JAGIELLONIAN UNIVERSITY MEDICAL COLLEGE

Genetics with Molecular Biology

Educational subject description sheet

Basic information

Department Faculty of Medicine	**Didactic cycle** 2016/17
Field of study Medical Program	**Realization year** 2016/17
Study level long-cycle master's degree program	**Lecture languages** English
Study form full-time	**Block** obligatory for passing in the course of studies
Education profile general academic	**Mandatory** obligatory
Disciplines Medical science	**Examination** graded credit
Subject related to scientific research Yes	**Standard groups** B. Scientific basics of medicine, C. Preclinical course

Subject coordinator	Marek Sanak
Lecturer	Marek Sanak, Sabina Lichołai

Period	**Examination**	**Number of ECTS points**
Semester 2	graded credit **Activities and hours** lecture: 22, seminar: 6, laboratory: 2	2.0

Goals

C1	Knowledge of biological and molecular basis of inheritance, opportunities to study and modify genetically determined traits and availability of tools and techniques. Basic concepts of medical genetics, genetic diagnostics, patterns of inheritance and genotype - phenotype correlations.
C2	Critical evaluation by students of novel concepts and approaches in genetics and molecular medicine. Practice in presentation of students opinions based on their independent literaturę data analysis.
C3	Learning of the knowledge resources and necessity to sytematically and continously update knowledge in the field of molecular medicine.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	nucleotide functions in the cell, primary and secondary DNA and RNA structures and chromatin structure	B.W13	test
W2	functions of the genome, transcriptome and human proteome, and basic methods used in their examination, processes of DNA replication, repair and recombination, transcription and translation and degradation of DNA, RNA and proteins, as well as concepts for regulation of gene expression	B.W14	test
W3	processes: cell cycle, cell proliferation, differentiation and aging, apoptosis and necrosis and their importance for the functioning of the body	B.W18	test
W4	in the basic scope, the subject matter of stem cells and their application in medicine	B.W19	test
W5	the mechanism of the body's aging	B.W23	test
W6	methods of diagnostic and therapeutic procedures appropriate for specific disease states	O.W3	classroom observation, test
W7	basic concepts in the field of genetics	C.W1	test
W8	phenomena of gene coupling and interaction	C.W2	test
W9	normal human karyotype and different types of sex determination	C.W3	test
W10	chromosome structure and molecular mutagenic background	C.W4	test
W11	the rules for the inheritance of different numbers of traits, the inheritance of quantitative traits, the independent inheritance of traits and the inheritance of non-nuclear genetic information	C.W5	test
W12	genetic determinants of human blood groups and serological conflict in the Rh system	C.W6	test
W13	aberrations of autosomes and heterosomes that cause disease, including oncogenesis and cancer	C.W7	test
W14	factors influencing the primary and secondary genetic balance of the population	C.W8	test
W15	basics of diagnostics of gene and chromosomal mutations responsible for hereditary and acquired diseases, including neoplastic diseases	C.W9	test
W16	benefits and threats resulting from the presence of genetically modified organisms (GMOs) in the ecosystem	C.W10	test
Skills – Student can:			
U1	plan the diagnostic procedure and interpret its results	O.U3	classroom observation, test
U2	use on-line photo, audio and video libraries	B.U21	test
U3	use on-line databases of the human genome	B.U23	test

U4	use the Internet databases of genetic disorders	B.U24	classroom observation, test
U5	explain and prioritize differences between prospective and retrospective, randomized and clinical-control studies, case reports and experimental studies according to the reliability and quality of scientific evidence	B.U12	test
U6	analyze genetic crossbreeds and pedigrees of human traits and diseases, and assess the risk of having a child with chromosome aberrations	C.U1	test
U7	make decisions about the need for cytogenetic and molecular tests	C.U3	classroom observation, test
U8	perform morphometric measurements, analyze morphograms and record karyotypes of diseases	C.U4	test
U9	estimate the risk of a given disease becoming apparent in the offspring based on family predisposition and the influence of environmental factors	C.U5	test
U10	assess environmental hazards and use basic methods to detect the presence of harmful (biological and chemical) factors in the biosphere	C.U6	test
Social competences – Student is ready to:			
K1	take actions towards the patient on the basis of ethical norms and principles, with an awareness of the social determinants and limitations of the disease	O.K4	classroom observation, test
K2	use objective sources of information	O.K7	classroom observation, test

Calculation of ECTS points

Activity form	**Activity hours***
lecture	22
seminar	6
laboratory	2
preparation for classes	6
conducting literature research	6
kształcenie samodzielne	8
participation in examination	2

Student workload	**Hours** 52
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	Function of human genome, transcriptome and proteome and methods to study them. Mechanisms of replication, repair and recombination of DNA. Transcription, translation and degradation of DNA, RNA and proteins. Basic concepts in genetics: linkage and association. Inheritance of quantitative and qualitative traits. Independent segregation of traits and extranuclear genetics.	W1, W12, W2, W7, U3, U4, U6, U8, U9	seminar, laboratory, e-learning lecture
2.	Basic methods of genetic diagnostics: mutations and chromosomal aberrations. Impact on inherited and acquired disorders. The normal human karyotype and the most common chromosomal aberrations.	W10, W11, W13, W14, W15, W6, W8, W9, U1, U2, U4, U7, U9	seminar, lecture
3.	Cell cycle and the control of genetic expression. Mechanisms of genes regulation. Basic knowledge on stem cells and the use in medicine.	W3, W4, W5, U1, U5, K2	seminar, lecture
4.	Genetic equilibrium of population, primary and secondary factors impacting the genetic pool. Theoretical risks for genetic traits based on patterns of inheritance and genetic crossings. Measures of genetic association: odds ratio and relative risk.	W14, W6, U1, U5, K1	seminar, laboratory, e-learning lecture
5.	Benefits and risk of the presence of genetically modified organisms in the ecosystem. Genetic mechanisms of acquired ddrug resistance by microorganisms and cancerous cells.	W16, W2, U10, U2, K2	seminar, lecture

Course advanced

Teaching methods:

laboratories (labs), discussion, case study method, seminar, lecture

Activities	Examination methods	Credit conditions
lecture	test	Lab practicals (each student comes once) and seminars – attendance will be checked
seminar	test	A multiple choice test, threshold calculated on the performance of whole class
laboratory	classroom observation	Students' attendance during laboratory practicals is obligatory

Additional info

Students are requested to sign in to ClinicalKey Student, available through the link at www.bm.cm.uj.edu.pl

Literature

Obligatory

1. Emery's Elements of Medical Genetics Fifteenth Edition
   https://www-1clinicalkey-1com-1rgzkprsk0036.hanproxy.cm-uj.krakow.pl/student/content/book/3-s2.0-B9780702066856000234
2. Thompson & Thompson Genetics in Medicine Eighth Edition
   https://www-1clinicalkey-1com-1rgzkprsk0036.hanproxy.cm-uj.krakow.pl/student/content/book/3-s2.0-B9781437706963000212

Optional

1. Medical Genetics, Sixth Edition
   https://www-1clinicalkey-1com-1rgzkpr2c0076.hanproxy.cm-uj.krakow.pl/student/content/book/3-s2.0-B9780323597371010018
2. Crash Course Cell Biology and Genetics Updated Print + eBook edition, Fourth Edition
   https://www-1clinicalkey-1com-1rgzkpr2c0076.hanproxy.cm-uj.krakow.pl/student/content/book/3-s2.0-B9780723438762000109

Standard effects

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B.U12	explain and prioritize differences between prospective and retrospective, randomized and clinical-control studies, case reports and experimental studies according to the reliability and quality of scientific evidence
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C.U4	perform morphometric measurements, analyze morphograms and record karyotypes of diseases
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