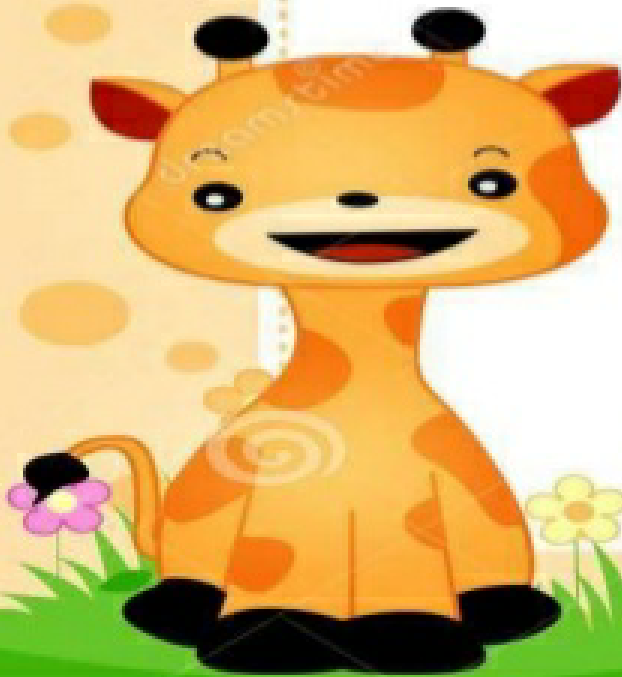




# Applied Genetics

# WHAT IS APPLIED GENETICS???

**Applied genetics is the manipulation; of the hereditary characteristics of an organism to improve or create specific traits in offspring.**



## Eugenics,

Improvement of human race through heredity law or using Pedigree analysis.

**Eugenics** is the science of improving the human species by selectively mating people with specific desirable hereditary traits. It aims to reduce human suffering by “breeding out” disease, disabilities and so-called undesirable characteristics from the human population



Dangerously Ahead of the Game - A Eugenics Exhibit at the 1920 Kansas State Fair

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It aims to **reduce human suffering by “breeding out” disease**, disabilities and so-called undesirable characteristics from the human population.

Early supporters of eugenics believed people inherited mental illness, criminal tendencies and even poverty, and that these conditions could be bred out of the gene pool.

**Positive** eugenics refers to efforts aimed at **increasing desirable** traits, while **negative eugenics** refers to efforts aimed at **decreasing undesirable traits**.

Breeding for 'desirable' traits to improve the human race, called **positive eugenics**. This focused on giving monetary incentives in the form of tax breaks and stipends to encourage the 'best' to reproduce and pass on their traits. These were designed to motivate those with desirable traits to have more children and therefore increase the number of individuals with such traits in the human population

**In Negative eugenics**, 'unfit' people are prevented from reproducing, often against their will. Negative eugenics involved sterilization, marriage restrictions, and in extreme cases euthanasia. Preventing such people from reproducing prevented their genes from 'tainting' the gene pool and bringing down the human race.

## **Euthenics:**

Euthenics is the study of the improvement of human functioning and well-being by improvement of living conditions. (Environment)

Affecting the "improvement" through altering external factors such as **education** and the **controllable environment**, including the **prevention and removal of contagious disease and parasites**, **environmentalism**, **education regarding employment**, **home economics**, **sanitation**, and **housing**.

## Euthenics vs. eugenics

<b>Eugenics</b>	<b>Euthenics</b>
Deals with race improvement through heredity	deals with race improvement through environment.
Eugenics is hygiene for the future generations	Euthenics is hygiene for the present generation.
Eugenics must await careful investigation.	Euthenics has immediate opportunity.
Genetic laws	Best environment

Euthenics precedes eugenics, developing better men now, and thus inevitably creating a better race of men in the future.

Euthenics is the term proposed for the preliminary science on which Eugenics must be based.

## **Euphenics**

*Euphenics deals with improvement of human race by genetic engineering.*

**Euphenics**, which literally means "good appearance" or "normal appearing", is the science of making phenotypic improvements to humans after birth, generally to affect a problematic genetic condition.



# Euphenics

*Euphenics deals with improvement of human race by genetic engineering.*

One of the first publicized applications of euphenics was the use of vitamins containing folic acid during pregnancy to combat neural-tube deficiencies such as spina bifida in the 1970s.

*However, medical science had been using euphenic strategies years before the term itself was coined. Euphenics is used today in the medical community to more generally refer to methods of affecting a genetic condition in a positive manner through diet, lifestyle or environment, such as the use of insulin to control diabetes or installation of a pacemaker to offset a heart defect.*

# Genetic Engineering

–it study or modify genes. Genetic engineering is applied in many ways:

- In agriculture

Genetic engineers have produced several types of new bacterias that help increase crop production. A genetically altered bacterium helps some plants resists frost damage.



# **MEDICAL GENETICS** | Diagnostic Techniques



Family History and Pedigree Analysis

Cytogenetic Studies

Fluorescence in Situ Hybridization (FISH)

DNA Analysis

Biochemical Analysis

# MEDICAL GENETICS | Diagnostic Techniques

## Cytogenetic



1. Cytogenetics is the study of chromosomes utilizing light microscopy.
2. Chromosomal analysis is done by growing human cells in tissue culture, chemically inhibiting mitosis, staining, observing, photographing, sorting, and counting the chromosomes;

# DNA Analysis

1. Molecular genetics involves understanding the expression of genes by studying DNA sequences of chromosomes.
2. **Once a particular gene is shown to be defective in a given disease, the nature of the mutation can be elucidated by sequencing the nucleotides and comparing with that of a normal allele.**
3. Molecular testing is available for more than 1000 hereditary conditions and has had a significant impact on the diagnosis of Mendelian disorders.
4. Similar to the use of specific probes in a FISH analysis of chromosomal abnormalities, probes are used to identify specific genes that may be mutated in a certain hereditary disease.

# DNA FINGERPRINT & FORENSIC

- Every individual carries a unique set of genes
  - Chemical structure of DNA is same, but the order of the base pairs differs
- Every cell contains a complete set of DNA that identifies the organism as a whole
- Only one tenth of 1% of DNA differs from person to person

# DNA FINGERPRINT & FORENSIC

- DNA fingerprinting is a way of telling individuals of the same species apart
- DNA sequences are variable and can therefore be used as identifying characteristics.
- DNA fingerprinting has advantages over other sources of evidence (fingerprints, blood type, etc.):
  - Highly accurate.
  - Can be gathered from trace crime scene evidence.

# DNA FINGERPRINT & FORENSIC

- Two Main Types of Forensic DNA Testing
  - **RFLP (restriction fragment length polymorphism)**
    - Requires larger amounts of DNA
    - DNA cannot be degraded
  - **PCR (polymerase chain reaction)**
    - Less DNA and DNA can be partially degraded
    - Extremely sensitive to contaminating DNA