MODERN METHODS OF MICROENCAPSULATING ACTIVE PHARMACEUTICAL SUBSTANCES

Baymuratova Zh. A.
South Kazakhstan Research University named after. M. Auezova, Shymkent, Republic of Kazakhstan
e-mail: zhaina.baimuratova@mail.ru
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Relevance: Microencapsulation is one of the most promising methods for improving the stability, bioavailability, and controlled release of drugs. Development of this approach will enable the development of new forms of drug delivery with fewer side effects.

Objective: To study modern methods of microencapsulation of active pharmaceutical ingredients and evaluate their effectiveness for the development of innovative dosage forms.

Research methods: Analysis of literature on modern microencapsulation technologies. Comparative study of coacervation, spray drying, and extrusion methods. Use of electron microscopy to study microcapsule morphology. Physicochemical analysis to assess the stability and homogeneity of active ingredient distribution. Use of mathematical modeling to predict drug separation kinetics.

Results: The coacervation method. was found to produce microcapsules with a high degree of encapsulation and controlled release of the active ingredient. Spray drying ensures process scalability and is suitable for heat-stable compounds. Extrusion technology demonstrated good results in the production of long-acting microgranules. Electron microscopy confirmed uniform distribution of the active ingredient within the capsules. Physicochemical analysis revealed increased stability of encapsulated compounds compared to unencapsulated forms. Mathematical modeling allowed us to predict production kinetics and select optimal process parameters. Overall, it was found that modern microencapsulation methods significantly expand the possibilities for creating innovative dosage forms.

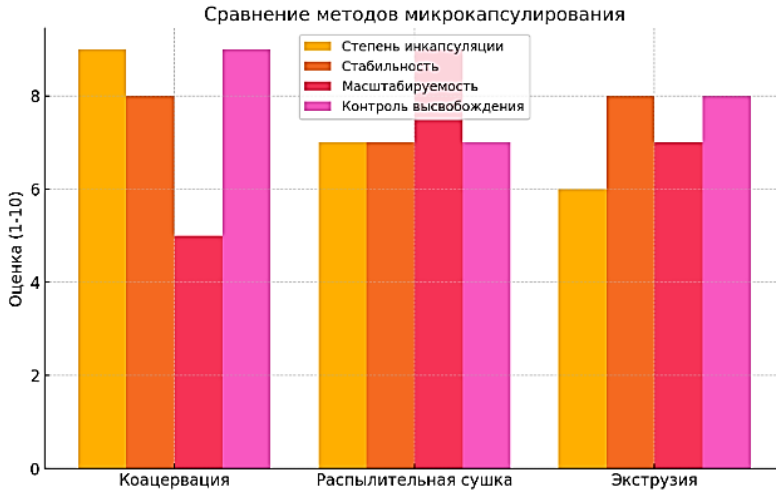

Diagram compares specified main microencapsulation methods main parameters: degree encapsulation, stability, scalability And control reproduction. 1. Coacervation exhibits the highest encapsulation efficiency and control, making it ideal for producing higher-capsule microcapsules. However, its scalability is limited compared to other methods. 2. Spray drying is highly scalable, making it suitable for industrial production. In this case, the encapsulation efficiency and yield control are comparable to other methods. 3. Extrusion occupies an intermediate position: it provides good stability and control of intake, but has a low level of encapsulation.

Conclusions: Thus, the choice of microencapsulation method depends on the objectives: coacervation is best for maximum control and efficiency, spray drying is suitable for industrial production, and extrusion is optimal when it is necessary to create prolonged forms .