VOLGOGRAD STATE MEDICAL UNIVERSITY

DEPARTMENT OF PHARMACOLOGY AND BIOINFORMATICS

Methodological recommendations for students for practical classes
«Immunobiological and gene therapy drugs»

Thematic block: **Immunobiological drugs**

Class topic:

Toxoid and split vaccines. Subunit vaccines – polysaccharide, conjugate, protein-based, recombinant or pathogen-based vaccines. Advantages and disadvantages of these groups of immunobiological drugs.

Pharmaceutical faculty

1. Class aims

• learn to analyze the action of immunobiological drugs (vaccines) based on their pharmacological properties, mechanisms and localization of action;

• learn the general principles of the immunological basis of vaccination;

• learn to evaluate the effectiveness of split vaccines, subunit and recombinant vaccines. Advantages and disadvantages of these groups of immunobiological drugs, depending on their type and method of application;

• learn to evaluate the advantages and disadvantages of this group of immunobiological drugs;

• become familiar with the need to conduct educational work with the population on issues of vaccination - as a significant factor in the fight against infectious diseases

2. TASKS

• For split vaccines, subunit and recombinant vaccines, study:

– *classification and composition;*

– *advantages and disadvantages of these groups of immunobiological drugs;*

– *main mechanisms of action and application in medicine of second, third generation vaccines and genetically engineered vaccines.*

• Study the features of development and production of the studied group of vaccines.

• Study the main terms and definitions used in the process of creating vaccines.

• Study the general requirements for the production, transportation and storage of vaccines.

3. THE FOLLOWING PRACTICAL SKILLS AND ABILITIES ARE PRACTISED IN THE CLASS

• ability to classify vaccines based on their mechanism of action and methods of application;

• ability to analyze the possibilities of using vaccines based on the type of vaccine and source of antigen, the speed of the immune response;

• ability to analyze the advantages and disadvantages of subunit, genetically engineered and split vaccines.

4 Class timetable:

Venue: classroom of the Department of Pharmacology and Bioinformatics.
Time of event: part 1 –2 AH

Formed competencies: УК-1.1.3, УК-1.2.1, УК-1.2.2, УК-1.2.3., УК-1.3.1, УК-1.3.2., УК-6.1.1., УК-6.2.1, УК-6.2.2, УК-6.3.1, УК-6.3.2, УК-6.3.3, УК-6.3.4, ОПК-1.1.1., ОПК-1.2.1, ОПК-1.2.2., ОПК-1.3.1, ОПК-6.1.1, ОПК-6.2.1, ОПК-6.3.1, ПК-7.1.1, ПК-7.2.1, ПК-7.3.1.

4.1 Technological map of the lesson

Part	№	Class stage	Time
1	1	Checking the students present at the lesson, lesson mode, lesson topic.	5 min
	2	Checking the initial level of students' knowledge (written survey).	10 min
	3	Survey on the topic of the lesson.	45 min
	4	Independent work of students (on prescriptions with analysis of the most complex prescriptions (if any in the topic), analysis of errors in medical prescriptions written by students; work with synonyms).	15 min
	5	Checking independent work	5 min
	6	Summing up the lesson. Assignment for the next lesson.	5 min
	7	Cleaning of workplaces.	5 min

4.2 Demonstrations

1. Demonstration of advertising brochures on this topic during a survey on the topic of the lesson.

4.3 Lesson plan

4.3.1 The lesson begins with an introductory speech by the teacher, a statement of the purpose of the lesson and answers to students' questions.

The importance of the topic in the system of training and activities of a pharmacist:

- *informing the population on vaccination issues in accordance with the National Vaccination Calendar;*
- *drawing the attention of pharmacists to the prohibition of dispensing medicinal products by pharmacies (clause 5, 6 of the RF Government Resolution of 22.12.2011 No. 1081 "On licensing pharmaceutical activities")*

4.3.2 Checking the initial level of knowledge (written survey).

4.3.3 Analysis of theoretical material

Plan for analyzing theoretical material

1 Vaccines:

- *classification;*
- *general characteristics of live (attenuated), killed (inactivated), adjuvant vaccines;*
- *composition of first-generation vaccines;*
- *features of the immune response when using first-generation vaccines.*

2 Split vaccines:

the main methodology used in the production of split vaccines, differences in composition

Split vaccines (split) consist of microorganism antigens obtained mainly by chemical methods. They contain: a mixture of various organic compounds or complexes consisting of proteins, polysaccharides and lipids. In some cases, ribosomal fractions of microbes are used. Viral split vaccines are made from destroyed viruses. The main principle of production is the isolation of protective antigens and their purification from ballast substances. Such vaccines are characterized by weak reactogenicity, can be administered repeatedly and in large doses.

- *advantage of using split vaccines;*
- *requirements for storage and transportation of split vaccines.*

3 Subunit vaccines:

– *polysaccharide vaccines, conjugate vaccines and protein-based vaccines. Main technique used in the production of subunit vaccines*

Subunit vaccines consist of fragments of an antigen that are capable of providing an adequate immune response. These vaccines can be presented as microbial particles or produced in the laborato-

ry using genetic engineering technology. Examples of subunit vaccines that use bacterial fragments are vaccines against Streptococcus pneumoniae and meningococcus type A. Subunit viral vaccines contain fragmented and purified particles, including surface proteins and other components of viruses. This group includes vaccines against influenza.

– *advantages of subunit vaccines:* - the purified immunogenic protein is stable - safe (in comparison with the pathogenic microorganism) - its chemical properties are known - it does not contain additional proteins and nucleic acids that could cause undesirable biological effects in the host organism (allergy)

4 Genetically engineered vaccines

– *recombinant vaccines - as a new generation of immune preparations;*

– *obtaining recombinant vaccines*

The main way is the integration of the pathogen's genetic material into the genome of other microorganisms: yeast cells, viruses, bacteria, plants. After cultivation, the finished synthesized antigen is isolated, purified, and the active substance is prepared. An example of a recombinant vaccine consisting of a finished antigen is the hepatitis B vaccine (Re-combivax HB, etc.).

- *options for creating genetically engineered vaccines* (introduction of virulence genes into avirulent or weakly virulent microorganisms; introduction of virulence genes into unrelated microorganisms with subsequent isolation of Ag and its use as an immunogen; artificial removal of virulence genes and use of modified organisms in the form of corpuscular vaccines).

5 Prospects for the use of nucleic acids *for immunoprophylaxis of infections caused by intracellular parasites (viruses, malaria plasmodium or tuberculosis pathogens).*

4.3.4 Independent work:

1. Conduct a search and write down the names of second-generation vaccines: split vaccines, subunit and recombinant vaccines.
2. Fill in the table of the National Immunization Calendar in the Russian Federation for diseases prevented by second- and third-generation vaccines. The information is entered into students' workbooks.
3. Working with advertising brochures of medicines on this topic.

4.3.5 Checking the completion of independent work.

4.3.6 Summing up the lesson. Answers to questions.

4.3.7 Concluding remarks by the teacher.

Compiled by,
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