

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

**Federal State Autonomous Educational Institution of Higher Education
«National Research Lobachevsky State University of Nizhny Novgorod»**

Институт клинической медицины

УТВЕРЖДЕНО

решением Ученого совета ННГУ

протокол № 10 от 02.12.2024 г.

Working programme of the discipline

Immunology, clinical immunology

Higher education level

Specialist degree

Area of study / speciality

31.05.03 - Dentistry

Focus /specialization of the study programme

Dentistry

Mode of study

full-time

Nizhny Novgorod

Year of commencement of studies 2025

1. Место дисциплины в структуре ОПОП

Дисциплина Б1.О.30 Иммунология, клиническая иммунология относится к обязательной части образовательной программы.

2. Планируемые результаты обучения по дисциплине, соотнесенные с планируемыми результатами освоения образовательной программы (компетенциями и индикаторами достижения компетенций)

Формируемые компетенции (код, содержание компетенции)	Планируемые результаты обучения по дисциплине (модулю), в соответствии с индикатором достижения компетенции		Наименование оценочного средства	
	Индикатор достижения компетенции (код, содержание индикатора)	Результаты обучения по дисциплине	Для текущего контроля успеваемости	Для промежуточной аттестации
ОПК-8: Способен использовать основные физико-химические, математические и естественнонаучные понятия и методы при решении профессиональных задач	ОПК-8.1: Знать основные физико-химические, математические и естественнонаучные понятия и методы ОПК-8.2: Уметь использовать основные физико-химические, математические и естественнонаучные понятия и методы при решении профессиональных задач ОПК-8.3: Владеть опытом использования основных физико-химических, математических и естественнонаучных понятий и методов при решении профессиональных задач	ОПК-8.1: Знает основные физико-химические, математические и естественнонаучные понятия и методы ОПК-8.2: Умеет использовать основные физико-химические, математические и естественнонаучные понятия и методы при решении профессиональных задач ОПК-8.3: Владеет опытом использования основных физико-химических, математических и естественнонаучных понятий и методов при решении профессиональных задач	Доклад-презентация Коллоквиум Тест	Экзамен: Контрольные вопросы
ОПК-9: Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач	ОПК-9.1: Знать принципы оценки морфофункциональных, физиологических состояний и патологических процессов в организме человека ОПК-9.2: Уметь оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных	ОПК-9.1: Знает принципы оценки морфофункциональных, физиологических состояний и патологических процессов в организме человека ОПК-9.2: Умеет оценивать морфофункциональные, физиологические состояния и патологические процессы в	Доклад-презентация Коллоквиум Тест	Экзамен: Контрольные вопросы

	задач ОПК-9.3: Владеть опытом оценки морфофункциональных, физиологических состояний и патологических процессов в организме человека для решения профессиональных задач	организме человека для решения профессиональных задач ОПК-9.3: Владеет опытом оценки морфофункциональных, физиологических состояний и патологических процессов в организме человека для решения профессиональных задач		
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3. Структура и содержание дисциплины

3.1 Трудоемкость дисциплины

	очная
Общая трудоемкость, з.е.	4
Часов по учебному плану	144
в том числе	
аудиторные занятия (контактная работа):	
- занятия лекционного типа	32
- занятия семинарского типа (практические занятия / лабораторные работы)	32
- КСР	2
самостоятельная работа	42
Промежуточная аттестация	36 Экзамен

3.2. Содержание дисциплины

(структурированное по темам (разделам) с указанием отведенного на них количества академических часов и виды учебных занятий)

Наименование разделов и тем дисциплины	Всего (часы)	в том числе			
		Контактная работа (работа во взаимодействии с преподавателем), часы из них			Самостоятельная работа обучающегося, часы
		Занятия лекционного типа	Занятия семинарского типа (практические занятия/лабораторные работы), часы	Всего	
	о ф о	о ф о	о ф о	о ф о	о ф о
The subject of immunology	53	16	16	32	21

Infections and immunity	53	16	16	32	21
Аттестация	36				
КСР	2			2	
Итого	144	32	32	66	42

Contents of sections and topics of the discipline

1. The section "Subject of immunology" includes:

Topic 1. The subject of immunology. The main stages of the development of immunology. Progress.

Topic 2. Antigens and antibodies. Pathogens.

Topic 3. Antigen-antibody reaction. Methods of immunochemical analysis.

Topic 4. Primary and secondary organs of the immune system

Topic 5. Innate immunity. Cellular factors of natural resistance.

Topic 6. The complement system, other factors of innate immunity.

Topic 7. The main histocompatibility complex. Presentation of the antigen.

Topic 8. Adaptive immune response.

2. The section "Infections and immunity" includes:

Topic 9. Infections and immunity. Induction of an immune response. Implementation of the immune response.

Topic 10. Antitumor immunity.

Topic 11. Immunological tolerance. The immunological relationship between the fetus and the mother's body.

Topic 12. Phylogeny of the immune response. Ontogenesis.

Topic 13. Fundamentals of immunopathology. Immunodeficiency conditions.

Topic 14. Primary and secondary immunodeficiency. HIV.

Topic 15. Allergic reactions. Autoimmune diseases.

Topic 16. Oncological diseases of the organs of the immune system.

Topic 17. Transplantation immunity.

Topic 18. Methods of immunodiagnostics.

4. Учебно-методическое обеспечение самостоятельной работы обучающихся

Самостоятельная работа обучающихся включает в себя подготовку к контрольным вопросам и заданиям для текущего контроля и промежуточной аттестации по итогам освоения дисциплины приведенным в п. 5.

Власенко В. С. Иммунология : учебное пособие / Власенко В. С., Конев А. В. - Омск : Омский ГАУ, 2021. - 123 с. - Книга из коллекции Омский ГАУ - Ветеринария и сельское хозяйство. - ISBN 978-5-89764-964-8. <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=797666&idb=0>

5. Assessment tools for ongoing monitoring of learning progress and interim certification in the discipline (module)

5.1 Model assignments required for assessment of learning outcomes during the ongoing monitoring of learning progress with the criteria for their assessment:

5.1.1 Model assignments (assessment tool - Report-presentation) to assess the development of the competency ОПК-8:

Pathological conditions associated with impaired barrier functions of the skin. Pathological conditions associated with impaired intestinal barrier functions. Pattern recognition receptors in the immune system.

The antigen-antibody reaction

Monoclonal and polyclonal antibodies

Methods based on precipitation and agglutination reactions. Enzyme immunoassay

Immunofluorescence analysis Methods for assessing cellular immunity

Methods for assessing humoral immunity Types of vaccines, principle of action Principles and types of immunotherapy

5.1.2 Model assignments (assessment tool - Report-presentation) to assess the development of the competency OIK-9:

Non-infectious and infectious allergens. There are 4 types of allergic reactions.

Classification of allergic reactions according to the mechanism of development. Name the four stages of allergy development.

What do you know about the immunological stage of an allergic reaction? What do you know about the pathochemical stage of an allergic reaction?

What do you know about the mediator stage of allergy?

What do you know about the pathophysiological stage of allergy? What is immediate type hypersensitivity?

Name the types of hypersensitivity reactions of the immediate type. Anaphylactic reactions.

The mechanism of cytotoxic allergic reaction. Immunocomplex allergic reactions.

An immunocomplex allergic reaction is a serum sickness. Antireceptor allergic reactions.

Granulocyte-mediated allergic reactions. Thrombocyte-mediated allergic reactions. What is delayed-onset hypersensitivity? Delayed-type contact sensitivity.

Tuberculin and granulomatous variants of delayed hypersensitivity.

Pseudoallergic reactions. Mechanisms of pseudoallergia.

Autoimmune (autoallergic) processes. Possible causes of autoimmune processes.

Transplant immunity. Autograft. Allogeneic graft. Xenotransplantation. Mechanisms of rejection reactions.

Antitumor immunity. Tumor-specific antigens. Antitumor immune therapy.

Assessment criteria (assessment tool — Report-presentation)

Grade	Assessment criteria
pass	The level of knowledge in the volume corresponding to the training program. Several gross mistakes were made.
fail	The level of knowledge is below the minimum requirements. There were gross mistakes.

5.1.3 Model assignments (assessment tool - Colloquium) to assess the development of the competency OIK-8:

1. Monocytes/macrophages, functions, receptors, phagosomes, lysosomes, participation in innate and adaptive immunity..
2. Activation of macrophages. Tissue macrophages.
3. Neutrophils as a factor of natural resistance of the body. Maturation of neutrophils.
4. The way neutrophils migrate through the body.
5. Neutrophil receptors, mechanisms of recognition and destruction of foreign objects.
6. Phagocytosis. Cells with phagocytic activity. Stages of phagocytosis.
7. Oxygen is an independent phagocyte protection factor. Respiratory explosion. Respiratory explosion products and their properties.
8. Proteins of the complement system. Molecular mechanisms of activation of the complement system.
9. Early and late stages of complement activation. Complement components as inflammatory mediators. A membrane-attacking complex.
10. The classic way of complement activation. 11. An alternative way to activate complement.
12. The lectin activation pathway. The role of complement in pathogen elimination.
13. The origin of skin cells. Signs of multipotent stromal cells. The main functions of multipotent stromal skin cells.
14. Realization of immune reactions in the skin.
15. Fibroblasts. Classifications of fibroblasts. Characteristics and functions of dermal fibroblasts of the skin.
16. Immunophenotypic characteristics of fibroblasts. Extracellular matrix components synthesized by human dermal fibroblasts.
17. Biosynthetic potential of fibroblasts. The use of fibroblasts in regenerative medicine.

5.1.4 Model assignments (assessment tool - Colloquium) to assess the development of the competency ОПК-9:

Peripheral organs of the immune system. Lymph nodes. The main functions of the lymph nodes.

The spleen. The main functions. Lymphoid tissue associated with mucous membranes. Functions.

What is an antigen? Modern extended definition of antigen. The main properties of the antigen. What is antigen foreignness?

What is the immunogenicity of an antigen? What is antigen specificity? Complete and incomplete antigens.

Sensitization of the body. Haptens and conjugated antigens. The structure of the antigen. What is an epitope? Recognition of the antigen.

The valence of the antigen. Linear and conformational epitopes. The chemical composition of antigens and immunogenicity.

Types of antigens. Thymus-dependent and thymus-independent antigens. Autoantigens.

Bacterial antigens. What are protective antigens? What is an antibody? Modern definition of antibodies. The structure of immunoglobulin.

What do you know about Fab and Fc fragments of immunoglobulins?

What is a paratope? What do you know about hypervariable sites? The functions of individual sites (domains) of the immunoglobulin molecule. What do you know about heavy chains of immunoglobulins?

What do you know about immunoglobulin light chains?

What are immunoglobulin idiotypes?

Antibody valence. How many classes of immunoglobulins do you know? Characterize class M immunoglobulins.

Name the main functions of IgM and characterize class G immunoglobulins.

Name the main functions of IgG and characterize class A immunoglobulins.

What do you know about secretory ID? Name the main functions of IdA.

Characterize Class E immunoglobulins.

What do you know about Class D immunoglobulins and their functions?.

What do you know about the classification of immunoglobulins by origin? What are natural immunoglobulins?

What are incomplete antibodies?

What are the most important functions of immunoglobulins in the body? Sites of antibody formation.

What do you know about the dynamics of antibody formation?

Name the stages of the primary immune response. Name the stages of the secondary immune response. What is immunological memory?

What is immunological tolerance?

The mechanism of antigen-antibody interaction. Features of the antigen-antibody reaction. Characteristics of precipitation and agglutination reactions. What are monoclonal antibodies?

Assessment criteria (assessment tool — Colloquium)

Grade	Assessment criteria
outstanding	A high level of training, impeccable command of theoretical material, the student demonstrates a creative approach to solving non-standard situations. The student gave a complete and detailed answer to all the theoretical questions of the ticket, confirming the theoretical material with practical examples. The student actively worked in practical classes. 100% completion of control exam tasks.
excellent	High level of training with minor mistakes. The student gave a complete and detailed answer to all the theoretical questions of the ticket, confirms the theoretical material with practical examples. The student actively worked in practical classes. Completion of control exam tasks by 90% and above.
very good	Good preparation. The student gives an answer to all the theoretical questions of the ticket, but there are inaccuracies in the definitions of concepts, processes, etc. The student actively worked in practical classes. Completion of control exam tasks from 80 to 90%.
good	In general, good preparation with noticeable mistakes or shortcomings. The student gives a complete answer to all theoretical questions of the ticket, but there are inaccuracies in the definitions of concepts, processes, etc. Mistakes are made when answering additional and clarifying questions from the examiner. The student worked in practical classes. Completion of control exam tasks from 70 to 80%.
satisfactory	Minimum sufficient level of training. The student shows a minimum level of theoretical knowledge, makes significant mistakes, but when answering leading questions, he can orient himself correctly and give the correct answer in general terms. The student attended practical classes. Completion of control exam tasks from 50 to 70%.
unsatisfactory	The preparation is insufficient and requires additional study of the material. The student gives erroneous answers, both to the theoretical questions of the ticket, and to the leading and additional questions of the examiner. The student missed most of the practical classes. Completion of control exam tasks up to 50%.
poor	The preparation is absolutely insufficient. The student does not answer the questions posed. The student was absent from most lectures and practical classes. The completion of control

Grade	Assessment criteria
	exam tasks is less than 20%.

5.1.5 Model assignments (assessment tool - Test) to assess the development of the competency OIK-8:

1. Which receptor recognizes antigens in combination with molecules of the main histocompatibility complex?

B-cell receptor

Fc receptor

The T-cell receptor

Toll-like receptors

2. Who developed the clonal-breeding theory of immunity?

Melvin Cohn

Rolf Zur hausen

Charles Janeway

Frank Burnett

3. What is an epitope?

Fragment of the antigen

Part of the pathogen

The complement component

The adhesion molecule

5.1.6 Model assignments (assessment tool - Test) to assess the development of the competency OIK-9:

4. Pathogen-associated molecular patterns are recognized:

Antibodies

Receptors of innate immune cells

Proteins of the complement system

T-cell receptors

5. Which cells are involved in adaptive immunity?

Neutrophils

Macrophages

Eosinophils

Lymphocytes

Assessment criteria (assessment tool — Test)

Grade	Assessment criteria
pass	more than 70% of the correct answers
fail	less than 70% of the correct answers

5.2. Description of scales for assessing learning outcomes in the discipline during interim certification

Шкала оценивания сформированности компетенций

Уровень сформированности компетенций (индикатора достижения компетенций)	плохо	неудовлетворительно	удовлетворительно	хорошо	очень хорошо	отлично	превосходно
	не зачтено		зачтено				
<u>Знания</u>	Отсутствие знаний теоретического материала. Невозможность оценить полноту знаний вследствие отказа обучающегося от ответа	Уровень знаний ниже минимальных требований. Имели место грубые ошибки	Минимально допустимый уровень знаний. Допущено много негрубых ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Допущено несколько негрубых ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Допущено несколько несущественных ошибок	Уровень знаний в объеме, соответствующем программе подготовки. Ошибок нет.	Уровень знаний в объеме, превышающем программу подготовки.
<u>Умения</u>	Отсутствие минимальных умений. Невозможность оценить наличие умений вследствие отказа обучающегося от ответа	При решении стандартных задач не продемонстрированы основные умения. Имели место грубые ошибки	Продemonстрированы основные умения. Решены типовые задачи с негрубыми ошибками. Выполнены все задания, но не в	Продemonстрированы все основные умения. Решены все основные задачи с негрубыми ошибками. Выполнены все задания в полном	Продemonстрированы все основные умения. Решены все основные задачи. Выполнены все задания в полном объеме, но некоторые	Продemonстрированы все основные умения. Решены все основные задачи с отдельными несущественными	Продemonстрированы все основные умения. Решены все основные задачи. Выполнены все задания, в полном объеме без недочетов

			полном объеме	объеме, но некоторые с недочетами	с недочетами	недочетам и, выполнены все задания в полном объеме	
<u>Навыки</u>	Отсутствие базовых навыков. Невозможность оценить наличие навыков вследствие отказа обучающегося от ответа	При решении стандартных задач не продемонстрированы базовые навыки. Имели место грубые ошибки	Имеется минимальный набор навыков для решения стандартных задач с некоторым и недочетами	Продемонстрированы базовые навыки при решении стандартных задач с некоторым и недочетами	Продемонстрированы базовые навыки при решении стандартных задач без ошибок и недочетов	Продемонстрированы навыки при решении нестандартных задач без ошибок и недочетов	Продемонстрирован творческий подход к решению нестандартных задач

Scale of assessment for interim certification

Grade		Assessment criteria
pass	outstanding	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "outstanding", the knowledge and skills for the relevant competencies have been demonstrated at a level higher than the one set out in the programme.
	excellent	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "excellent",
	very good	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "very good",
	good	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "good",
	satisfactory	All the competencies (parts of competencies) to be developed within the discipline have been developed at a level no lower than "satisfactory", with at least one competency developed at the "satisfactory" level.
fail	unsatisfactory	At least one competency has been developed at the "unsatisfactory" level.
	poor	At least one competency has been developed at the "poor" level.

5.3 Model control assignments or other materials required to assess learning outcomes during the interim certification with the criteria for their assessment:

5.3.1 Model assignments (assessment tool - Control questions) to assess the development of the competency ОПК-8

1. Types of antigens. Thymus-dependent and thymus-independent antigens. Complete and incomplete antigens.
2. General principles of innate immunity. Molecular patterns and their receptors.

3. The structure of the antigen. Autoantigens. Bacterial antigens. Protective antigens. 4. General principles of adaptive immunity. Burnet's clonal selection theory. 5. Antibodies. Modern definition of antibodies. The structure of immunoglobulin.

6. The relationship between innate and adaptive immunity. Features of innate and adaptive immunity.

7. Fab and Fc fragments of immunoglobulins. Functions. 8. Monocytes/macrophages, functions, macrophage receptors.

Phagosomes and lysosomes of macrophages, their role in innate and adaptive immunity. 9. Paratope. Hypervariable antibody sites.

10. Activation of macrophages. Tissue macrophages.

11. Functions of individual sites (domains) of the immunoglobulin molecule. Characterization of heavy and light chains of immunoglobulins.

12. Neutrophils as one of the main factors of the body's natural resistance. 13. Idiotypes of immunoglobulins. The valence of antibodies. Classes of immunoglobulins.

14. Neutrophil receptors, mechanisms of recognition and destruction of foreign objects.

5.3.2 Model assignments (assessment tool - Control questions) to assess the development of the competency ОПК-9

The primary (central) organs of the immune system. The role of red bone marrow in the immune system.

The main stages of the development of an adaptive immune response.

The functioning of the thymus in the body. The initial stages of differentiation of T lymphocytes. The stages of induction of the immune response. The main professional cells of the immune system. Positive and negative selection of T lymphocytes.

Contacts between developing thymocytes and thymus epithelial cells.

The stages of realization of the immune response. The main humoral factors of the immune system. Peripheral organs of the immune system. The main functions.

Lymph nodes. The spleen. Lymphoid tissue associated with mucous membranes. Functions.

Cells and structures capable of recognizing the antigen.

The role of T lymphocytes in the cellular and humoral immune response to Antigen. Modern extended definition of antigen.

The main properties of the antigen. The epitope. Recognition of the antigen. The valence of the antigen. Linear and conformational antigens.

The mechanism of the immune response. Thymus-dependent and thymus-independent immune response.

Sensitization of the body. Haptens and conjugated antigens. The chemical composition of antigens and immunogenicity.

Assessment criteria (assessment tool — Control questions)

Grade	Assessment criteria
outstanding	A high level of training, impeccable command of theoretical material, the student demonstrates a creative approach to solving non-standard situations. The student gave a complete and detailed answer to all the theoretical questions of the ticket, confirming the theoretical material with practical examples. The student actively worked in practical classes. 100% completion of control exam tasks.
excellent	High level of training with minor mistakes. The student gave a complete and detailed answer to all the theoretical questions of the ticket, confirms the theoretical material with practical examples. The student actively worked in practical classes. Completion of control exam tasks by 90% and above.
very good	Good preparation. The student gives an answer to all the theoretical questions of the ticket, but there are inaccuracies in the definitions of concepts, processes, etc. The student actively worked in practical classes. Completion of control exam tasks from 80 to 90%.
good	In general, good preparation with noticeable mistakes or shortcomings. The student gives a complete answer to all theoretical questions of the ticket, but there are inaccuracies in the definitions of concepts, processes, etc. Mistakes are made when answering additional and clarifying questions from the examiner. The student worked in practical classes. Completion of control exam tasks from 70 to 80%.
satisfactory	Minimum sufficient level of training. The student shows a minimum level of theoretical knowledge, makes significant mistakes, but when answering leading questions, he can orient himself correctly and give the correct answer in general terms. The student attended practical classes. Completion of control exam tasks from 50 to 70%.
unsatisfactory	The preparation is insufficient and requires additional study of the material. The student gives erroneous answers, both to the theoretical questions of the ticket, and to the leading and additional questions of the examiner. The student missed most of the practical classes. Completion of control exam tasks up to 50%.
poor	The preparation is absolutely insufficient. The student does not answer the questions posed. The student was absent from most lectures and practical classes. The completion of control exam tasks is less than 20%.

6. Учебно-методическое и информационное обеспечение дисциплины (модуля)

Основная литература:

1. Дьячкова С. Я. Иммунология / Дьячкова С. Я. - 3-е изд., стер. - Санкт-Петербург : Лань, 2022. - 168 с. - Книга из коллекции Лань - Медицина. - ISBN 978-5-8114-9986-1.,

<https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=799283&idb=0>.

2. Зверев В.В. Медицинская микробиология, вирусология и иммунология : Т. 2 : учебник / Зверев В.В.; Бойченко М.Н. - Москва : ГЭОТАР-Медиа, 2022. - 472 с. - ISBN 978-5-9704-7100-5., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=809550&idb=0>.

Дополнительная литература:

1. ИММУНОЛОГИЯ № 6, 2020. Том 41 : научный журнал. - Москва : ГЭОТАР-Медиа, 2020. - . - ISBN J2022-IMM-2020-06., <https://e-lib.unn.ru/MegaPro/UserEntry?Action=FindDocs&ids=838457&idb=0>.

Программное обеспечение и Интернет-ресурсы (в соответствии с содержанием дисциплины):

ЭБС «Юрайт». Режим доступа: <http://biblio-online.ru>.

ЭБС «Консультант студента». Режим доступа: <http://www.studentlibrary.ru>.

ЭБС «Лань». Режим доступа: <http://e.lanbook.com/>.

ЭБС «Znaniyum.com». Режим доступа: www.znaniyum.com.

7. Материально-техническое обеспечение дисциплины (модуля)

Учебные аудитории для проведения учебных занятий, предусмотренных образовательной программой, оснащены мультимедийным оборудованием (проектор, экран), техническими средствами обучения.

Помещения для самостоятельной работы обучающихся оснащены компьютерной техникой с возможностью подключения к сети "Интернет" и обеспечены доступом в электронную информационно-образовательную среду.

Программа составлена в соответствии с требованиями ФГОС ВО по направлению подготовки/специальности 31.05.03 - Dentistry.

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