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Introduction to biotechnology
Question: what are the aspects of medical biotechnology?

Answer:

Several aspects of biotechnology include:

- Bioinformatics (also called "gold biotechnology") is an interdisciplinary field that addresses biological problems using computational techniques, and makes the rapid organization as well as analysis of biological data possible. The field may also be referred to as *computational biology*, and can be defined as, "conceptualizing biology in terms of molecules and then applying informatics techniques to understand and organize the information associated with these molecules, on a large scale." Bioinformatics plays a key role in various areas, such as functional genomics, structural genomics, and proteomics, and forms a key component in the biotechnology and pharmaceutical sector.

- Blue biotechnology is based on the exploitation of sea resources to create products and industrial applications. This branch of biotechnology is the most used for the industries of refining and combustion principally on the production of bio-oils with photosynthetic micro-algae.
- Green biotechnology is biotechnology applied to agricultural processes. An example would be the selection and domestication of plants via micropropagation. Another example is the designing of transgenic plants to grow under specific environments in the presence (or absence) of chemicals. One hope is that green biotechnology might produce more environmentally friendly solutions than traditional industrial agriculture. An example of this is the engineering of a plant to express a pesticide, thereby ending the need of external application of pesticides. An example of this would be BT corn. Whether or not green biotechnology products such as this are ultimately more environmentally friendly is a topic of considerable debate. It is commonly considered as the next phase of green revolution, which can be seen as a platform to eradicate world hunger by using technologies which enable the production of more fertile and resistant, towards biotiv and abiotic stress, plants and ensures application of environmentally friendly fertilizers and the use of biopesticides, it is mainly focused on the development of agriculture. On the other hand, some of the uses of green biotechnology involve microorganisms to clean and reduce waste.
- Red biotechnology is the use of biotechnology in the medical and pharmaceutical industries, and health preservation. This branch involves the production of vaccines and antibootics, regenerative therapies, creation of artificial organs and new diagnostics of diseases. As well as the development of hormones, stem cells, antibodies, siRNA and diagnostic test.
- White biotechnology, also known as industrial biotechnology, is biotechnology applied to industrial processes. An example is the designing of an organism to produce a useful chemical. Another example is the using of enzymes as industrial catalyst to either produce valuable chemicals or destroy hazardous/polluting chemicals. White biotechnology tends to consume less in resources than traditional processes used to produce industrial goods.
- "Yellow biotechnology" refers to the use of biotechnology in food production, for example in making wine, cheese, and beer by fermentation. It has also been used to refer to biotechnology applied to insects. This includes biotechnology-based approaches for the control of harmful insects, the characterisation and utilisation of active ingredients or genes of insects for research, or application in agriculture and medicine and various other approaches.

- Gray biotechnology is dedicated to environmental applications, and focused on the maintenance of biodiversity and the remotion of pollutants.
- Brown biotechnology is related to the management of arid lands and desert. One application is the creation of enhanced seeds that resist extreme environmental conditions of arid regions, which is related to the innovation, creation of agriculture techniques and management of resources.
- Violet biotechnology is related to law, ethical and philosophical issues around biotechnology.
- Dark biotechnology is the color associated with bioterrorism or biological weapons and biowarfare which uses microorganisms, and toxins to cause diseases and death in humans, livestock and crops.

Medical biotechnology

In medicine, modern biotechnology has many applications in areas such as pharmaceutical dugs discoveries and production, pharmacogenomics, and genetic testing (or genetic screening). DNA microarray chip – some can do as many as a million blood tests at once

Pharmacogenomics (a combination of pharmacology and genomics) is the technology that analyses how genetic makeup affects an individual's response to drugs. Researchers in the field investigate the influence of genetic variation on drug responses in patients by correlating gene expression or single nucleotide polymorphism with a drug's efficacy or toxicity. The purpose of pharmacogenomics is to develop rational means to optimize drug therapy, with respect to the patients' genotype, to ensure maximum efficacy with minimal adverse effect. Such approaches promise the advent of "personalized medicine"; in which drugs and drug combinations are optimized for each individual's unique genetic makeup.
Computer-generated image of insulin hexamers highlighting the threefold symmetry, the zinc ions holding it together, and the histidine residues involved in zinc binding.

Biotechnology has contributed to the discovery and manufacturing of traditional small molecule pharmaceutical drugs as well as drugs that are the product of biotechnology – biopharmaceutics . Modern biotechnology can be used to manufacture existing medicines relatively easily and cheaply .the first genetically engineered products were medicines designed to treat human diseases. To cite one example, in 1978 Genentech developed synthetic humanized insulin by joining its gene with a plasmid vector inserted into the bacterium . Insulin, widely used for the treatment of diabetes, was previously extracted from the pancreas of abbatoir animals (cattle or pigs). The genetically engineered bacteria are able to produce large quantities of synthetic human insulin at relatively low cost. Biotechnology has also enabled emerging therapeutics like gene therapy. The application of biotechnology to basic science (for example through the human genome project) has also dramatically improved our understanding of biology and as our scientific knowledge of normal and disease biology has increased, our ability to develop new medicines to treat previously untreatable diseases has increased as well. Genetic testing allows the genetic diagnosis of vulnerabilities to inherited disease, and can also be used to determine a child's parentage (genetic mother and father) or in general a person's ancestry. In addition to studying chromosomes to the level of individual genes, genetic testing in a broader sense includes biochemical tests for the possible presence of genetic diseases, or mutant forms of genes associated with increased risk of developing genetic disorders. Genetic testing identifies changes in chromosomes, genes, or proteins. Most of the time, testing is used to find changes that are associated with inherited disorders. The results of a

genetic test can confirm or rule out a suspected genetic condition or help determine a person's chance of developing or passing on a genetic disorder. As of 2011 several hundred genetic tests were in use. Since genetic testing may open up ethical or psychological problems, genetic testing is often accompanied by genetic counselling .