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ПРОБЛЕМИ ТА ДОСЯГНЕННЯ СУЧАСНОЇ БІОТЕХНОЛОГІЇ

PROBLEMS AND ACHIEVEMENTS OF MODERN BIOTECHNOLOGY

Матеріали
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Unfortunately, despite their strong connection to folk medicine and history, there is a scarcity of publications in the modern scientific literature dedicated to the clinical efficacy of sphagnum moss as an antibacterial agent [Moore et al., 2012]. However, it is evident that sphagnum is a promising natural biomaterial for wound care and infection control. The current advancement of biotechnologies allows for the enhancement and strengthening of the beneficial natural properties of this biological material. Ukraine possesses significant peatland reserves and substantial scientific potential for the development of both pharmaceutical drugs and medical devices: textile materials, sorbents, and antimicrobial dressings based on sphagnum. Such products can meet both short-term humanitarian needs (highly absorbent and pH-modulating materials) and the strategic objectives of the healthcare system, contributing to the fight against antimicrobial resistance and the development of domestic manufacturing capabilities.

Biotechnological aspects of the production and application of pharmacological biologically active substances

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Modern pharmaceutical and medical biotechnology regards biologically active substances as one of the key resources for the creation of new prophylactic, diagnostic and therapeutic agents. This group includes microbial metabolites, recombinant proteins, bioactive peptides, polysaccharides, phenolic compounds, terpenoids, alkaloids and functionalised nanoforms of natural molecules. Their pharmacological value is determined by their antioxidant, anti-inflammatory, antimicrobial, immunomodulatory and antitumour properties, as well as their ability to influence key molecular targets of the pathological process.

One of the leading approaches to obtaining pharmacologically significant bioactive substances is the use of microorganisms as biosynthetic platforms. Bacteria, yeasts, actinomycetes and microscopic fungi produce a wide range of secondary metabolites, including antibiotics, enzymes, polyketides, lipopeptides and other compounds with significant biomedical potential. Metabolic engineering and synthetic biology enable the optimisation of biosynthetic pathways, increase the yield of target molecules, and ensure the reproducibility of pharmaceutical substance quality. Plant biotechnology is no less promising, particularly cell and tissue cultures, hairy root systems and elicitation, which enable the controlled synthesis of secondary metabolites regardless of seasonality and natural limitations of raw materials.

The biotechnological production of recombinant proteins, peptides and antibodies remains an important area. The use of bacterial, yeast and cell expression systems enables the production of hormones, cytokines, enzyme preparations, vaccine antigens and targeted molecules for modern personalised medicine. In this case, biotechnology serves not only as a method for obtaining a substance, but also as a means of controlling its structure, post-translational modifications, bioavailability and immunogenicity. Further opportunities are opened up by combining biotechnology with nanotechnological approaches, as nanoformulations allow for increased solubility and stability of natural biologically active compounds, prolonged release, and targeted delivery to target cells.

The practical application of pharmacologically active biological substances covers an extremely wide range of areas in modern preventive and clinical medicine, including the prevention and treatment of infectious, metabolic, inflammatory, neurodegenerative and oncological diseases. They are regarded as a promising basis for the creation of new medicinal products, adjunctive therapeutic agents, functional formulations, and preventive products with targeted biological action. Of particular interest are substances with antioxidant, immunomodulatory, anti-inflammatory, antimicrobial, cytoprotective and regulatory properties, which can influence key links in the pathogenesis of various pathological conditions. However, their introduction into pharmaceutical practice requires comprehensive standardisation, encompassing

not only chemical and biological characterisation but also a thorough assessment of the toxicological profile, storage stability, bioavailability, pharmacokinetic characteristics and evidence of efficacy. Equally important is establishing the mechanisms of action of these compounds at the molecular, cellular and organismal levels, as well as determining optimal dosage forms and methods of delivery to biological targets. It is precisely at the intersection of chemistry, pharmacology and biotechnology that the most promising models for the creation of new medicines and preventive products are formed, capable of combining high biological activity, safety, technological reproducibility and practical value for medicine and pharmacy.

Thus, the biotechnological aspects of obtaining pharmacologically active biological substances encompass the selection of a biological source, the engineering of producers, the optimisation of cultivation, extraction, purification, structural identification and the development of effective delivery systems. Further development in this area should be linked to the use of synthetic biology, omics approaches, digital modelling and the principles of green chemistry.

Altered pharmacokinetics of cis-diamminedichloroplatinum(II) upon complexation with the DNA polyanion: a pathway to reduced nephrotoxicity

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Nephrotoxicity remains a primary dose-limiting adverse effect of chemotherapy based on cis-diamminedichloroplatinum(II) (DDP). The DDP–DNA polyanion complex (DDP-DNA) is an organoplatinum compound (poly{hexakis[chloroamminoaquaplatinum(II)]-μ-deoxyribonucleate}, MW ~6.2×10^6 Da) representing a DNA adduct whose active substance is formed in situ through