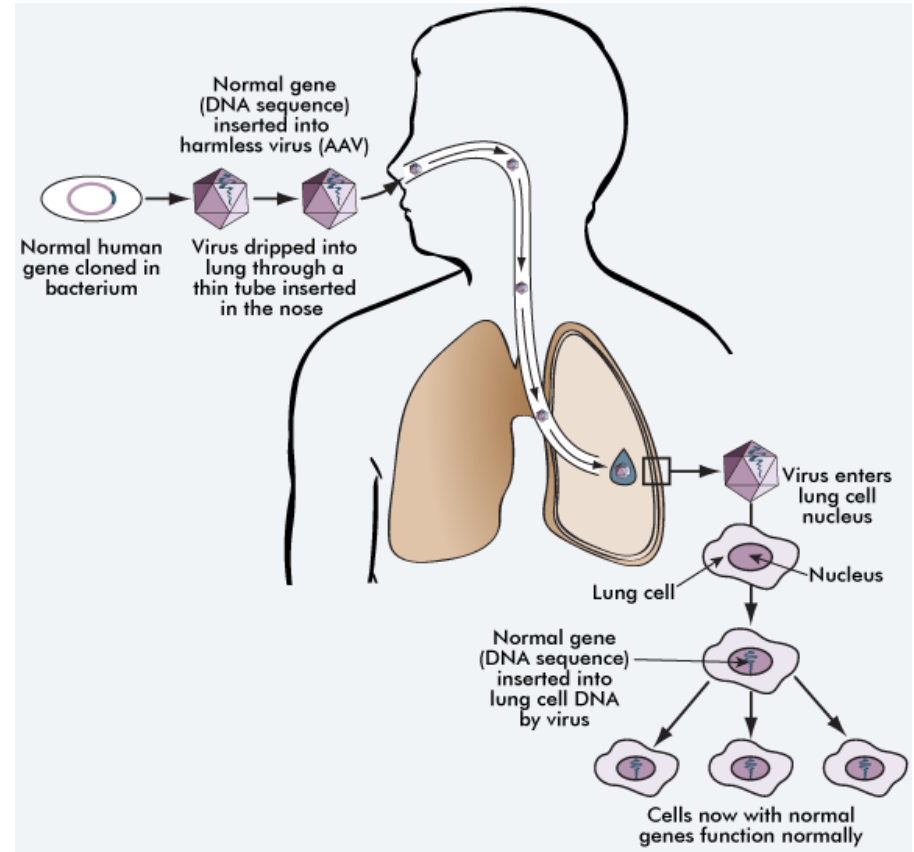
- Insulin making genes can be inserted into bacteria to have the bacteria make insulin
- Growth hormone making genes can be inserted into bacteria as well



Genetic Engineering

- Gene Therapy

- A normal gene is placed in a virus
- The virus then delivers the normal gene to the target cell



Genetic Engineering

- Genetically Engineered Plants
 - Finding DNA for desired traits in one plant, and then inserting that DNA into another plant

