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ROLE OF BIOTECHNOLOGY IN HUMAN WELFARE

VIRENDRA BAHADUR SINGH[1]

Department of Zoology, R.R. P.G. College Amethi, U.P., India

ABSTRACT

The subject of biotechnology has assumed enormous significance in recent years due to major impact on human welfare involving all aspects of life including healthcare, agriculture, industrial growth etc. It is truly multidisciplinary in nature and it encompasses several disciplines of basic science and engineering, science disciplines from which biotechnology draws heavily are biochemistry, immunology, Genetics, Physiology, cell and tissue culture etc on the other hand engineering sides it learns heavily on process, Chemical and biochemical engineering, since large scale cultivation of microorganism and cell. other than being hugely useful biotechnology is also hugely controversial religious seat are against biotechnology as they believe it interferes with the will of god many governments are against, commercialization of biologically engineered products the debate over Bt brinjal is a recent example from India other Issues includes patenting of successful variants and other legal and ethical issues. Biotechnology though very successful is still in its initial stage in India and has a long way to go and many barriers to overcome.

KEYWORDS: Multidisciplinary, Controversial, Commercialization, Ethical, Religious

Biotechnology is the integrated use of biochemistry microbiology and engineering sciences in order to achieve technological (industrial) application of the capabilities of microorganism cultured tissue cells and part thereof.

Traditional Pharmaceutical drugs are small chemical molecules that treat the symptoms of a disease or illness one molecule directed at a single target biopharmaceutical are large biological molecules known as proteins there target the underlying mechanism. It is relatively young Industry they can deal with targets in humans that are not accessible with traditional medicines a patients typically is dosed with a small molecule via a tablet where a large molecule is typically inducted small molecule are manufactured by chemistry but large molecules are created by living cells for examples bacteria cell yeast cell animal cells .

Modern biotechnology is often associated with the use of genetically altered microorganism such as Ecoli or yeast for the production of substance like insulin or antibiotics. It can also refer to transgenic animals or transgenic plants such as Bt corn, genetically altered mammalian cells such as Chinese Hamster ovary (CHO) cells are also widely use to manufacture Pharmaceuticals,

Biotechnology is also commonly associated with landmark breakthrough in new medical therapies to treat disease HepatitisB, HepatitisC, Cancer, arthritis, Hemophilia, Bone fracture, Multiple sclerosis, Cardiovascular as well as molecular diagnostics devices that can be used to define patient population,

HISTORY OF BIOTECHNOLOGY

The origin of biotechnology can be traced back to prehistoric times, when microorganisms were already used for processes like fermentation. Although a molecular biologist may consider cloning of DNA to be the most important event in the history of biotechnology, the latter has actually been rediscovered in 1970's for the third time during the present century. In 1920's Clostridium acetobutylicum was used by Chain Weizmann for converting starch into butane and acetone; the latter was an essential component of explosives during World War I. This raised hopes for commercial production of useful chemicals through biological processes, and may be considered as the first rediscovery of biotechnology in the last century. Similarly during World War II (in 1940's), the production of penicillin (as an antibiotic discovered by Alexander Fleming in 1929) on a large scale from cultures of Pencillium notatum marked the second rediscovery of biotechnology, This was the beginning of an era of antibiotic research. The third rediscovery of biotechnology is its reincarnation in the form of recombinant-DNA technology during 1970's which led to the development of a variety of gene technologies and is thus considered to be the greatest scientific revolution of the twentieth century.

[1]**Corresponding author**

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Biotechnology has applications in four major industrial areas; including helath are (medical), crop production and agriculture, non food (industrial) uses of crops and other products (e.g. biodegradable plastic, vegetable oil, biofuels) and environmental uses.

BIOTECHNOLOGY IN MEDICINE

In the field of medicine, initially insulin and interferon synthesized by bacteria and released for sale during 1980s were considered as major achievements of biotechnology. A large number of vaccines or immunization against dreadly disease, DNA probes and monoclonal antibodies (including ELISA tests) for diagnosis of various diseases, and human hormone and other pharmaceutical drugs for treatment of diseases were also released. In 1988 for the first time, an experiment to introduce in human body the lymphocytes containing a bacterial gene was also approved for patients who were in the terminal stages of cancer and had no chance to survive. Following this, during 1900s and later, patients suffering with some lethal diseases were also subjected to gene therapy, although gene therapy trails often received a setback due to occasional death of patients. In 2003-04, the Worlds first gene therapy drug called 'GENDICINE was also approved and released in China for treatment of a type of a cancer. During 2008, successful gene therapy was also achieved for a serious congenital blindness (see Science May 2, 2008) DNA fingerprinting and autoantibody fingerprinting techniques are also proving a great boon in forensic medicine for identification of criminals through the study of DNA or antibodies from blood and semen stains, urine, tears, saliva, perspiration or hair roots. etc.

BIOTECHNOLOGY IN AGRICULTURE

Biotechnology has also revolutionized research activities in the area of agriculture which includes the following:

(i) Plant cell, tissue and organ culture; this is used extensively for micro propagation of elite trees, each crops and other plants,

(ii) Genetic engineering followed by regeneration of plants to give transgenic plants carrying desirable traits like herbicide resistance, insect resistance and disease resistance; eventually this may also be used for increasing photosynthetic efficiency, nitrogen fixing ability, improved storage proteins, hybrid crops, for food processing etc. The transgenic crops were first grown commercially in 1995 and occupied worldwide an area of 125 million hectares in 2008. In India Bt-cotton is the only GM crop grown commercially; it was first grown in 2002, and occupied 75% yield increase over non-Bt-cotton.

(iii) Somatic hybrids between sexually incompatible species, permitting transfer of desirable traits from wild or unrelated crop species to our crop plants;

(iv) Transgenic animals produced in mice, pigs, goats, chickens cows, etc; it is suggested that some of these will eventually be used as bioreactors to produce drugs through their milk, blood or urine; this area has sometimes been described as molecular farming.

BIOTECHNOLOGY AND INDUSTRIAL MICROBIOLOGY

Industrial microbiology is yet another area, receiving major attestation of biotechnologists. A number of pharmaceutical drugs and chemicals (including vaccines) are being produced, or will be produced in future utilizing techniques of biotechnology (including genetic engineering) to increase substantially both the quality and the increase substantially both the quality and the quantity of these drugs and chemicals, Microbial genomics (including met genomics, involving sequencing of pool of unidentified genomes, and pan genomics involving sequencing a number of pan genomics involving sequencing a number of genomes from the same species) is another important area, which will be extensively utilized in future for a variety of purposes.

BIOTECHNOLOGY AND METABOLIC ENGINEERING

One of the major objectives of biotechnology research is also the use of living systems for the production of metabolites at the industrial scale. However, cell's metabolic networks, which occur in nature, are not optimized for industrial production of these metabolites. In such cases, performance of metabolic pathways are being manipulated, so that the metabolites are overproduced. The opportunity to introduce heterogonous, genes and regulatory elements made metabolic engineering a very

fascinating area of research. An important example of the successful use of metabolic engineering is the development of golden rice (rice in vitamin A). Which was developed in the early years of the present century (2000-2005). However, there is a variety of limitations in metabolic engineering that need to be overcome.

BIOTECHNOLOGY AND PROTEIN OR ENZYME ENGINEERING

Another very important area of biotechnology is protein engineering that will lead to the production o superior, as well as novel enzymes and storage proteins. In this area, a protein engineer first prepares a computer aided protein model for a specific function and then either modifies a native gene for synthesizes a new gene that will produce this desired protein in a predictable manner, thus, in future, proteins will be engineered in the desired manner. Biotechnology has also provided us with a remarkable technique in the form of immobilized enzyme systems, which allowed the production of a variety of substances e.g. production of high fructose corn syrup as a sweetening agent for soft dring industry using an immobilized enzyme, glucose isomers. The market for these immobilized enzymes now is of the order of billions of dollars per year and supports multibillion dollar industries.

BIOTECHNOLOGY AND ENVIRONMENT

Biotechnology is also being used for dealing with environmental problems. Fears are also being expressed about the implication of advances in biotechnology in terms of release of harmful organisms developed through recombinant DNA technology, In view of this, rules and laws have been framed to safeguard against the risks, which the recombinant. DNA technology poses to the environment. Biotechnological methods have been devised for some environmental problems have been devised for some environmental problems like the following:

(i) Pollution control
(ii) Bioremediation
(iii) Depletion of natural resources for non renewable energy.
(iv) Restoration of degraded lands and
(v) Biodiversity conservation for instance, microbes are being developed to be used as bio-pesticides, biofertilizers, biosensors etc and for recovery of metals, cleaning of spilled oils and for a variety of other purpose, They are also used for biomonitoring in industries, where employees are exposed to a variety of risks biomass is being produced as a renewable source of energy.

GENE TECHNOLOGY AS A TOOL FOR BIOTECHNOLOGY

Most Biotechnology companies make the use of gene technology for genetic engineering which involves recombinant DNA and genetic engineering,

More recently extensive use of polymerase chain reaction (PCR) discovered in 1990s have also been made in biotechnology, technique for gene isolation and gene synthesis have also been developed and used for a variety of purpose. New generation DNA sequencing technologies discovered and commercialized during 2005-08 will also be extensively used for genomics research which is component of biotechnology.

CONCLUSION

Some of the important contribution of biotechnology to the human welfare are recombinant DNA, vaccine production, monoclonal antibodies, DNA probes, valuable drugs like insulin, DNA finger printing in the field of medicine, autoantibody, transgenic plant through genetic engendering, germplasm conservation, molecular markers, rapid clonal multiplication through meristem culture, is important areas in the field of biotechnology, hormone induced super ovulation and/ or embryo splitting in form animals for manipulation of animals of superior genotypes and production of transgenic animals are to name a few in animal biotechnology.

Efficient degradation of petroleum, sewage treatment and management of oil spills, detoxification of wastes and industrial effluents, biocontrol of plans disease and insect pests are the fancied areas of research in environmental biotechnology. Production of useful compounds like ethanol, lactic acid, glycerin, citric, acid, laconic acid, acetone etc, production of antibiotics like penicillin, streptomycin, erythromycin and mineral extraction through leaching from low grade ores are some of the areas in industrial welfare are are to provide a major interdisciplinary forum forum for presenting new approaches from relevant areas of bio science and technology.

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