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Extended Abstract

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Present and new vistas in biotechnology

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Following the definition of biotechnology, I shall delineate four areas of biotechnology which are undergoing an explosive growth: gene editing and delivery; nanoparticulate delivery of drugs-prepared from natural polymers, low cost metallic nanoparticles, and cellular-derived nanoparticles-exosomes; modelling in biotechnology and systems biology and artificial intelligence; and immunotherapy, particularly of cancer. First, I will mention some classical gene delivery methods, than cover in some detail relatively new development, the CRISPR-Cas9 method, dealing with gene editing and delivery. Even though this method matured only in 2002, an exponential growth is noted. Some warning is mentioned because of flagrant se of this method in connection with human embryo. Second part will deal with nanoparticles, covering three subjects. First some polymeric nanoparticles will be introduced, followed by metallic-based nanoparticles prepared from bacteria, yeasts, algae and plants with help of reducing agents. Some examples of what these nanoparticles can do will be listed, particularly of oxidation of toxic agents. Then a special nanoparticle introduced from all kinds of cells will be discussed-exosomes. This are is largely unexplored and will perhaps play a significant role in biotechnology. The third section will deal with modelling in biotechnology, with an emphasis on systems biology and closed with an exposure to the artificial intelligence which is going to play in biotechnology (is already playing in automobile industry) significant growth in biotechnology once more molecular knowledge is accumulated. At last, the medical biotechnology/immunology will be (it is already) more significant in fighting cancer. Immunology is undergoing revolution only now as the accumulated knowledge is now coming to fruiting. We only mention a small portion of this burgeoning field, checkpoint inhibitors which are becoming more effectiveompared to the rest of drugs, fighting cancer.

Biotechnology seems to be leading a new biological revolution. Biotechnology is not a single subject, it covers a wide variety of subjects, Genetics, biochemistry, Microbiology, Immunology, Bio-statistics, Plant breeding, Cell and Molecular biology and Genetic engineering etc. "Biotechnology means any technological applications that uses biological systems, living organisms or derivatives there of to make or modify the products or processes for specific use". In modern terms, biotechnology has come to mean the use of cell and tissue culture, cell fusion, molecular biology and in particular recombinant deoxyribonucleic acid (DNA) technology to generate unique organisms with new traits or organisms that have the potential to produce specific products. One example of modern biotechnology is genetic engineering .Genetic engineering is the process of transferring individual genes between organisms or modifying the genes in an organism to remove or add a desired trait or characteristics. Biotechnology at the beginning of the twentieth century began to bring industry and agriculture together. Bio-Technology is the use of living things, especially cells and bacteria in industrial process. There is a great scope in this field as the demand for biotechnologist is growing in India as well as abroad. An individual aspiring for career in Biotechnology should have a scientific aptitude and a keen interest in the biological sciences. Some other aspects like problem solving skills, information technology skill, analyzing and interpreting skills are also essential for a successful career in this field. The candidate should be methodical and patient by nature, able to work neatly and accurately and have a flair for laboratory work. The ability to work independently is another important aspect. The knowledge of computers in work is a must. Biotechnical methods are now used to produce many proteins for pharmaceutical and other specialized purposes. A harmless strain of Escherichia coli bacteria, given a copy of the gene for human insulin, can make insulin. As these genetically modified (GM) bacterial cells age, they produce human insulin, which can be purified and used to treat diabetes in humans. Microorganisms can also be modified to produce digestive enzymes. In the future, these microorganisms could be colonized in the intestinal tract of persons with digestive enzyme insufficiencies. Products of modern biotechnology include artificial blood vessels from collagen tubes coated with a layer of the anticoagulant heparin. Gene therapy – altering DNA within cells in an organism to treat or cure a disease – is one of the most promising areas of biotechnology research. New genetic therapies are being developed to treat diseases such as cystic fibrosis, AIDS and cancer. DNA fingerprinting is the process of cross matching two strands of DNA. In criminal investigations, DNA from samples of hair, bodily fluids or skin at a crime scene is compared with those obtained from the suspects. In practice, it has become one of the most powerful and widely known applications of biotechnology today. Another process, polymerase chain reaction (PCR), is also being used to more quickly and accurately identify the presence of infections such as AIDS, Lyme disease and Chlamydia.

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