History of Biotechnology

Unit 9: Microbiology

What is Biotechnology?

- Biotechnology: the branch of molecular biology that studies the use of microorganisms to perform specific industrial processes; "biotechnology produced genetically altered bacteria that solved the problem"

Biotechnology in B.C.

- **500 BC:** The Chinese use moldy curds as an antibiotic to treat boils
- **250 BC:** The Greeks practice crop rotation to increase soil fertility
- 100 BC: Chinese use powdered chrysanthemum as an insecticide

Pre-20th Century Biotechnology

- **1590:** Janssen invents the microscope
- **1663:** Hooke discovers cells
- **1675:** Leeuwenhoek discovers bacteria and protozoa
- **1797:** Jenner inoculates a child with a viral vaccine to protect him from smallpox
- **1802:** 1st time the term "biology" is used

Pre-20th Century Biotechnology

- **1830:** Proteins, the building blocks of cells, are discovered
- **1833:** The nucleus of the cell is discovered
- **1855:** The E. coli bacterium is discovered
- **1855:** Pasteur works with yeast, eventually proving they are living organisms
- **1863:** Mendel discovers genes while working with peas. He lays the groundwork for genetics.

Pre-20th Century Biotechnology

- **1879:** Flemming discovers chromatins
- **1883:** The rabies vaccine is developed
- **1888:** Waldyer discovers the chromosome

Biotechnology In The First Part Of The 20th Century

- **1902:** The term "immunology" first used
- **1906:** The term "genetics" is used
- **1915:** Bacterial viruses, called phages, are discovered
- **1919:** The word "biotechnology" is first used
- **1927:** Muller discovers that X-rays cause mutation
- **1928:** Fleming discovers penicillin
- **1938:** The term "molecular biology" is used
- **1941:** The term "genetic engineering" is first used

Biotechnology In The First Part Of The 20th Century

- **1942:** The electron microscope is used and characterizes viruses that infect bacteria, called bacteriaphages
- **1944:** DNA is shown to be the building block of the gene
- **1949:** Pauling proves that sickle cell anemia is a "molecular disease" caused by a mutation

Biotechnology in the 1950s and 1960s

- **1953:** Watson and Crick understand the structure of DNA
- **1954:** Cell-culturing techniques are first used
- **1955:** An enzyme involved in the production of a nucleic acid is isolated
- **1956:** The fermentation process is perfected
- **1960:** Messenger RNA is discovered
- **1961:** The genetic code is understood

Biotechnology in the 1970s

- **1972:** The DNA composition of humans is shown to be 99% similar to that of chimps and gorillas
- **1977:** Genetically-engineered bacteria are used to make human growth protein
- **1978:** North Carolina scientists, Hutchinson and Edgell, prove it is possible to introduce specific mutations at specific sites in a DNA molecule
- **1979:** The first monoclonal antibodies are synthesized

Biotechnology in the 1980s

- **1980:** The U.S. Supreme Court approves the patenting of genetically-engineered life forms
- **1980:** The U.S. patent for gene cloning is awarded to Boyer and Cohen.
- **1981:** The North Carolina Biotechnology Center is created—the 1st state-sponsored research center for biotechnology
- **1981:** The first genetically-engineered plant is reported
- **1981:** 1st mice to be successfully cloned
- **1982:** Humulin, human insulin drug, produced by genetically-engineered bacteria (first biotech drug approved by the FDA)

Biotechnology in the 1980s

- 1983: The first artificial chromosome is made
- 1983: The first genetic markers for specific inherited diseases are found
- 1984: The DNA fingerprinting technique is developed.
- 1984: The first genetically-engineered vaccine is developed.
  1986: The first biotech-derived interferon drugs for the treatment of cancer are synthesized
- 1988: Congress funds the Human Genome Project
- 1989: Microorganisms are used to clean up the Exxon Valdez oil spill

Biotechnology in the 1990s

- **1990:** The first federally-approved gene therapy treatment is performed successfully
- **1992:** The structure of HIV RT is elucidated
- **1993:**The FDA declares that genetically engineered foods are "not inherently dangerous"
- **1994:** The first breast cancer gene is discovered
- **1996:** Scientists clone identical lambs from early embryonic sheep

Biotechnology in the 1990s

- **1998:** Scientists clone three generations of mice from nuclei of adult ovarian cells
- **1998:** Embryonic stem cells are used to regenerate tissue and create disorders that mimic diseases
- **1998:** The Biotechnology Institute is founded by BIO as an independent, national, 501(c)(3) education organization
- **1999:** The genetic code of the human chromosome is deciphered

Biotechnology 2000 and Beyond

- **2000:** A rough draft of the human genome is completed
- **2000:** Pigs are the next animal cloned by researchers to help produce organs for human transplant
- **2001:** The sequence of the human genome is published in *Science and Nature*
- **2002:** Scientists complete the sequence of the pathogen of rice, a fungus that ruins enough rice to feed 60 million people annually
- **2003:** Dolly, the cloned sheep from 1997, is euthanized

Resources

- http://www.biotechinstitute.org