

Syllabus course

“ BIOCHEMISTRY OF ESSENTIAL NUTRIENTS ”

selective discipline

Amount	60 hours / 2.0 ECTS
Semester, year of study	4th year of study, 7th semester
Days, time, place	Venue: Odessa, st. Olgiivska, 4a (Main building of ONMedU), Department of Clinical Chemistry and Laboratory Diagnostics. Days and times of classes: According to the schedule of the educational department
Teacher (s)	1. Docent Yasinenko Nina Yevhenivna 2. Docent Storchylo Olha Vyacheslavivna 3. Senior Lecturer Oliynyk Kathryn Victorovna 4. Senior Lecturer Vasylieva Antonina Georhiivna 5. Senior Lecturer Maryniuk Ganna Serhiivna 6. Assistant Kostina Alina Anatoliivna 7. Assistant Poplavska Nataly Andriivna 8. Assistant Davydenko Veronika Leonidivna
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Workplace	Odessa, street Olgiivska, 4a (Main building of ONMedU), Department of Clinical Chemistry and Laboratory Diagnostics.
Consultations	According to the schedule posted on the information stand of the department

COMMUNICATION

Communication with students will be carried out in the classroom.

During distance learning, communication is carried out through the Microsoft Teams platform, as well as through e-mail correspondence, via Viber, Telegram, WhatsApp messengers.

COURSE ANNOTATION

Subject discipline study - structural and functional characteristics of essential nutrients as essential nutrients and biochemical mechanisms of their involvement in the functioning of various metabolic pathways of the body.

Prerequisites of the course: to study the course students must have knowledge of biological chemistry, physiology, pathological physiology, pharmacology, pharmaceutical chemistry.

Postrequisites of the course: assimilation by students of modern biochemical bases of metabolic and regulatory role of essential nutrients as important components of an organism

which function as coenzymes, hormones, antioxidants, mediators of the cellular signaling and regulators of growth and differentiation of cells and fabrics.

The aim of the course is to form in students a holistic system of knowledge about high- and low-molecular-weight essential nutrients, their structures, metabolism and functional impact on the human body.

Tasks of the discipline:

- ♦ to acquaint with features of metabolism of vitamins, quasi-vitamins as marginal compounds, essential fatty and amino acids;
- ♦ to obtain the fundamental knowledge necessary for the interpretation of the results of detection of abnormalities in the functioning of one or more organs;
- ♦ learn to characterize the involvement of vitamins and other nutrients in the development, progression and correction of pathological processes;
- ♦ assess the stock of functional capabilities of the body.

Expected results

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

- chemical structure and chemical properties of essential macro- and micronutrients;
- processes of metabolic transformations of vitamins, quasi-vitamins, essential amino and fatty acids;
- the main pathways of metabolism of essential macro- and micronutrients and the key mechanisms that regulate these pathways.
- biochemical mechanisms and patterns of their metabolic and regulatory role in human cells and tissues.
- characteristics of pathologies, the development of which is associated with a deficiency of macro- and micronutrients, toxicity of these compounds and general metabolic disorders.

Students must be able to:

- classify essential nutrients and their metabolically active forms by structure and nature of functional activity;
- analyze and interpret the molecular mechanisms of metabolic activity of vitamins, essential amino acids, ω -3 fatty acids;
- use acquired theoretical knowledge for setting and solving practical problems;
- to diagnose the state of biological systems based on the results of research of organisms of different levels of organization;
- to analyze biological phenomena and processes at the molecular, cellular organismal, population-species and biosphere levels from the point of view of fundamental general scientific knowledge, as well as with the use of special modern research methods.

COURSE DESCRIPTION

Forms and methods of teaching

The course will be presented in the form of lectures (30 hours), practical classes (20 hours), organization of independent work of students (10 hours).

The main forms of teaching the discipline are: lectures, practical classes, independent work of students. The following teaching methods are used during the teaching of the discipline: lectures, explanations, conversations, multimedia presentations, laboratory work, problem solving, oral examination, testing, etc.

Students' independent work is to study the material of lectures, as well as to prepare for

and defend practical work, prepare for current and final control, perform training tests, search for information from literature and the Internet and conduct elements of scientific work.

Students' scientific work is carried out in the work of circles, preparation and speeches at scientific student conferences, writing articles.

The content of the discipline

Topic 1. History of the discovery of vitamins and the development of vitaminology. Integration of vitamin metabolism.

Topic 2. General characteristics of components and content of nutrients in common human food: a) macrocomponents (carbohydrates, fats, proteins); b) microcomponents (vitamins, trace elements).

Topic 3. Fat-soluble and water-soluble vitamins. Distribution and daily requirement. Features of absorption, transportation and chemical modifications of vitamins in the human body.

Topic 4. Structural and functional characteristics of individual quasi-vitamins: myo-inositol, S-methyl methionine, orotic acid, pangamic acid, pyrroloquinoline quinone, quinine, taurine, bioplerin.

Topic 5. Integrative mechanisms of functioning of ω -3 fatty acids and mitochondria. Fatty acid nutrition profile. Unsaturated fatty acids: vital or toxic?

Topic 6. Metabolism of essential amino acids. Integrated index of essential amino acids. Predicting the biological value of proteins.

Topic 7. Structural and functional characteristic individual pharmacological drugs as antivitamins. The use of antivitamins in medical practice. Metabolism of antivitamins.

Topic 8. Assessment of adequate supply of macronutrients and vitamins. Biochemical basis of vitamin interventions in the correction of the functioning of the methionine cycle. Experimental contradictions in the use of vitamin preparations.

Topic 9. Nutrient deficiency conditions and therapeutic use of essential nutrients.

Topic 10. Final control of knowledge: credit

List of recommended reading

1. Lehninger. Principles of Biochemistry. 7th edition. NY, United States. 2017.
2. Lippincott Illustrated Reviews: Biochemistry. Philadelphia :Wolters Kluwer, 2017.
3. Zimmerman M., Snow B. An Introduction to Nutrition. - 2012.
4. Blake S. Vitamins and Minerals Demystified / [S. Blake]. - New York: McGaw-Hill, 2008. - 342 p.
5. Nollet LML, Toldrá F. Chapter 1. Essential Amino Acids // Handbook of Analysis of Active Compounds in Functional Foods. - 2012. - P. 3-24

EVALUATION

The results of students' academic performance are presented in the form of assessment on the national scale, 200-point and ECTS scale and have standardized generalized criteria for assessing knowledge:

national scale:

- "Excellent" (5) rating is awarded to a student, who is fluent in material of questionnaire, participates in discussion of debated questions, is able to write basic biochemical reactions occurring in the body, to identify key biochemical parameters in biologic objects and give them medical and biological assessment. He who realized the relationship of certain sections of the discipline, their importance for the future profession, showed creative abilities in understanding and using the curriculum, showed the ability to independently update and

replenish knowledge; level of competence - high (creative).

- "Good" (4) rating is awarded to a student, who is fluent in material of questionnaire, able to write basic biochemical reactions occurring in the body, to identify key biochemical parameters in biologic objects and give them medical and biological assessment, but makes some minor errors in answers to questions and is capable of their independent updating and renewal in the course of further training and professional activity; level of competence - sufficient (constructive-variable);

- "Satisfactory" (3) rating is awarded to a student who is familiar with all questions of program and learned the themes of mandatory qualification minima, is able to identify key biochemical parameters in biological objects and give them medical and biological evaluation. One who has made some mistakes in answering the exam and in performing exam tasks, but has the necessary knowledge to overcome mistakes under the guidance of a researcher; level of competence - average (reproductive);

- "Unsatisfactory" (2) rating is awarded to a student who has significant gaps in knowledge of the program material, makes fundamental errors in explaining the laws of metabolism in humans; does not have the necessary practical skills; the level of competence is low (receptive-productive).

Ongoing control

Ongoing monitoring is done at each practical class through oral examination or written controls. After studying each section based on control of theoretical knowledge, skills and abilities the control of practical skills is carried out. The current educational activity of the student is evaluated in practical classes on a 4-point (traditional) scale.

Additional (bonus) points can be received for individual tasks:

- Participation and report in the student scientific conference;
- Report on the student scientific circle;
- Preparation of multimedia slides and tests;
- Translations of scientific articles from foreign languages;
- Abstract work on a particular topic.

The number of points accrued for different types of individual tasks depends on their scope and significance, and is determined by the standard and working programs of the discipline and is added to the sum of points scored by students for current academic activities for a particular section. Grades for individual tasks are given to the student only if they are successfully completed and defended. The grade is added to the current performance.

At the end of the study, the current performance is calculated - the average current score (the arithmetic mean of all current grades on a traditional scale, rounded to two decimal places).

Final control

The form of final control is the credit. The credit is which involved the control of theoretical and practical training (practical skills and situational tasks).

The final control in the form of credit is assessed on a two-point scale:

- the grade "passed" is given to a student who has completed the curriculum of the discipline, has no academic debt and has an average score for current educational activity of not less than 3.00; level of competence - high (creative);

- the grade "not passed" is given to a student who has not fulfilled the curriculum of the discipline, has an academic debt (average score below 3.0 and / or absences); the level of competence is low (receptive-productive).

Conversion of the traditional grade from the discipline to 200-point is performed by the information and computer center of the university program "Contingent" according to the formula:

average grade point (current / discipline) x 40.

national scale:	points
«5»	185-200
«4»	151-184
«3»	120-150

According to the scores, students are evaluated on the ECTS rating scale. Students enrolled in one specialty are ranked on the ECTS scale on the basis of the number of points scored in the discipline as follows:

ECTS assessment	Statistical index
«A»	The best 10% of students
«B»	The next 25% of students
«C»	The next 30% of students
«D»	The next 25% of students
«E»	The next 10% of students

Individual independent work (IInW)

Tasks for independent work are the general obligatory tasks highlighted in workbooks, which student should prepare for each class; making notes, filling out a workbook, learning vocabulary, studying subtopics that do not require explanation.

Students' independent work, which is provided by the topic of the lesson along with the classroom work, is assessed during the current control of the topic in the relevant lesson. Learning topics submitted only on independent work is checked during the credit.

COURSE POLICY

Deadline and exam re-taking policy:

It is expected that students will attend all lectures and practical classes. If they missed a class, it is necessary to re-work it (according to the schedule posted on the information stand of the department and according to the permission of the dean's office, if necessary).

Re-work of practical skills mastering controls is carried out during a semester individually with the decision of re-work time.

Unsatisfactory grades re-work is carried out in the last month of discipline study if the average score for the current educational activity is less than 3.00 (conducted according to the schedule posted on the department's information stand).

Academic Integrity Policy:

Adherence to academic integrity by students involves:

- Independent performance of educational tasks, tasks of current and final control (current controls and credit in the discipline), and learning outcomes (for persons with special educational needs this requirement is applied according to their individual needs and capabilities);
- Links to sources of information in case of the use of ideas, developments, statements, information;
- Providing reliable information about the results of their own (scientific, creative) activities, used research methods and sources of information.

The following is unacceptable in educational activities for participants in the educational process: use of prohibited auxiliary materials or technical means (cheat sheets, abstracts, headphones, telephones, smart phones, tablets, etc.) during control measures.

For violation of academic integrity, students may be held liable for the following academic liability:

- Reduction of results of assessment of control work, examination, credit, etc.;
- Re-taking the assessment (test, exam, test, etc.);
- Appointment of additional control measures (additional individual tasks, controls, tests, etc.).

Attendance and lateness policy:

Attendance at lectures and practical classes is mandatory. If you are more than 15 minutes late, the lesson is considered missed and needs to be re-worked.

Mobile devices:

During practical classes, the use of a smart phone, tablet or other device is allowed for storing and processing information only with the permission of the teacher.

The use of mobile devices and their accessories is strictly prohibited during any control.

Classroom behavior:

The following is allowed during classes: leaving the classroom for a short time if necessary and with the teacher's permission; taking photos of presentation slides; taking an active part in the class.

The following is not allowed during classes: eating (except for persons whose special medical condition requires so; then medical confirmation is required); smoking, drinking alcohol and low-alcohol beverages or taking drugs; using obscene language or words that offend the honor and dignity of colleagues and faculty; playing games; damaging the materials and technical base of the university (inventory, equipment; furniture, walls, and floors damage, littering the premises and territories); crying, shouting or listening to loud music in classrooms and even in corridors during classes.