



PROGRAMS AND BIBLIOGRAPHY

Subject	
Code	Name
QO854	Nanomaterials for drug delivery applications

Vector
OF:S-5 T:002 P:000 L:000 O:000 D:000 HS:002 SL:002 C:002 AV:N EX:S FM:75%

Pre requirement
QO321 *QO521

Summary
Introduction to Nanotechnology. Potentialities of Nanomedicine. Principles and applications of Drug Delivery. Liposomes, micelles and vesicles. Polymeric Nanoparticles. Metal Nanoparticles. Dendrimers and dendrons. Hydrogels. Carbon allotropes. Perspectives.

Program
<p>1. Introduction to Nanotechnology. (a) Richard Feynman vision. (b) Current definition of nanomaterial. (c) Types of nanomaterials: organic, inorganic and hybrid. (d) Characterization techniques for nanomaterials.</p> <p>2. Potentialities of Nanomedicine. (a) Drug delivery. (b) Delivery of nucleic acids (DNA, plasmids, siRNA). (c) Agents for early diagnosis. (d) Dynamic phototherapy. (e) Theranostics agents. (f) Biosensors.</p> <p>3. Principles and applications in Drug Drug Delivery. (a) Paradigm change in medicinal chemistry. (b) Cancer. (c) Infectious diseases. (d) Diabetes. (e) Cardiovascular diseases. (f) Enhanced permeation and retention effect. (h) Biomolecules for targeting.</p> <p>4. Liposomes, micelles and vesicles. (a) Definitions. (b) Properties. (c) Encapsulation methods. (d) Characterization. (e) Examples and applications.</p> <p>5. Polymeric nanoparticles. (a) Definitions. (b) Properties. (c) Types of biodegradable and biocompatible polymers. (d) Copolymers. (e) Formulation of nanoparticles and encapsulation methods. (d) Characterization. (e) Examples and applications.</p> <p>6. Metal nanoparticles. (a) Definitions. (b) Properties. (c) Types of metal nanoparticles: gold, silver, iron oxide, quantum dots. (d) Functionalization of nanoparticles. (e) Relationship between size, shape and application. (f) Characterization. (g) Examples and applications.</p> <p>7. Dendrimers. (a) Definitions. (b) Convergent and divergent synthesis. (c) Properties. (d) Types of dendrimers. (e) Dendrimers, dendrons, dendronized polymers and hyperbranched polymers. (f) Multifunctional dendrimers for drug delivery. (g) Encapsulation and attachment of drugs. (h) Relationship between size, shape and application. (i) Characterization. (j) Examples and applications.</p>

8. Hydrogels.

(a) Definitions. (b) Synthesis of nanohydrogels: covalent and non-covalent. (c) Properties. (d) Encapsulation and attachment of drugs. (e) Methods of release. (f) Injectable hydrogels. (g) Characterization. (h) Examples and applications.

9. Carbon Allotropes.

(a) Definitions. (b) Carbon nanotubes. (c) Fullerenes. (d) Graphene. (e) methods of functionalization. (f) Characterization. (g) Examples and applications.

10. Perspectives.

Bibliography

1. Kenneth Gonsalves, Craig Halberstadt, Cato T. Laurencin, Lakshmi Nair, "Biomedical Nanostructures", Wiley, 2007.
2. Yuliang Zhao, Youqing Shen, "Biomedical Nanomaterials", Wiley, 2016.

Evaluation criteria

For grading policy, see: Regimento Geral de Graduação, Seção I – Normas Gerais, Capítulo V – Da Avaliação do Aluno na Disciplina. Students are required to attend 75 % of the lectures. For further details, see: Regimento Geral de Graduação, capítulo VI, seção X, artigo 72.