Federal State Autonomous Educational Institution of Higher Education

«Peoples' Friendship University of Russia»

Medical Institute

Recommended MCSD

SYLLABUS
(STUDY GUIDE)

Subject

Medical Elementology

Recommended for the direction of training (specialty)

31.05.01 General Medicine

Program (profile, specialization)

General Medicine

1. Aims and objectives of the discipline:

• studying the biological role of macro- and trace elements and their significance for human health;

• formation in students of clinical thinking for diagnosis, assessment of disease prognosis and successful treatment;

• application of new methods and schemes of correction of various metabolic disorders and pathological processes.

2. The place of discipline in the structure of higher education:

The discipline "medical elementology" refers to the compulsory part of the 1st block of the curriculum.

Previous and subsequent disciplines aimed at the formation of competencies

№ p/p	Code and name of the competence	Previous disciplines	Subsequent disciplines (groups of disciplines)
Universal competencies:			
1	UC-1.2		-
General professional competencies			
1	GP-1.1		
3	GP-7.2		
Professional competencies			
1	P-2.2		

3. Requirements for the results of the discipline acquisition:

Based on the results of the study of Medical elementology in conjunction with other disciplines, the student should have the following general cultural, general professional and professional competences:

Emerging competencies

Code and name of the competence	Name of the competence	Indicators of competence achievement
UC-1	Able to carry out a critical analysis of problem situations based on a systematic approach, to develop a strategy for action	IUC 1.2 is able to: acquire new knowledge based on analysis, synthesis, etc.; collect data on complex scientific problems related to the professional field; search for information and solutions based on actions, experiments and experience
GP-1	Able to implement moral and legal norms, ethical and deontological principles in professional activities	IGPC 1.1 Knows how to comply with moral and legal standards in professional activities.
GP-7	Able to organize work and make professional decisions in emergency situations, in emergency situations, epidemics, and in centers of mass	IGPC 7.2 is able to: recognize conditions that require the provision of medical care in an emergency form, including in the conditions of emergency situations, epidemics and in the foci of mass lesions that require the provision of medical care in

	destruction	an emergency form; organize the work of medical personnel in emergency conditions, in the conditions of emergency situations, epidemics and in the foci of mass lesions; provide emergency medical assistance to patients in conditions that pose a threat to the life of patients, including clinical death (stopping vital functions of the human body (blood circulation and / or breathing); use medicines and medical devices when providing medical care in emergency conditions; perform basic cardiopulmonary resuscitation; use personal protective equipment;
P-2	Capable of examining a patient to establish a diagnosis	IPC 2.2: Able to formulate a preliminary diagnosis and draw up a plan for laboratory and instrumental examinations of the patient.

As a result of studying the discipline, the student must:

Know:

- - Rules of safety and work in biochemical laboratories with reagents, instruments, animals;
- - The role of biogenic elements and their compounds in living systems;
- - Elements of tissues biochemistry;
- - Bases of bioelementology, principles of biogeochemical distribution of chemical elements;
- - Approaches to correcting the imbalance of macro- and trace elements;
- - The role of macro and trace elements in the aspect of the specialty "Medical care".

Be able to:

- use educational, scientific, popular scientific literature, the Internet and educational portal for professional activities;
- search for information over literary sources;
- classify chemical elements depending on their biological role;
- assume negative consequences for the organism of imbalance of certain macro- and trace elements.

Own:

- methods of applying the analysis and solving specific practical and scientific problems;
- basic technologies of information retrieval and transformation, including using educational resources.

4. Length of the course and types of academic work

- The total labor coefficient of the discipline is 2 credit units.

Type of academic work	Total hours	Semesters			
		VI			
Classroom activities (total)	**30**	**30**			
Including:	-	-			
Lectures	-	-			
Practical training (PT)		-			

Seminars (S)			-			
Laboratory work (LW)		28	28			
Independent work (total)		**36**	**36**			
Types of intermediate attestation						
Including:						
Running attestation (colloquium)		4	4			
Grading test		2	2			
Total labor intensity	hours	**72**	**72**			
	credit units	**2**	**2**			

5. Contents of the discipline

5.1 Contents of the discipline sections

№	Title of the discipline section	Contents of the section
1.	Introduction to Medical Elementology	1. Subject of medical elementology. Biological classification of chemical elements. The concept of bioelements.
		2. Biogeochemistry and factors affecting the elemental status of the population.
		3. A new paradigm of nutrition and therapy.
2.	General Elementology	4. Factors affecting the homeostasis of trace elements. Interaction between trace elements.
		5. Elemental status of a person. Personalized assessment of human elemental status.
3.	Special Elementology	6. Essential trace elements (iron, zinc, copper, manganese, chromium, cobalt, molybdenum, selenium, iodine): role in the body; absorption; excretion; deficiency and toxicity; associated diseases; sources.
		7. Conditionally essential trace elements (lithium, strontium, vanadium, nickel, tin, silicon, fluorine): role in the body; absorption; excretion; deficiency and toxicity; associated diseases; sources.
		8. Toxic and potentially toxic trace elements (arsenic, aluminum, lead, cadmium, mercury): role in the body; absorption; excretion; toxicity; associated diseases; sources.
		9. Macroelements (potassium, sodium, calcium, magnesium,

		phosphorus, sulfur, chlorine): role in the body; absorption; excretion; deficiency and excess; toxicity; associated diseases; sources.
		10. Elements-organogenes (carbon, oxygen, nitrogen, hydrogen): a role in the body; absorption; excretion; associated diseases; sources.
4.	The role of chemical elements in the diagnosis and treatment of human diseases	11. Imbalances of chemical elements in various diseases: diseases of the skin, diseases of the musculoskeletal, broncho-pulmonary, immune, endocrine, cardiovascular systems, childhood diseases, trace elements in oncology and hematology.

5.2 Discipline sections and the interdisciplinary relations

№	**Name of the ensured (subsequent) disciplines**	**№ of the sections of this discipline necessary for the study of the ensured (subsequent) disciplines**										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1.	Normal physiology	+	+	+	+	+	+	+	+	+	+	
2.	Pathophysiology				+	+	+	+	+	+	+	
3.	General Pharmacology				+	+	+	+	+	+	+	
4.	Clinical Pharmacology				+	+		+	+	+	+	
5.	Biochemistry	+	+	+		+			+	+	+	

5.3 Discipline sections and the activities

№	**Name of the discipline section**	**Lectures**	**Practical exercises and laboratory work**			**Independent work**	**Total hours**
			PT/S	**LW**	***Incl. individual***		
1.	Section 1	-	-	4	2	4	8
2.	Section 2	-	-	4	2	4	8
3.	Section 3	-	-	22	16	24	46
4.	Section 4	-	-	4	2	6th	10
	Total	**0**	**0**	**34**	**22**	**38**	**72**

6. Laboratory practice

On the laboratory lesson, the main theoretical questions are discussed in detail, repeated and generalized. Qualitative (logical) tasks are being solved. Laboratory work is conducted with discussion of theoretical bases of medical elementology, data values for clinical diagnosis and selection of correction methods. In the classroom, students also answer the test questions of the running test work, distributed to them individually in printed form.

№	№ of the discipline section	Title of laboratory works	Length (hours)
1.	1	Laboratory work №1. Preparation of the patient for the analyzis on the content of chemical elements. Significant factors for analysis.	2
2.	2	Laboratory work №2. Methods of hair, nails sample preparation for mass spectrometric analysis.	2
3.	2	Laboratory work №3. Methods of blood (whole blood, serum, plasma) sample preparation for mass spectrometric analysis.	2
4.	2	Laboratory work №4. Methods of urine and saliva sample preparation for mass spectrometric analysis.	2
5.	1,2	Control work №1. Introduction to medical elementology. General elementology.	2
6.	3	Laboratory work №5. Determination of the content of chemical elements in solid biosubstrates (hair and nails). Interpretation of the results.	2
7.	3	Laboratory work №6. Determination of the content of chemical elements in serum and blood plasma. Interpretation of the results.	2
8.	3	Laboratory work №7. Determination of the content of chemical elements in whole blood. Interpretation of the results.	2
9.	3	Laboratory work №8. Features of the determination of the content of macroelements in solid biosubstrates. Interpretation of the results.	2
10.	3	Laboratory work №9. Features of the determination of the content of macroelements in liquid biosubstrates. Interpretation of the results.	2
11.	3	Laboratory work №10. Methods of statistical processing of analysis results.	2
12.	4	Laboratory work №11. Identification of relations between various diseases (not including dental diseases) and test results.	2
13.	2,3	Control work №2. Special elementology.	2
14.	3,4	Laboratory work №12. Identification of connections between diseases and test results.	2

№	№ of the discipline section	Title of laboratory works	Length (hours)
15.	3,4	Laboratory work №13. Identification of connections between diseases and test results.	2
16.	1,2,3,4	A summative lesson; defence of abstracts (all sections).	2
17.	1,2,3,4	Final control.	2

7. Practical exercises are not provided

8. Material and technical support of the discipline:

Computers, multimedia projectors, projection devices;

Students have access to electronic versions of the lecture course, homework, tests;

ICP mass spectrometer ELAN 9000 (PerkinElmer Sciex, USA);

ICP AES Optima 2000 DV (PerkinElmer, USA);

ICP mass spectrometer Nexion 300D (PerkinElmer);

SPEEDWAVE Four (BERGHOF, Germany) microwave digestion system with vertical loading of samples;

PerkinElmer S200 high performance liquid chromatography system (PerkinElmer, USA);

Water deionizer Labconco Waterpro HPLC;

Laboratory digital pH meter (range - 1-14 pH, step - 0.01 pH units);

Vacuum centrifuge Labconco CentriVap;

Diaphragm vacuum pump N86 KT.18 from KNF;

Solid phase extraction chamber SupelCo.

9. Information support of the discipline

a) Software: OS Windows XP, Windows Vista, Windows 7, a set of office programs OpenOffice.org (or MS Office 2003, 2007), Internet search engines FireFox or Internet Explorer, Opera, or other software tools for knowledge control. Databases Medline, PubMed, etc.

b) The site of the RUDN library - Access: http://lib.rudn.ru/ - from desktop computers of the PFUR
University library ONLINE - Access: http://www.biblioclub.ru/
Book collections of SPRINGER publishing. - Access: www.springerlink.com
Vestnik RUDN (Series "Medicine") - Access: http://www.elibrary.ru/defaultx.asp
Universal database East View . - Access: http://online.ebiblioteka.ru/
Full-text collection of Russian scientific journals. eLibrary.ru - Access:
http://elibrary.ru/defaultx.asp?
On-line access to journals. Information database on all branches of science and electronic delivery of documents. SwetsWise. - Access: https://www.swetswise.com
http://quakes.globalincidentmap.com/ ,
http://www.globalincidentmap.com/ ,
http://earthquake.usgs.gov/earthquakes/recenteqsww/Quakes/quakes_all.php ,
http://www.tesis.lebedev.ru/forecast_activity.html
Electronic Library System RUDN - EBS RUDN: http://lib.rudn.ru:8080/MegaPro/Web
The educational portal of RUDN (http://web-local.rudn.ru);
University library online: http://www.biblioclub.ru

National digital resource "RUKONT": http://rucont.ru
IQlib: http://www.iqlib.ru
Science Direct: http://www.sciencedirect.com
EBSCO: http://search.ebscohost.com
Sage Publications: http://online.sagepub.com
Springer / Kluwer: http://www.springerlink.com
Tailor & Francis: http://www.informaworld.com
Web of Science: http: //www.isiknowledge. com
University information system RUSSIA: http://www.cir.ru/index.jsp
The portal of the RUDN: http://web-local.rudn.ru/
Consultant of the student http://www.studmedlib.ru

10. Methodological support

Basic literature

1) Medical Elementology = Медицинская элементология : manual for Medical Students and Phisicians / A.B. Скальный, М.Г. Скальная, А.А. Киричук, А.А. Тиньков. - Книга на английском языке; Электронные текстовые данные. - М. : PFUR, 2018. - 250 с. : ил. - ISBN 978-5-209-08996-4 : 386.14.

2) Introduction to Medical Elementology: A Textbook. I.V. Radysh, A.V. Skalny. - Moscow: PFUR, 2015. - 200 p.: ill. ISBN 978-5-209-06691-0.

3) Introduction to Bioelementology = Введение в биоэлементологию : textbook / A.B. Скальный, И.В. Радыш, М.Г. Скальная, А.А. Тиньков; Edited by Anatoly V. Skalny. - Книга на английском языке; Электронные текстовые данные. - М.: Изд-во РУДН, 2017. - 253 с.: ил. - ISBN 978-5-209-07819-7 : 155.00.

4) Oberlis D., Harland V., Skalny A. Biological role of macro and microelements in humans and animals. - SPb.: Science, 2008. - 544 p.

5) Skalny A.V., Lakarova E.V., Kuznetsov V.V., Skalnaya M.G. Analytical methods in bioelementology. - St. Petersburg: Science, 2009. – 264 p.

Additional literature

1) World Health Organization. (1996). Trace elements in human nutrition and health.

2) Skalny A.V. Bioelements and bioelementology in pharmacology and nutrition: fundamental and practical aspects // Pharmacology and nutritional intervention in the treatment of disease, Edited by Faik Atroshi. 2014.-P. 225-241.

3) Skalny A.V., Rudakov I.A. Notova S.V., Burtseva T.I., Skalny V.V., Baranova O.V., Gubaydulina S.G., Bioelementology: basic concepts and terms. IPK GOU OSU - Orenburg. - 2005. – 50 p.

4) Ibragimova M.Ya., Skalnaya M.G., Sabirova L.Ya., Skalny A.V., Zhdanov R.I. Exchange of macro and microelements in the human body. Modern methods of determining chemical elements in biological materials / Selected chapters of fundamental and translational medicine. R.I. Zhdanov, the manager. Ed. - Kazan: Kazan Publishing House. University. 2014. P. 330-346.

5) Skalny A.V. Microelements // Laboratory diagnostics of infectious diseases. Reference book / Ed. IN AND. Pokrovsky, M.G. Tvorogovoy, G.A. Shipulina. - Moscow: Publishing House BINOM, 2013 - 447- 467p.

6) Skalny A.V., Tsygan V.N. Pathophysiology of macro-and microelement exchange // Pathophysiology of Metabolism: a Textbook / Ed. V.N. Gypsy. - St. Petersburg: SpetsLit, 2013. - P. 262-333.

7) Skalny A.V. Chemical elements in human physiology and ecology. -M .: ONYX 21 Century: The World, 2004. -216 p.

8) Skalny A.V. Physiological aspects of the application of macro- and microelements. IPK GOU OSU - Orenburg, 2005. - 206 p.

9) Agadzhanyan N.A., Veldanova M.V., Skalny A.V. Ecological portrait of man and the role of microelements. -M., 2001. -236 p.

10) Skalny A.V., Rudakov I.A. Bioelements in medicine. -M.: ONYX 21 Century: The World, 2004. -272 p.

11. Guidelines for the students on the development of discipline (module)

The student is required to attend classes, perform the tasks of the instructor of the discipline, study with the recommended literature, etc. When attending the student it is assessed the quality of work in classes, the level of training for independent activity in the chosen field, the quality of the performance of teacher' discipline tasks, the ability to independently study the teaching material.

In practical exercises and lectures in the classrooms, the appropriate topics are analyzed using multimedia technology (computer, projector).

Independent work in class-off hours can take place both in the classroom and in the computer class, where students can study the material on presentations prepared by the Department's teachers, as well as on computer tests.

Presentations on the classes' topics can be recorded on a CD or flash card for independent work of students on a home computer.

Study guides in electronic form for a number of studying topics are posted on the Department' pages and on Department of Nursing Management and on the RUDN learning web portal, as well as on local resources of the electronic library system of the RUDN.

As one of the forms of independent work the preparation of abstracts for different sections of the course is provided.

Out-of-class independent work includes: the study of material on the textbook, manuals on paper and electronic media; preparation of abstracts on selected topics; preparation for the execution of control and test tasks.

Academic ethics

When preparing creative works, it is necessary to comply with the requirements of academic ethics.

All footnotes available in the creative work are carefully verified and provided with links to the source of information. Direct quotations are given in quotation marks and are also accompanied by appropriate footnotes.

It is unacceptable to include in your work excerpts from the works of other authors without indicating this, to retell someone else's work close to the text without reference to it, to use someone else's ideas without specifying the original source. This also applies to sources found on the Internet. In this case, you must specify the full address of the site. If the site contains the name of the source, publication, author's name, then the relevant data should also be indicated in the footnotes and the list of sources and literature used in the preparation of the creative work. At the end of the work, an exhaustive list of all the sources used is given.

Any cases of plagiarism, i.e. the use of any sources without reference to the author, should be excluded.

12. Fund of assessment tools for students interim attestation in discipline (module) «Medical Elementology»

Materials for assessing the level of mastering the educational material of the discipline «Medical elementology» (evaluation materials), including a list of competencies with an indication of the stages of their formation, a description of indicators and criteria for assessing competencies at various stages of their formation, a description of assessment scales, typical control tasks or other materials necessary to assess knowledge, skills and (or) experience of activities that characterize stages of the

formation of competencies in the process of mastering the educational program, methodological materials defining the procedures for assessing knowledge, skills and (or) experience of activities that characterize the stages of the formation of competencies are developed in full and are available for students on the discipline page in TUIS RUDN.

The program is compiled in accordance with the requirements of the ES HE RUDN University.

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