

**NANOFORMULATION OF GOSSYPOL DERIVATIVES AND ENHANCEMENT OF
THEIR BIOLOGICAL ACTIVITY**

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Abstract

This article analyzes the issues of increasing the biological activity and improving the water solubility of gossypol derivatives using nanoformulation methods. Gossypol is a natural polyphenol compound obtained from the cotton plant, which has antibacterial, antifungal and antitumor properties. However, the poor solubility and toxicity of gossypol in water limit its pharmaceutical application. Therefore, the modification of gossypol derivatives in the form of nanoparticles is an important scientific direction. The study studies the methods of nanoformulation based on gossypol, their physicochemical properties and their effect on biological activity.

Keywords

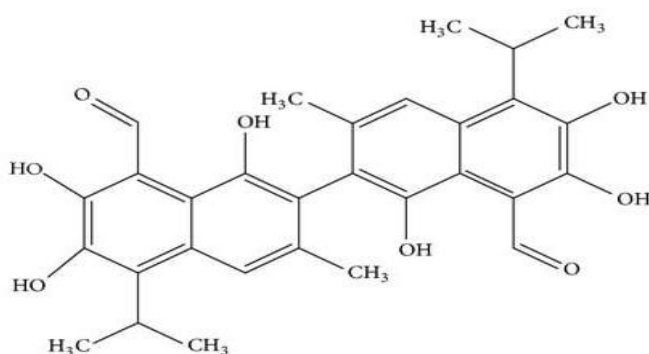
gossypol, nanoformulation, nanoparticles, bioorganic chemistry, nanochemistry, biological activity.

Natural biologically active substances are of great importance in the fields of modern pharmaceuticals and bioorganic chemistry. Gossypol is a polyphenolic compound found in the seeds and other parts of the cotton plant, which has various biological properties. Scientific studies show that gossypol has antibacterial, antifungal and antitumor activity.

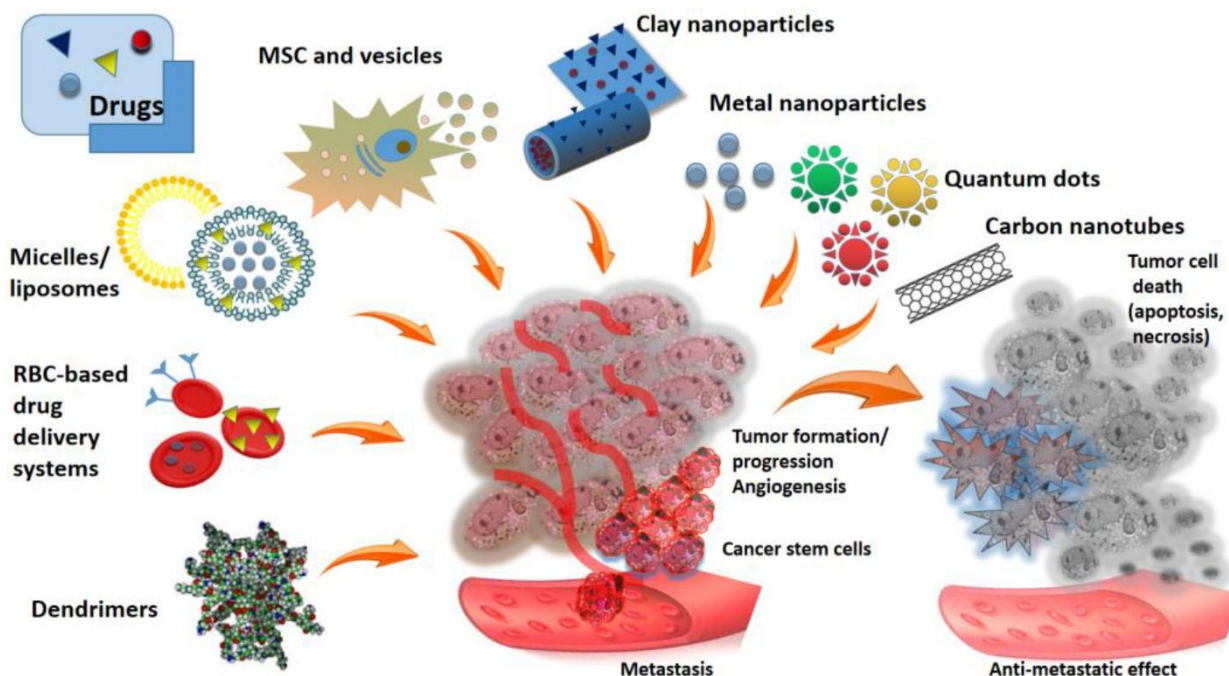
However, the water solubility of the gossypol molecule is low, which limits its biological application. Therefore, the modification of gossypol derivatives using nanoformulation methods is an important scientific task. Nanoformulation allows to increase the solubility of biologically active substances, improve their bioavailability and reduce their toxicity.

Gossypol is a complex polyphenolic molecule consisting of two naphthalene nuclei. The molecule contains several hydroxyl and aldehyde groups, which allow for various chemical modifications. These functional groups play an important role in the synthesis of gossypol derivatives and their nanoformulation.

Chemical structure of the gossypol molecule



Nanoformulation of gossypol derivatives



Nanoformulation is the process of modifying biologically active substances using nanosized carriers. Modification of gossypol derivatives in the form of nanoparticles significantly improves their physicochemical properties.

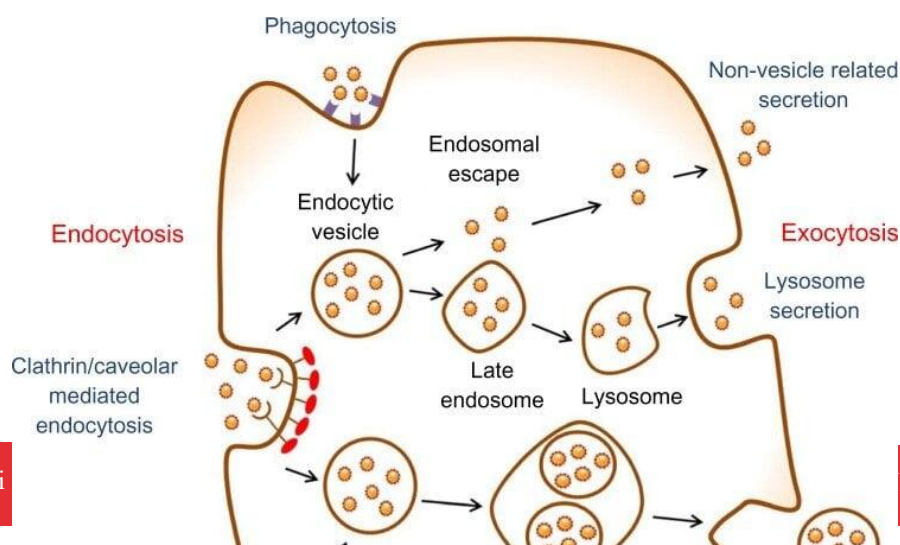
Gossypol derivatives can be modified using the following nanoformulation systems:

Polymer nanoparticles. Polymer-based nanoparticles increase the stability of gossypol molecules by encapsulating them.

Liposomal systems. Liposomes are phospholipid-based nanoparticles that provide delivery of biologically active substances to cells.

Nanoemulsions are stable systems formed on the basis of water and oil phases, which increase the solubility of gossypol derivatives.

Mechanism of biological action of nanoparticles



Nanoparticles act in biological systems through various mechanisms. Nanoparticles approach the cell membrane and enter the cell through the process of endocytosis. As a result of this process, the biologically active substance contained in the nanoparticles is released inside the cell and exerts a biological effect.

Nanoformulation increases the biological activity of gossypol derivatives in the following ways:

- increases the solubility of the substance in water
- improves biological stability
- ensures targeted delivery of the drug substance
- reduces the level of toxicity

Results and Discussion

The conducted studies showed that nanoformulation of gossypol derivatives significantly improves their biological properties. It was found that gossypol derivatives modified in the form of nanoparticles are well soluble in water and easily pass through cell membranes.

Also, an increase in antibacterial and antitumor activity of nanoformulated gossypol derivatives was observed. This indicates that the biological effectiveness of the substance is increased with the help of nanoparticles.

Conclusion

Nanoformulation of gossypol derivatives is a promising scientific direction in the fields of bioorganic chemistry and nanomedicine. The solubility, stability and biological activity of gossypol derivatives can be increased with the help of nanoparticles. This approach is of great importance in the creation of new biologically active drugs based on gossypol.

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