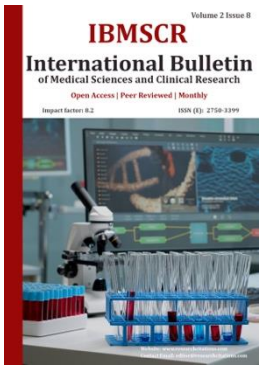

MEDICAL ENGINEERING

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Abstract: This article covers topics on bioengineering. This is an interdisciplinary field that combines the principles of engineering sciences with medical and biological knowledge to develop and implement technologies and devices aimed at improving the diagnosis, treatment and prevention of diseases.

Keywords: Engineering, gene, neurodegenerative, bacteria, DNA, hemoglobin, albumin, implantation, information technologies.

Medical engineering is an interdisciplinary field of science and technology that integrates medicine, biology, engineering, and technology to design, manufacture, and apply medical devices, equipment, and technologies. The primary goal of medical engineering is to improve the quality of life of people and increase the efficiency of diagnosis, treatment, and prevention of various diseases.

An important area of innovation is the development of new treatments. The development of biologics, gene therapy, and stem cell technologies promises to revolutionize the treatment of many diseases, including cancer, heart disease, and neurodegenerative disorders.

The Importance of Genetic Engineering in Medicine**.**

Genetic engineering products have gradually but firmly entered medical practice: drugs for the treatment of rare diseases, recombinant insulin, vaccines against the hepatitis B virus - it is difficult for a modern doctor to imagine the world without them. Genetic engineering methods are used to produce some highly selective allergens for skin tests, some reagents for enzyme immunoassay, and much more. At the stage of preclinical testing of drugs, millions of genetically modified animals are sacrificed. Below, in order of increasing complexity of the technology and the degree of detachment from reality, are the main examples of the use of genetic engineering in medicine.

Medicines from bacteria

Today, doctors have a number of drugs at their disposal for which exact compliance with analogues in the body is critically important. These are drugs for replacement therapy in endocrinological diseases, hematological diseases (erythropoietin, granulocyte colony-stimulating factor, blood clotting factors, some monoclonal antibodies, etc.), viral infections (interferons), myocardial infarction and ischemic stroke (fibrinolytics), and many others.

Genetic engineering methods have the following advantages in obtaining such drugs:

• Identity of substances in structure to human. Insulin produced from the pancreas of pigs and cattle differed from human insulin in one and three amino acids, which often led to adverse reactions.

• Lower cost and convenient production. To obtain 200 g of dry matter of the same insulin, pancreases from more than 6,000 cows (or pigs) are required. The same amount can be produced by bacteria contained in 1000 liters of culture fluid.

• Refusal of specific raw materials that are not completely purified, for example, pituitary glands of corpses were used to obtain somatotropic hormone, and urine of menopausal women is a traditional source of follicle-stimulating and luteinizing hormones.

Medicines from flora and fauna

Bacteria and yeast, Chinese hamster ovary cell cultures and carrots that produce raw materials for drugs are good, but quite expensive, and the assembly of some complex molecules is not available to the same bacteria due to biochemical differences with humans. The idea of transferring "bioreactors" to pasture or fertilizers has been in the air for a long time. The mechanism is generally the same: the desired gene is built into the DNA of an animal or plant. DNA is microinjected into the nucleus of a fertilized egg, which is implanted in the uterus. Most embryos, of course, die, and not all of the animals that are born produce the necessary substance. Nevertheless, today we have transgenic cows, goats, pigs, rabbits, chickens, salmon, and silkworms. Human α-antitrypsin, albumin, hemoglobin, erythropoietin, hormones, blood clotting factors, suture and dressing material have been obtained from their biological fluids in experiments. It is not yet clear whether it was worth moving away from female urine for the sake of pig sperm, since difficulties with purification remain, and the price of these drugs, taking into account the technological process, will still be very high.

Main areas of medical engineering

1. Biomedical devices and technologies

Biomedical devices include all instruments and devices used in medicine for diagnosis, treatment and monitoring of the patient's condition. These may include devices such as:

◦ Medical devices (e.g. heart rate monitors, ultrasound machines, X-ray machines);

◦ Implantable devices (e.g. pacemakers, artificial joints, neuroprostheses);

◦ Assistive devices (e.g. hearing aids, inhalers, prostheses).

2. Medical informatics

Prospects and challenges of medical engineering:

Every year, medical engineering develops, offering new possibilities for diagnosis and treatment. One of the important areas of the future is the integration of artificial intelligence (AI) into medical practice. AI algorithms are able to analyze large amounts of data, improving the accuracy of diagnosis and predicting treatment outcomes. The use of AI can be useful for developing personalized treatment methods, which is especially relevant in oncology and genetics.

Another promising area is the development of nanotechnology. In medicine, nanoparticles can be used for targeted drug delivery, molecular diagnostics, and the creation of innovative medical devices.

However, despite all the achievements, medical engineering faces a number of challenges. One of them is the high cost of technology and equipment, which limits the availability of modern treatment methods for the general population. There is also the

problem of protecting patients' personal data, since the threat of data leaks increases with the development of information technology.

Conclusion

Medical engineering is an important field that has a huge impact on the development of medicine and improving the quality of life of people.

Developments in this field contribute not only to the creation of more effective methods of treatment and diagnosis, but also to the increase in the availability of medical services. In the future, given the progress in technology, we can expect significant improvements in the field of healthcare, as well as new challenges that medical engineering will successfully cope with, ensuring the safety and well-being of patients

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