

History of Biotechnology

Dr. Imran Riaz Malik
Introduction to Biotechnology

What is Biotechnology

-The science of using living organisms, or the products of living organisms for human benefit(or to benefit human surroundings- that is to make a product or solve a problem.

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- **In fact, now days many applications represent old practices with new methodologies**
- **- Humans have been using other biological organisms for their benefit in many processes for several thousand years.**

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- **Chinese , Greeks, Romans, Babylonians and Egyptians and among have been involved in biotechnology since about 2000B.C.**
- **Biotechnology does not mean hunting and gathering animals and plants for food.**
- **However, the domestication of animals such as sheep and cattle for use as livestock is a classic example of biotechnology.**

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- Early ancestors also took advantage of microorganisms and used fermentation to make breads, cheeses, yogurts and alcoholic beverages such as beer and wine.
- During fermentation, some strain of yeast decompose sugars to derive energy, and in the process they produce ethanol(alcohol) as a waste product.
- Bread dough is being made, yeast(*Saccharomyces cerevisiae*, commonly called bakers yeast) is added to make the dough rise.
- This occurs because yeast ferments sugar releasing carbon dioxide, which causes dough to rise and creates holes in bread.

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- Alcohol produced by the yeast evaporates when the bread is cooked.
- If you make bread or pizza dough at home, you may have probably added store bought *s. cerevisiae* from an envelope or jar to your dough mix.
- Similar processes are very valuable for production of yogurts, cheeses and beverages.
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- **For thousands of years, human have used selective breeding as a biotechnology application to improve production of crops and livestock used for food purposes.**
- **In selective breeding, organisms with desirable features are purposely mated to produce offspring with the same desirable characteristics.**
- **For example, cross breeding plants that produce the largest, sweetest and most tender ears of corn is a good way for farmers to maximize their land to produce the most desirable crops.**
- **Similar breeding techniques are used with farm animals, including turkeys(to breed birds producing largest and most tender breast meat) cows, chickens and pigs etc.**



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- **Other examples include breeding wild species of plants such as lettuces and cabbage over many generations to produce modern plants that are cultivated for human consumption.**
- **Many of these approaches are really genetic applications of biotechnology.**
- **with out realizing and without expensive labs, sophisticated equipment, trained scientists and well planned experiments- human have been manipulated genes for hundreds of years.**

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- **By selecting plants and animals with desirable characteristics, humans are choosing organisms with useful genes and taking advantages of their genetic potential for human benefit.**
- **Scientists at the children hospital of Boston produced a transparent zebrafish names casper.**
- **Casper was created by mating a zebrafish mutant that lacked reflective pigment with a zebrafish that lacked black pigment.**
- **Zebrafish are important experimental model organisms and scientists believe that casper will be important for drug testing and in vivo studies of stem cells and cancer.**

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- **Cancer has already proven to be valuable studying how cancer cells spread.**
- **Scientists injected fluorescent tumor cells into the fish's abdominal cavity and were able to track the migration of those cells to specific locations in the body.**

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- In 1928, Alexander Fleming discovered that the mold *penicilium* inhibited the growth of a bacterium called *Staphylococcus aureus* which causes skin disease in humans.
- Antibiotics are substances produced by microorganisms that will inhibit the growth of other microorganisms.
- In 1940s penicillin became widely available for medical use to treat bacterial infections in humans.
- In 1950s and 1960s, advances in biochemistry and cell biology made it possible to purify large amounts of antibiotics from many different strains of bacteria.
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- **Batch (large scale) processes: in which scientists can grow bacteria and other cells in large amounts and harvest useful products in large batches- were developed to isolate commercially important molecules from microorganisms.**
- **Since the 1960s, rapid development of our understanding of genetics and molecular biology has led to exciting new innovations and applications in biotechnology.**
- **As unravel of the secrets of DNA structure and function, new technologies have gene cloning, the ability to identify and reproduce a gene of interest, and Genetic engineering, manipulating the DNA of an organism.**

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- **Through genetic engineering, scientist are able to combine DNA from different sources called recombinant DNA technology is used to produce many proteins of medical importance, including insulin, human growth hormone and blood clotting factors.**
- **Recombinant DNA technology has led to hundred of applications including development of disease resistant plants food crops that produce greater yields, golden rice engineered to be more nutritious and genertically engineered bacteria capable of degrading environmental pollutants.**
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- **Gene cloning and recombinant DNA technology have had a tremendous impact on human health through the identification of thousands of genes involved in human genetic disease conditions. The ultimate gene cloning project the human genome project was an international effort that began in 1990.**
- **A primary goal of human genome project was to identify all genes-the genome contained in the DNA of human cells and to map their locations to each of the 24 human chromosomes(chromosomes 1 to 22 and the x and y chromosomes).**
- **The human genome project has provided unlimited potential for the development of new diagnostic approaches for detecting disease and molecular approaches treating and curing human genetic disease conditions.**

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- **Human genome project tell us the chromosomal location and code of every human gene, from genes that control normal cellular processes and determine characteristics such as hair color height and weight to the myriad of genes that cause human genetic diseases.**
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