

Nanomedicine-based Immunotherapy
PHA 6XXX
Class Periods: Monday, Friday 1pm to 2:30pm
Location: On-campus, room TBD
Academic Term: Fall 2023
Credits: 3

Instructor:

Dr. Fan Zhang, fzhang1@ufl.edu

MSB P3-27

Office Hours: email fzhang1@ufl.edu to schedule appointment.

Teaching Assistants:

Not required

Course Description

Covers the whole spectrum of nanomedicine drug development through the lens of immunology and immunotherapy, by integrating nanomedicine formulation with Drug Delivery, Pharmaceutical Analysis, and Pharmacokinetics. The topics covered in this course include nanomedicine formulation and characterization, pharmacology (PK&PD), and their clinical translation.

Course Pre-Requisites / Co-Requisites

Permission of Instructor

Course Objectives

The primary goals for this course are for students to:

1. Understand the concept of 'nanomedicine' and the whole spectrum of nanomedicine drug development
2. Understand the basic concept of immunology, immune-related diseases, and immunotherapy
3. Understand the basic chemistry methods in the formulation and characterization of nanomedicine
4. Apply basic PK/PD principles to analyze the interaction of nanomedicine with biological system
5. Identify major barriers and challenges in the development and clinical translation of nanomedicine
6. Apply critical thinking skills by comprehend knowledge from multiple disciplinarys and integrating them in nanomedicine-based immunotherapy design.

Materials and Supply Fees

N/A

Required Textbooks

Immune Aspects of Biopharmaceuticals and Nanomedicines

Author: Raj Bawa, Janos Szebeni, Thomas Webster, Gerald F. Audette

eBook ISBN 9780203731536; Hardback ISBN: 9789814774529;

Recommended Materials

Handbook of Clinical Nanomedicine Nanoparticles, Imaging, Therapy, and Clinical Applications

Author: Raj Bawa, Gerald F. Audette, Israel Rubinstein

eBook ISBN 9780429068287; Hardback ISBN: 9789814669207;

Basic Immunology – Functions and Disorders of the Immune System

Author: Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai.

ISBN-13: 978-0323549431

Nanoparticles for biomedical applications: fundamental concepts, biological interactions and clinical applications

Author: Chung, Eun Ji; Leon, Lorraine; Rinaldi, Carlos;

ISBN: 9780128166635

Course Schedule

WEEK	TOPICS
Nanomedicine Basics:	
1	<ul style="list-style-type: none"> Overview of nanomedicine Immune Aspects of Nanodrugs
2	<ul style="list-style-type: none"> Properties of nanomedicine (size, charge, composition, release, targeting, stability, sterility)
3	<ul style="list-style-type: none"> Basic Cell Biology, cellular uptake, and intracellular trafficking Ligand-receptor binding kinetics and targeted delivery
Pharmacology and Immune-biology of Nanomedicine	
4	<ul style="list-style-type: none"> Pharmacokinetics and Biodistribution Drug diffusion in biological system and permeation through biological barriers
5	<ul style="list-style-type: none"> Immunological Issues with Medicines of Nano Size: The Price of Dimension Paradox
6	<ul style="list-style-type: none"> The Immune System Nanomedicine and Innate Immune Activation
7	<ul style="list-style-type: none"> Nanomedicine and T cell-mediated Immune Response/Vaccine
8	<ul style="list-style-type: none"> Protein Corona and Complement Activation: Challenges to Nanomedicine Development
9	<ul style="list-style-type: none"> Immune Reactions in the Delivery of RNA-Based Therapeutics: Mechanisms and Opportunities
10	<ul style="list-style-type: none"> The Accelerated Blood Clearance Phenomenon of PEGylated Nanocarriers
11	<ul style="list-style-type: none"> Current Understanding of Interactions between Nanoparticles and the Immune System
Translation of Nanomedicine (through the lens of disease pathology)	
12	From bench to bedside: translational nanomedicine research
13	Cancer Biology and Cancer Immunology Case study in nanomedicine: Cancer Immunotherapy
14	Infection and Infectious Disease Case study in nanomedicine: Infectious disease (HIV and AIDS)
15	Inflammation/Autoimmunity Case study in nanomedicine: Autoimmune Diseases/Inflammation

Reading List in alignment with course schedule:

WEEK	TOPICS
Nanomedicine Basics:	
1	eBook ISBN 9780429068287, Chapter 5
2	Nanomedicine: Principles, Properties, and Regulatory Issues (PMID: 30177965)
3	Concepts of nanoparticle cellular uptake, intracellular trafficking, and kinetics in nanomedicine (PMID: 31022434)
Pharmacology and Immune-biology of Nanomedicine	
4	Chapter 7 & Chapter 8, ISBN: 9780128166635
5	Chapter 2, ISBN 9780203731536
6	Chapter 3, ISBN 9780203731536
7	Enhancing cancer immunotherapy with nanomedicine, PMID: 32005979
8	Chapter 9, ISBN 9780203731536
9	Chapter 14, ISBN 9780203731536
10	Chapter 7 & Chapter 8, ISBN 9780203731536
11	Chapter 5, ISBN 9780203731536
Translation of Nanomedicine (through the lens of disease pathology)	
12	Clinical Translation of Nanomedicine, PMID: 26088284
13	Selected by students

14	Selected by students
15	Selected by students

Attendance Policy, Class Expectations, and Make-Up Policy

Excused absences must be consistent with university policies in the [Graduate Catalog](#) and require appropriate documentation. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: [Attendance Policies](#).

Evaluation of Grades

3 quizzes throughout the semester, 1 midterm exam, and 1 research project

<i>Assignment</i>	<i>Total Points</i>	<i>Percentage of Final Grade</i>
Quizzes (3, 10 pts each)	30	30%
Midterm Exam	20	20%
Research Project	40	40%
<i>Mini Review (20 pts)</i>		
<i>Oral Presentation (20 pts)</i>		
Course Participation and In-class Discussion	10	30%
Overall Total	100	100%

Research Project:

This research project will consist of two part (1) writing a mini review on a self-selected disease-oriented nanomedicine topic (see below for a list of suggested topics); and (2) giving an oral presentation on the selected topic.

The mini review should: summarize and evaluate the literature, show relationships between different studies, and provide perspectives to future directions of the field. Contain no less than 2000 words.

A list of suggested research project topics: Cancer, Infectious disease, Inflammation, Autoimmune, and Transplantation.

Format of this review: Font: Time new roman, Font size: 11, line space: single, Margins: normal

Grading Policy

<i>Percent</i>	<i>Grade</i>
92.50-100%	A
89.50-92.49%	A-
86.50-89.49%	B+
82.50-86.49%	B
79.50-82.49%	B-
76.50-79.49%	C+
72.50-76.49%	C
69.50-72.49%	C-
66.50-69.49%	D+
62.50-66.49%	D
59.50-62.49%	D-
0 - 59.9%	E

More information on UF grading policy may be found at:

[UF Graduate Catalog](#)
[Grades and Grading Policies](#)

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the [Disability Resource Center](#). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. [Click here for guidance on how to give feedback in a professional and respectful manner](#). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/. [Summaries of course evaluation results are available to students here](#).

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." [The Honor Code](#) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see the [Notification to Students of FERPA Rights](#).

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or police.ufl.edu.

Academic Resources

[E-learning technical support](#), 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.

[Career Resource Center](#), Reitz Union, 392-1601. Career assistance and counseling.

[Library Support](#), Various ways to receive assistance with respect to using the libraries or finding resources.

[Teaching Center](#), Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

[Writing Studio](#), 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.

[Student Complaints Campus](#)

[On-Line Students Complaints](#)