

# Inheritance of Traits

- ☺ A trait's pattern of inheritance within a family can be determined by analyzing a PEDIGREE
- ☺ Geneticists often prepare a PEDIGREE, a family history that shows how a trait is inherited over several generations
- ☺ Pedigrees are especially helpful for gathering information on genetic disorders

## Autosomal or Sex-Linked

- ☑ Because the X and Y chromosomes differ between the sexes, they are called **SEX CHROMOSOMES**
- ☑ Other chromosomes are called **AUTOSOMES**
- ☑ If a trait is autosomal, it will appear in both sexes equally
- ☑ A sex-linked trait is a trait whose allele is most often located on the X chromosome
- ☑ Most sex-linked traits are recessive
- ☑ Because males have only one X chromosome, a male who carries a recessive allele on the X or Y chromosome will exhibit the sex-linked condition
- ☑ If a trait is sex-linked, it is often seen only in males
- ☑ A female who carries a recessive allele on one X chromosome will NOT exhibit the condition if there is a dominant allele on her other X chromosome
- ☑ She WILL express the recessive condition ONLY IF she inherits TWO recessive alleles

## Dominant or Recessive

- If the trait is **AUTOSOMAL DOMINANT**, every individual with the trait will have a parent with the trait
- If the trait is **AUTOSOMAL RECESSIVE**, an individual with the trait can have one, two, or neither parent exhibit the trait

## Heterozygous or Homozygous

- If individuals with autosomal traits are **HOMOZYGOUS DOMINANT** or **HETEROZYGOUS**, their **PHENOTYPE** will show the dominant characteristic
- If individuals are **HOMOZYGOUS RECESSIVE**, their **PHENOTYPE** will show the recessive characteristic

## Human Genetic Disorders

- Genes build proteins
- Your body requires specific proteins in order to be healthy
- Sometimes genes get damaged or are copied incorrectly
- A change in a gene is called a **MUTATION**
- Most mutations are recessive and therefore are not expressed in the heterozygous condition
- The harmful effects that some mutations produce are called **GENETIC DISORDERS**
- In most cases, a genetic disorder is recessive—the individual needs to have **BOTH** recessive alleles to have the disorder
- A person with a recessive disorder has inherited a defective gene from **BOTH** parents
- Other genetic disorders are caused by dominant alleles
- In this case, a **SINGLE** copy of the defective gene is enough to cause the disease

## Disorders Due to Nondisjunction; What is Nondisjunction?

- ⊛ Failure of homologous chromosomes to separate during meiosis I
- ⊛ Failure of sister chromatids to separate during meiosis II

### Nondisjunction can cause gametes to:

- Lack a chromosome
- Have an extra chromosome

### TYPES

#### Monosomy

A zygote with 45 chromosomes –has only one copy of a particular chromosome

#### Trisomy

A zygote with 47 chromosomes – has 3 copies of a particular chromosome

### Nondisjunction can also affect the sex chromosomes:

- Males with an extra X chromosome have Klinefelter's syndrome (XXY)
  - Some feminine characteristics
  - Sometimes mentally retarded
  - Sometimes infertile
  
- Individuals who have a single X chromosome instead of a pair of sex chromosomes have Turners syndrome (XO)
  - Female appearance
  - Do not mature sexually
  - Remain infertile
  
- Zygotes that receive only a single Y chromosome do not survive because the X chromosome contains information that is essential for development

# Gel Electrophoresis

Gel Electrophoresis separates nucleic acids (DNA) or proteins according to their **SIZE** and **CHARGE**

It does this by using an electric current that runs through an agarous gel

- DNA or protein samples are placed in tiny wells made on the gel
- An electric current is then run through the gel for a given period of time
- The DNA fragments, which are negatively charged, migrate toward the positively charged end of the gel
- They **DO NOT** migrate, however, at the same rate
- Smaller fragments migrate faster and further than larger fragments
- These fragments are then stained and look like bands
- Scientists can then compare the bands and look for genetic disorders

Geneticists will sometimes run an individuals DNA on a gel to look for genetic disorders

**Notice that allele 2 in individual A does not line up with the control sample. All alleles in B and C do line up with the control. This would suggest that individual A has a defect in allele 2.**

