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Editorial Article

Aspects of Biomedical Engineering and Biotechnology

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Editorial

The Biomedical Engineering and Biotechnology (BMEBT) is an interdisciplinary program that includes various courses e.g., bioengineering, biology, chemistry, biochemistry, computer information science, electrical and computer engineering, mathematics, mechanical engineering, and medical laboratory science. Now a days people from different disciplines work together under the same umbrella for making a workable force together. BMEBT is one such umbrella which addresses contemporary biomedical and health research problems and contributes significantly to meeting the need of industry, government, and education for biomedical and biotechnology researchers. Many prestigious universities of the world offer BMEBT at undergraduate and post graduate level. In postgraduate level students from life sciences or engineering and physical science backgrounds are generally encouraged to apply.

Though the words Bioengineering, and Biomedical engineering roll off the tounge similarly, but in practice there are many differences between the two. Bioengineering covers a more detail area whereas Biomedical engineering covers a more precise area. Biomedical engineering is a more specialized version of bioengineering, utilizing many of the discipline's principal theories and putting them to practice improving human health. Bioengineers often focus on the general theory that can be applied to various different areas of natural sciences to solve problems. Biomedical engineering, on the other hand, is more focused and practical, specifically in the context of health care. With technology advancing and the demand for cutting-edge medical equipment and devices, expanding, biomedical engineering is a rapidly growing field. Bridging the gap between biological science, medicine and engineering, the interdisciplinary field of biomedical engineering is changing the way we interact with the world.

On the other hand, Biotechnology is an integrated approach of combining life sciences (e.g... Biochemistry and cell biology) with process engineering, design and scale-up principles. Biotechnology has four main types: medical biotechnology, agricultural biotechnology, industrial biotechnology, environmental biotechnology. In addition to these major types, there are other types of biotechnology, e.g., food biotechnology, marine biotechnology etc. Globally the biotechnology market is huge and many giant industries like as Abbott Laboratories, Agilent Technologies, Amgen, Biogen Scientific, Bio-Rad Laboratories, Danaher, F. Hoffmann-La Roche, Illumina, Merck, PerkinElmer, Qiagen and Thermo Fisher Scientific are operating in the Biotechnology field.

The top medical device companies in the world are Medtronic, Jonson and Jonson. Abott, Philips, Frdesenius Medical care, GE health care, BD, Siemens Healthineers, Cardinal Heath and Stryker. A huge number of competent Biomedical engineers are working in these companies. In the recent years four areas of Biomedical engineering have created waves in the world of science. These are:

1. wearable devices and implantable technologies,
2. Nanorobotics
3. Brain-computer interfaces, 4.3D bioprinting.

The most common and popular wearable health devices that biomedical engineers have launched in world market is pacemakers

that have been around for over half a century. Nanorobotics is an emerging field of technology that involves creating tiny surgical robots whose components are roughly the size of a nanometer.

Brain-computer interfaces (BCIs) are devices that enable signals from the brain to direct external activity, such as moving a cursor or prosthetic limb. 3D bioprinting describes the use of 3D-printing techniques to combine cells, growth factors (proteins or hormones) and biomaterials to create biomedical parts that precisely imitate natural tissue characteristics. 3D bioprinting's potentials are enormous. In the near future, doctors may have the ability to print artificial skin cells for burn wound victims.

We can grossly summarize the global top trends of biotechnology as follow:

1. Artificial intelligence
2. Big data management
3. Gene editing
4. Precision Medicine
5. Gene sequencing
6. Biomanufacturing
7. Synthetic Biology
8. Bioprinting
9. Microfluidics
10. Tissue engineering

All these fields are ever emerging. In each of this branch biotechnology is playing an indispensable principal role. For example, big data management is contributing immensely to the management of personal health. Concurrent to the collection of personal data, biotechnologist is amassing enormous data from different sources e.g genomics, proteomics, transcriptomics, microbiome etc. Using advance biotechnological tools and comparing data from these sources it is now possible to make a regimen of customized care for individual patient. At present one of the most fundamental and powerful data sets for human health is the human genome. With time technology is becoming easier to reach. The first human genome sequence was finished in 2003, took 13 years to complete, and cost billions of dollars. Today, due to biotech and computational advancements, sequencing a person's genome cost approximately $1,000 and can be completed in about a day. All these things become possible due to hand in hand working of Biotechnologists as well as Biomedical engineers. In 2016, France started genomic medicine 2025 project. This project includes 14 operating measures, linking health care, research and industry. It aims to position France as an international leader in personalized and precision medicine, fully integrating genomic medicine into healthcare pathways and establishing a national genomic medicine industry that promotes innovation and economic growth.

It is time-taking and costly to get competent Biotechnologists and Biomedical engineers. If we take a closer look, it will be found that most activities of these disciplines are centered around the first world countries. The irony is that if the developing and the third world countries produce some technologists in their own country, they can't afford them in their soil. As a result, there is a huge brain drain as well. On the other hand, it is true that for the sake of sustainable development, each and every country needs its own technologists which is now very much evident in this pandemic situation. Only a handful of countries have the capacity of manufacturing vaccines and conducting vaccine trials. Some countries in the world may not even see vaccines in 2022, though Covid -19 emerged nearly two years earlier.

So, it is important to have a national policy and budget for the research and gradual growth of life sciences. It is important for a country to have infrastructural facilities as well as competent life science activists to cope up with the modern research that is going on globally. Otherwise, it will be impossible for a country to keep up with the global development.

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Conflicts of Interest

No conflicts of interest.