The history of biotechnology

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- **10,000-7,000 BC** Wine making developed in Eastern Mediterranean.
- **7,000-5,000 BC** Beer developed in Egypt and Babylon.
- **5.000 BC** Cheese making and some medicinal plants were developed.
- **4,000 BC** Vinegar was referenced in old testament.
- **500 AD** Algae was cultivated for food by Aztecs.
- **500 AD** Yogurt, sauces and fermented meats were developed.
- **1600 AD** The name fermentation was used.

- **1680 AD** *Van Leeuwenhoek* observed yeast cells in alcohol fermentation.
- **1781 AD** Pressed Baker's yeast produced by Dutch (this was the first improvement process in handling Baker's yeast).
- **1789 AD** *Jenner* demonstrated vaccination against smallpox infection (First immunization).
- **1837 AD** *Cagniard-Latour*, *Schwann* and *Kutzing* independently hypothesized that yeast is a living thing. (First knowledge on cell biology).

- **1847 AD** *Blondeau* studied fermentation of lactic acid, butyric acid, acetic acid and urea. He hypothesized that different fermentations carried out by different organisms (fungi?).

- **1857 AD** *Pasteur* demonstrated that living yeast cells ferment sugar into ethanol and carbon dioxide *Pasteur* noted cylindrical organisms produce butyric acid only in absence of oxygen. (First knowledge on anaerobic fermentation).

- **1859 AD** *Darwin* published the Origin of Species.

- **1877 AD** *Pasteur* noted relationship between microbes / infectious disease. (First knowledge on pathogenic organisms).

- **1881 AD** *Koch* developed methods for handling microbial cultures (First knowledge on microbial technique and maintenance).

- **1881 AD** First commercial production of lactic acid by anaerobic fermentation.

- **1894 AD** *Takamine* patented a process to isolate diastase enzymes from molds that can break down starch. (First knowledge on enzymes it's applications).

- **1916 AD** Germany produces baker's yeast grown on molasses as protein supplement. Also, produced glycerol by yeast fermentation.

- **1918 AD** Great Britain produced acetone and butanol by anaerobic fermentation process.
- **1923 AD** Commercial production of citric acid by surface cultures.
- **1929 AD** *Fleming* demonstrated that mold contaminant in a petri-dish causes bacterial death. (Fist discovery of microbial antibiotics)
- **1934 AD** *Gautheret* successfully cultured plant cells. (First knowledge on plant tissue culture).
- **1940 AD** Florey and *Chain* isolated penicillin, elucidated its structure and demonstrated its bacterial properties on G(+) bacteria.

- **1940s** *Waxman* discovered streptomycin's. and its properties on G(-) bacteria (first microbial screening method for new antibiotics discovery) *Waxman* also discovered vitamin B12.

- **1950s** The production of Cortisone at the cost of $200/g (now it's cost is $16/g).
  The production of polio and peruses vaccines.

- **1960s** The production of Xanthus gum.
  The production of alkine protease for detergents industry.

- **1970s** The discovery of glucose isomerase and the production of high fructose corn syrup (HFCS) as a sweetener.

- **1970s** Human growth hormone was synthesized.
  The development of recombinant human insulin.
- **1980s** *Kohler* and *Milstein* developed monoclonal antibodies.
  The production of poly (hydroxybutyrate).
  US Supreme Court approved the principle of patenting organisms.
  First recombinant DNA vaccine for livestock.
  FDA approved Insulin drug.
  Interferon the first anticancer drug.
  The first pest resistant corn (Bt corn).
  FDA approve the first hepatitis C vaccine.
  The first transgenic animals

- **1990s** The production of amino acids (lysine,
- threonine and isoleucine).

  The production of antibodies.

  The discovery of first breast cancer gene.

  The discovery of gene associated with Parkinson's disease.

  A sheep named Dolly become the first animal cloned from an adult cell.

  FDA approved bovine (BST) for dairy cows.

  The commercialization of first genetically engineered corps.

  The first gene therapy for immune disorder.

- **2000s** The production 1,2-propandiol.

  The production of xylitol

  The production of hydroxpropanoic acid.

  FDA approved the first gene target for patient with chronic myeloid leukemia.

  FDA approved the first transgenic rootworm resistant corn.

  Sequencing human genome.

  FDA approved the first anti-angiogenic drug for cancer.

  FDA approved the recombinant HPV vaccine.

  FDA approved the first H_5N_1 avian flue vaccine.

- **2000s** FDA approved the first transgenic animal for the production of human recombinant anti-thrombine.
  USDA granted the first regulatory for a plant made vaccine.
  Global biotechnology crops reaches over 330 million acres.

- **2010s** The creation of first synthetic cell.
  Advances in stem cell technology.
  Advances in 3-D printing technology leading to skin printing.

Thank you for your attention