



Recent Advances Of Biotechnology In Medicine And Pharmacology

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Article History	ABSTRACT
Received: Revised: Accepted: CC License CC-BY-NC-SA 4.0	<p>The term Biotechnology in the field of the medicines and pharmacology are very useful for the development and growth in production of medicines and drugs. Its applications in the fields of industries related to the medicine and agriculture are very wide. The development, enhancement, and the usage of modern and innovative techniques, procedures including the production of the personalized medicines and technologies related to CRISPR. The main aim of the present study is to show the role and usage of the innovative and modern approaches that are used by the biotechnology in the fields of the medicine and pharmacology. The collection, gathering, assembling of information and knowledge that are done by using the secondary sources, explaining the importance and benefits of the biotechnology including interpretivism philosophy. Explanation of various analysis that includes the development of various antibiotics, medicines and drugs that are made by the modern biotechnological processes.</p> <p>Keywords- deductive, biotechnology, CRISPR technology, antibiotics, innovations</p>

INTRODUCTION

The term biotechnology is described as an application that is technical for the system of organisms and living or the representation of the derived substance that is biologically in order to make the products [1]. The rapid and constant growth of this branch deals with science and technology and the people who are working for the welfare of human beings also helped in the advancement of many industries or organizations, such as agriculture, pharmacology, and medicine [2]. It is also represented as the multidisciplinary field that use numerous advanced technologies that are applied to the cells of living organisms. Also involves the areas that deals with microbiology, genetics, molecular biology, immunology as well as genetic engineering. All the suitable products are applied and used in the agriculture and pharmaceutical industries.

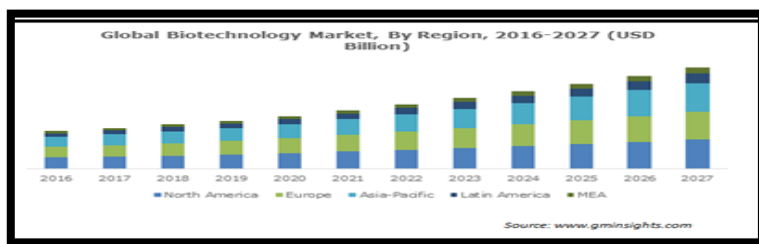


Figure 1: The Size of the Market in Biotechnology

(Source: Influenced By Morin-Crini *et al.* [3])

The figure 1 is a graphical representation of the market size of biotechnology in the field of medicine and pharmacology [4]. Pharmaceutical biotechnology is recently a rapidly growing field in which the principles that are related to biotechnology are applied to the development and growth of medicine and drugs [3]. The majority of drugs that are therapeutic in the recent market situations are bio formulations, which includes, products and vaccines that are related to nucleic acid as well as antibodies. In 2021, nearly or an estimation about 45% of the total value of the pharmaceutical biotech industries all over the world has taken active participation in Oncology with Neurology and rare diseases.

The aim of the present study is to describe and explains the importance of biotechnology, its recent advancements, role and its applications in the fields of medicine and pharmacology.

OBJECTIVES

- To evaluate the recent advancement, growth and innovation of biotechnology in the fields of medicine and pharmacology.
- To represent the roles and the usage of biotechnology in the growth and expansion of medicine and pharmacology.
- To describes how the applications of biotechnology help in the development and growth of the fields of medicine and pharmacology.
- To illustrate the type of medicines and drugs that are made in the field of pharmacology with the help of biotechnology.

REVIEW OF LITERATURE

Recent innovations and developments in biotechnology in the fields of pharmacology and medicine

The concept of biotechnology confines to an extensive range of techniques and approaches that help in the modification of living organism for the purpose of humans in the development of agriculture and improvement of the various breeding programs which employs or show hibernation or artificial selection. As stated by, Marchev *et al.*, [5], the modern applications of biotechnology includes engineering related to genetics as well the culture of tissues and cells. However, Shrestha *et al.* [6] stated, the advancement of biotechnology has a very significant impact or influence on the many fields or society or industries that include medicine, environmental science, and agriculture. The industries of biotechnology have shown rapid and fast development in recent years.

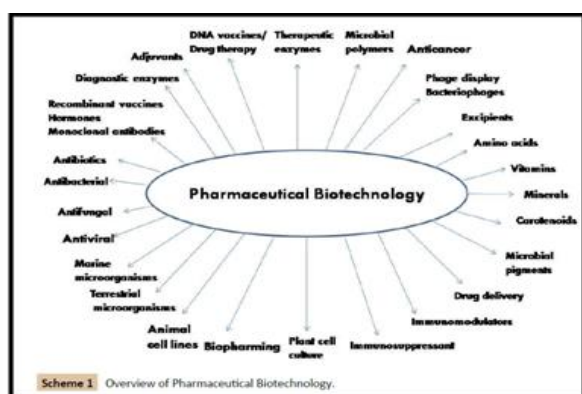


Figure 2: The recent advancement in the Pharmaceutical biotechnology

(Source: Influenced by Jain & Thareja [7])

Available online at: <https://jazindia.com>

The figure 2 is the representation of the advancement in pharmaceutical biotechnology in the field of medicine. As per the views of Jain & Thareja [7], this development is basically done in order to provide valuable insight into the usage and enhancement the medical treatment, environmental solutions, and agricultural practices. As opined by, Ansari *et al.* [8], through the continuous analysis and growth in the technologies, it has been seen various compelling breakthroughs in the year 2022. On the contrary, Jimenez *et al.* [9] stated that, the development of the technology of “CRISPR”, revolutionary environmental resolutions, and artificial intelligence.

Role, advancement, and the applications of biotechnology in the fields of medicine and pharmacology

In the industries of medicines modernized and advanced biotechnology has a variety of applications such as discoveries of pharmaceutical drugs, and their production, testing of genetics, genetic screening, and pharmacogenomics. As per the views of, Jimenez *et al.* [9], the term biotechnology has contributed a lot to the manufacturing and discovery of the traditional small-molecule drugs of pharmaceuticals as well as the medicines that are produced and are the product of biotechnology- biopharmaceuticals. On the contrary, Ansarie *et al.* [8], stated that developed and advanced biotechnology can be useful for the manufacture and production of the current medicines that are cost effective and easily available. As opined by Andryukov *et al.* [10], the first genetically engineered products include medicines that is produced and designed in such a way order to treat general human diseases. However, Egbuna, Mishra and Goyal [11], stated that the term pharmacogenomics includes the combination of genomic and pharmacology, and is the modern technology that analyzed and explained how genetic makeup has an impact on individual responses to medicines or drugs. Therefore, as stated by Gilmore and Denyer[12], medical treatments are precisely tailored to the person, deserting the procedures and techniques of the traditional treatment related to medicine. In order to highlight the top trends and innovations which are related to biotechnology within healthcare, are instantly brought in the revolutionary movement in connection with personalized medicine.

CRISPR technology

The year 2022, has highlighted the important and meaningful development with the therapies that are based on CRISPR. As stated by, Gilmore & Denyer [12], the discoveries of these modernized technologies have introduced a gene editing tool and brought an advanced wave of revolutionary treatment from the development and growth of disorders that are genetics. On the contrary, Jain and Thareja [7], stated that these disorders include, thalassemia, Muscular Dystrophy, and hemochromatosis.

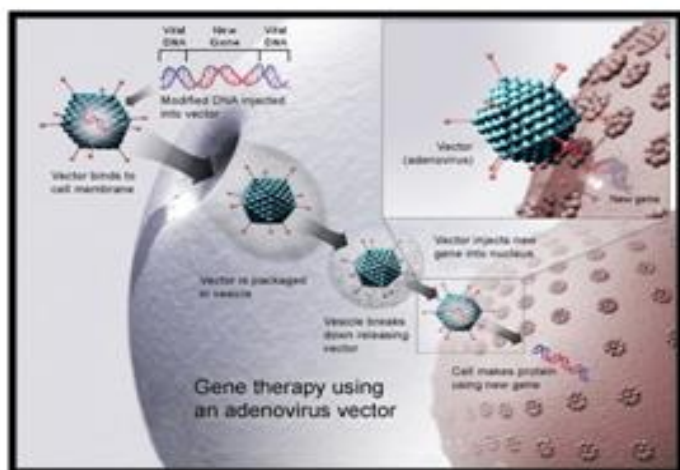


Figure 3: Use of Biotechnology in Medicine

(Sources: Influenced By Marchev, Yordanova and Georgiev [5])

The figure 3, demonstrates that how biotechnologies are used in the medicine and production of the drugs. The individual who is there for the treatment of CRISPR mainly includes one who has disorders related to blood, AIDS, blindness, cystic fibrosis, and many more. As opined by, Marchev, Yordanova and Georgiev [5]. The ability and capability to change the sequences of the sequences and series “DNA” and cancer are the other diseases that are focused on and targeted by the research in the current scenario. Researchers mainly focus on the effectiveness of this technology by editing.

METHODOLOGY

The methods and the techniques that are used for the assembling and gathering of data or knowledge about biotechnology in the field of pharmacology and medicine are procedure that show the advancement of the new innovation that are created or constructed [2]. All informations and knowledge gathered and collected about how the medicines are made through the use of secondary sources [13]. The information and knowledge of the topic are already available and known are then explained and analyzed properly. The role and the usage of biotechnology its recent advancement and innovation, that benefits the industries of pharmacology or medicines are taken into considerations [11].

The collected information and knowledge also provides numerous possibilities and options through the utilization of the maximum available knowledge and information [10]. Moreover, the assembled, gathered, or collected data that are represented are examined through an inductive approach and procedures it also involved the interivism philosophy in order to get or evaluate the detailed explanation and observation of the data [9]. This collection methods of data also involved the gathering or assembling of the information and knowledge about the innovation and growth of biotechnology in the field of medicine or the industries of pharmaceuticals are done through qualitative analysis.

FINDINGS

Recent developments of biotechnology in the fields of medicine and pharmacology

The overall market value of biotechnology in the field of medicines and pharmacology is estimated as 860.96 billion around 60-70%. The industries that are related to biotechnology is all set to grow or developed a CAGR of 9.4% showing the market will almost double by the year 2030 [12]. The development in technologies that are related to CRISPR, and the enhancement in artificial intelligence for the development in revolutionaries and solutions are related to the environment [6]. This development is pin-pointed in the path of the most evolved, developed, progressive and advanced biotechnology in the coming year [14]. The establishment of editing and sequencing related to genetics has opened the door for all the medicines and drugs that are personalized [15]. Through this analysis and demonstration of genetics, the professionals related to health care have the ability to identify the issues that are related to the patients and might be used in genetic sequencing to create the tailored treatment.

The innovation, growth, role and usage of biotechnology in the fields of pharmacology and medicine

In the coming years, many key initiatives are taken into consideration for the development and growth of the “personalized medicine”, or “pharmacogenomics” which are considered the genetics of the patients or the individual indicating and responsible to the diseases and medical treatment related to the biologic [12]. These initiatives will allow and create the individual for the tailored treatment showing positive effects in the patients or the individuals. There are a variety of issues that are faced by the products that are based on the biotechnologies, which include or show their instability and ability in the formulations of the pharmaceuticals. The formulation of the pharmaceutical is both physical and chemical in nature helping in the process of the degradation.

DISCUSSION

The term biotechnology is the field of scientific research that provides numerous applications to a variety of other areas of science [12]. The term medical biotechnology is the moderately advanced and developed field in which the elements of biotechnology are applicable for the growth in the production of drugs [12]. The term modernized biotechnology influences the industries of the medical in different ways. It also has the capability in order to show the change and development in the principles of the field of medicine [9]. Majority of the drugs and medicine include antibodies, the production of vaccines that are made of nucleic acid; and the wide usage of the molecular diagnostics [16,17]. The production of these therapeutic medicines and drugs shows the global market trend of the present, resulting in the bio formulations in connection with biotechnology [18]. The usage of modern biotechnology in the field of pharmacology and medicine has developed the production of medicine and drugs as an estimation of about 50-60% contributing to around 70-80% of the overall market [10,19].

CONCLUSION

The products based on the modernized use of biotechnology have been created great influence on the industries related to a pharmaceutical that shows rapid and constant success in the development and enhancement of drugs and medicine that act as therapeutic agents. There is always a requirement for the delivery of the special oral in the area of the biological production of the peptides and proteins which are intended for the administration in connection with oral drugs. The industries that are pharma-based and have modernized biotechnologies, products and medicines that are highly unstable in nature and are always required very special attention, care, and needs.

REFERENCES

1. Anand, U., Jacobo-Herrera, N., Altemimi, A. and Lakhssassi, N. (2019). A comprehensive review on medicinal plants as antimicrobial therapeutics: potential avenues of biocompatible drug discovery. *Metabolites*, 9(11), 258.
2. Badalyan, S. M., Barkhudaryan, A. and Rapior, S. (2019). Recent progress in research on the pharmacological potential of mushrooms and prospects for their clinical application. *Medicinal mushrooms: recent progress in research and development*, 1-70.
3. Morin-Crini, N., Lichtfouse, E., Torri, G. and Crini, G. (2019). Applications of chitosan in food, pharmaceuticals, medicine, cosmetics, agriculture, textiles, pulp and paper, biotechnology, and environmental chemistry. *Environmental Chemistry Letters*, 17(4), 1667-1692.
4. Das, K., and Paital, B. (2020). First week of social lockdown versus medical care against COVID-19-with special reference to India. *Current Trends in Biotechnology and Pharmacy*, 14(2), 196-216.
5. Marchev, A. S., Yordanova, Z. P. and Georgiev, M. I. (2020). Green (cell) factories for advanced production of plant secondary metabolites. *Critical reviews in biotechnology*, 40(4), 443-458.
6. Shrestha, J., Razavi Bazaz, S., Aboulkheyr Es, H., Yaghobian Azari, D., Thierry, B., Ebrahimi Warkiani, M. and Ghadiri, M. (2020). Lung-on-a-chip: the future of respiratory disease models and pharmacological studies. *Critical reviews in biotechnology*, 40(2), 213-230.
7. Jain, A. K. and Thareja, S. (2019). In vitro and in vivo characterization of pharmaceutical nanocarriers used for drug delivery. *Artificial cells, nanomedicine, and biotechnology*, 47(1), 524-539.
8. Ansari, F., Pourjafar, H., Tabrizi, A. and Homayouni, A. (2020). The effects of probiotics and prebiotics on mental disorders: a review on depression, anxiety, Alzheimer, and autism spectrum disorders. *Current pharmaceutical biotechnology*, 21(7), 555-565.
9. Jimenez, P. C., Wilke, D. V., Branco, P. C., Bauermeister, A., Rezende-Teixeira, P., Gaudêncio, S. P. and Costa-Lotufo, L. V. (2020). Enriching cancer pharmacology with drugs of marine origin. *British Journal of Pharmacology*, 177(1), 3-27.
10. Andryukov, B., Mikhailov, V. and Besednova, N. (2019). The biotechnological potential of secondary metabolites from marine bacteria. *Journal of Marine Science and Engineering*, 7(6), 176.
11. Egbuna, C., Mishra, A. P. and Goyal, M. R. (Eds.). (2020). *Preparation of phytopharmaceuticals for the management of disorders: The development of nutraceuticals and traditional medicine*. Academic Press. Retrieved Gilmore, B. F. and Denyer, S. P. (Eds.). (2023). *Hugo and Russell's pharmaceutical microbiology*. John Wiley & Sons.
12. Krishnaveni, C., Arvapalli, S. and Sharma, J. V. C. (2019). *International Journal of Innovative Pharmaceutical Sciences and Research*.
13. Badman, C., Cooney, C. L., Florence, A., Konstantinov, K., Krumme, M., Mascia, S. and Trout, B. L. (2019). Why we need continuous pharmaceutical manufacturing and how to make it happen. *Journal of pharmaceutical sciences*, 108(11), 3521-3523.
14. Sinko, P. J. (2023). *Martin's physical pharmacy and pharmaceutical sciences*. Lippincott Williams & Wilkins.
15. Li, W., Cao, Z., Liu, R., Liu, L., Li, H., Li, X., and Liu, Y. (2019). AuNPs as an important inorganic nanoparticle applied in drug carrier systems. *Artificial cells, nanomedicine, and biotechnology*, 47(1), 4222-4233. Retrieved
16. Ledley, F. D., McCoy, S. S., Vaughan, G. and Cleary, E. G. (2020). Profitability of large pharmaceutical companies compared with other large public companies. *Jama*, 323(9), 834-843.
17. Michael, A. (2021). A study on impact of medicinal plants *Polyalthia longifolia* and *Bacopa monnieri* with reference to acne treatment. *Current Trends in Biotechnology and Pharmacy*, 15(5), 401-405.

18. Dan, W., Liu, J., Guo, X., Zhang, B., Qu, Y. and He, Q. (2020). Study on medication rules of traditional Chinese medicine against antineoplastic drug-induced cardiotoxicity based on network pharmacology and data mining. *Evidence-Based Complementary and Alternative Medicine*, 2020.