



Regenerative medicine – future of clinical medicine

1. IMPRINT

Academic Year	2023/2024
Department	Faculty of Medicine
Field of study	Medicine
Main scientific discipline	Medical sciences
Study Profile	General academic
Level of studies	Uniform MSc
Form of studies	Full time studies
Type of module / course	Non-compulsory
Form of verification of learning outcomes	Completion
Educational Unit / Educational Units	Department of Regenerative Medicine 1b Banacha St. 02-097 Warsaw tel 48 22 116 61 09
Head of Educational Unit / Heads of Educational Units	Prof. dr hab. n. med. Magdalena Kucia

Course coordinator	Dr Andrzej Ciechanowicz, andrzej.ciechanowicz@wum.edu.pl
Person responsible for syllabus	Dr hab. Mateusz Adamiak, mateusz.adamiak@wum.edu.pl
Teachers	Prof. dr hab. Mariusz Z. Ratajczak, Prof. dr hab. Magdalena Kucia, dr hab. Mateusz Adamiak, dr Andrzej Ciechanowicz, dr Justyna Jarczak, mgr Kamila Bujko

2. BASIC INFORMATION

Year and semester of studies	2 nd , 3 rd , 4 th , 5 th and 6 th	Number of ECTS credits	2
FORMS OF CLASSES		Number of hours	ECTS credits calculation
Contacting hours with academic teacher			
Lecture (L)			
Seminar (S)		30	2
Discussions (D)			
e-learning (e-L)			
Practical classes (PC)			
Work placement (WP)			
Unassisted student's work			
Preparation for classes and completions			

3. COURSE OBJECTIVES

O1	Define the types of stem cells proposed for use in regenerative medicine. Present the various molecular mechanisms regulating the self-renewal and regeneration of stem cells. List the strategies and examples of using stem cells in medicine. Understand the mechanisms of aging in relation to stem cell function Define paracrine effects in stem cell therapy List the most common chemotactic and chemokinetic factors regulating stem cell migration.
O2	Give examples of molecular methods and experimental models in the study of stem cells.
O3	To explain the potential role of stem cells in cancer

4. STANDARDS OF LEARNING – DETAILED DESCRIPTION OF EFFECTS OF LEARNING (concerns fields of study regulated by the Regulation of Minister of Science and Higher Education from 26 of July 2019; does not apply to other fields of study)

Code and number of effect of learning in accordance with standards of learning	Effects in time (in accordance with appendix to the Regulation of Minister of Science and Higher education from 26th of July 2019)
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Knowledge – Graduate* knows and understands:

G.K1	processes: cell cycle, proliferation, cell differentiation and aging, apoptosis and necrosis and their importance for the functioning of the body; B.W18
G.K2	ways of communication between cells and between cell and matrix extracellular and signaling pathways within the cell as well examples of disorders in these processes leading to the development of neoplasms and others diseases ; B.W17
G.K3	basic issues of stem cells and their applications in medicine B.W19
G.K4	the body's aging mechanism; B.W23

Skills– Graduate* is able to:

G.S1	use basic laboratory techniques such as analysis qualitative, titration, colorimetry, pHmetry, chromatography, protein and nucleic acid electrophoresis; B.U8
G.S2	use databases, including the Internet, and search for the necessary information with the help of the available tools; B.U10

* In appendix to the Regulation of Minister of Science and Higher education from 26th of July 2019 „graduate”, not student is mentioned.

5. ADDITIONAL EFFECTS OF LEARNING (non-compulsory)

Number of effect of learning	Effects of learning in time
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Knowledge – Graduate knows and understands:

K1	
K2	

Skills– Graduate is able to:

S1	
S2	
S3	

Social Competencies – Graduate is ready for:

SC1	
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6. CLASSES		
Form of class	Class contents	Effects of Learning
S1	<p>S1: Molecular and in vivo models in stem cell therapies:</p> <ul style="list-style-type: none"> In vitro and in vivo tests to evaluate robustness of stem cell compartment. Nanotechnology in cell therapies. “Omics” techniques in stem cell research. Preclinical animal models in regenerative potential. <p>B.W18; B.W17; B.W19; B.W23</p>	
S2	<p>S2: Introduction to stem cells application in medicine:</p> <ul style="list-style-type: none"> Sources of stem cells. Stem cells of embryonic origin. Adult tissue-derived stem cells. Stem cells in physiological tissue and organ rejuvenation and regeneration. <p>B.W18; B.W17; B.W19; B.W23; B.U8; B.U10</p>	
S3	<p><i>Stem cells in clinical applications:</i></p> <ul style="list-style-type: none"> <i>Stem cells in aging.</i> <i>Use of stem cells in hematologic transplantology.</i> <i>Use of stem cells in non-hematological disorders (e.g., cardiology, dermatology, and other potential medical applications)</i> <i>Role of paracrine effects in stem cell therapies.</i> <i>Stem cells involvement in cancerogenesis</i> <i>Gene editing</i> <i>Cancer immunotherapy including CAR T cell technology</i> <p>B.W18; B.W17; B.W19; B.W23; B.U8; B.U10</p>	
S4	<p><i>Mechanisms, that regulate self-renewal and stem cells migration:</i></p> <ul style="list-style-type: none"> <i>Mechanism that regulates stem cell differentiation into tissues.</i> 	

	<ul style="list-style-type: none"> • <i>Mechanisms involved in regulation of stem cell migration during organogenesis.</i> • <i>Chemotactic and chemokinetic factors involved in stem cells migration.</i> • <i>Novel strategies that increase stem cells migratory potential.</i> <p><i>Models and methods to evaluate stem cell trafficking.</i></p> <p>B.W18; B.W17; B.W19; B.W23; B.U8; B.U10</p>	
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7. LITERATURE

Obligatory

1. Ratajczak MZ. A novel view of the adult bone marrow stem cell hierarchy and stem cell trafficking. *Leukemia*. 2015 Apr;29(4):776-82.
2. Ratajczak MZ, Jadczyk T, Pędziwiatr D, Wojakowski W. New advances in stem cell research: practical implications for regenerative medicine. *Pol Arch Med Wewn*. 2014;124(7-8):417-26.
3. Baharvand H., Ghdami N.A. *Regenerative medicine and cell therapy*. New York: Humana Press, 2013, ISBN9781627030977.

Supplementary

1. Ratajczak MZ, Zuba-Surma EK, Machalinski B, Kucia M. Bone-marrow-derived stem cells--our key to longevity? *J Appl Genet*. 2007;48(4):307-19.
2. Ratajczak MZ, Marycz K, Poniewierska-Baran A, Fiedorowicz K, Zbucka-Kretowska M, Moniuszko M. Very small embryonic-like stem cells as a novel developmental concept and the hierarchy of the stem cell compartment. *Adv Med Sci*. 2014 Sep;59(2):273-80

8. VERIFYING THE EFFECT OF LEARNING

Code of the course effect of learning	Ways of verifying the effect of learning	Completion criterion
<i>e.g. G.K1, G.S1, K1</i>	<i>This field defines the methods used for grading students e.g. pop quiz, test, written report etc.</i>	<i>e.g. threshold number of points</i>

9. ADDITIONAL INFORMATION *(information essential for the course instructor that are not included in the other part of the course syllabus e.g. if the course is related to scientific research, detailed description of, information about the Science Club)*

**No limit of participants,
Classes on the Banacha campus, once a week (3 hours of classes) from the 4th week after the start of the semester.**

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ATTENTION

The final 10 minutes of the last class in the block/semester/year should be allocated to students' Survey of Evaluation of Classes and Academic Teachers.