UNIVERSITY OF NOVI SAD
FACULTY OF MEDICINE

Study program: Doctoral Academic Studies in Biomedical Sciences

Course title: NANO- AND MICROCARRIERS OF ACTIVE SUBSTANCES

Teacher: Veljko S. Krsotnošić, Dejan M. Ćirin

Course status: elective

ECTS Credits: 20

Condition: -

Course aim

To obtain the theoretical and practical knowledge regarding the design of colloidal systems for the delivery of active compounds in pharmaceutical and cosmetic formulations. The aim of the design and the development of colloidal drug carriers is to enhance bioavailability, achieve controlled release and targeted delivery of active compounds. Also, the aim is to improve and increase the capacity od the drug carriers.

Expected outcome of the course:

Students will acquire knowledge and skills necessary for the development of colloidal drug delivery systems. They will learn how to modify the colloidal systems in order to improve bioavailability of active compounds, achieve controlled release, targeted delivery of active compounds and increase the capacity of the drug carriers.

Course description

Theoretical education

1. General rules for the development of drug carriers. Importance of biocompatibility and biodegradability. Classification of colloidal drug delivery systems.
2. Targeted and controlled drug delivery obtained with drug carriers. Active and passive targeted drug delivery.
3. The utilization of colloidal carriers in pharmaceutical and cosmetic products. The possibillity to incorporate various active ingredients in the colloidal systems.
4. Macromolecule-drug conjugates. Properties of polymer-drug and antibody-drug conjugates. Preparation of macromolecule-drug conjugates. Achievement of controlled release and targeted delivery. Application.
5. Micellar colloids. Properties of aggregates of surface active macromolecules. Application of micellar colloids as drug carriers. Influence of various factors on the properties of micellar colloids and their ability to solubilize active compounds.
6. Dendrimers, liposomes, virosomes, niosomes and polymerosomes. Preparation and properties. Incorporation of active compounds. Modification of the carriers in order to increase the capacity for incorporation of active compounds, obtain their controlled release and targeted delivery. Their application as drug carriers.
7. Solid lipid nanoparticles. Preparation and properties of solid lipid nanoparticles. Modification of the lipid nanoparticles in order to achieve controlled release and targeted delivery. Application of the lipid nanoparticles.
8. Emulsions (microemulsions, nanoemulsions). Preparation and properties. Modification of the emulsions in order to obtain improved bioavailability and controlled release of an active compound. Application.
9. Microcapsules. Microencapsulation method and properties of microcapsules. Modification of the microencapsulation process in order to obtain the material with improved capacity for incorporation of active compounds and their controlled release. Application of microcapsules as drug carriers.
10. Virus-like particles. Preparation and properties. Capsid modification in order to achieve controlled release and targeted drug delivery.

Practical education: exercises

1. Case studies. Selection of appropriate colloidal system. Consideration of possible modifications of a colloidal carrier in order to achieve controlled drug delivery of higher amount of active compounds.
2. Preparation of water solutions of colloidal systems for drug delivery.
3. Preparation of dispersed systems which serve as colloidal carriers in aqueous vehicle.
4. Determination of the solubilization capacity of surface active macromolecules and its modification.

Writing an essay in this field.

Literature

Compulsory

1. Fanun M. Colloids in drug delivery. CRC Press; 2016.
2. Devarajan PV, Jain S, editors. Targeted drug delivery: concepts and design. Springer International Publishing; 2015.
3. D'Souza GGM. Liposomes. Humana, 2016.

Number of active classes	**Theory:** 60	**Practices**: 45
Teaching methods Lectures. Practice		
Student activity assessment (maximally 100 points) lectures: 10 practices: 20 essay: 20 written exam: 50		