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КАФЕДРА ЭПИДЕМИОЛОГИИ

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АЭРОЗОЛЬНЫЕ ИНФЕКЦИИ

AEROSOL INFECTIONS

Учебно-методическое пособие

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Описываются особенности этиологии, факторы, механизм развития и проявления эпидемического процесса аэрозольных инфекций. Рассматриваются основные направления профилактики и противоэпидемические мероприятия, проводимые при выявлении лиц, инфицированных возбудителями аэрозольных инфекций вирусной и бактериальной этиологии.

Предназначено для студентов 3-го курса медицинского факультета иностранных учащихся, обучающихся по специальностям «Лечебное дело» и «Стоматология» на английском языке.

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MOTIVATIONAL CHARACTERISTICS OF THE TOPIC

Total time of classes: 2 academic hours.

Respiratory infectious diseases can cause public health emergencies, threatening human well-being, social operation, and economic development. Knowledge the transmission mechanism and preventive measures of aerosol infections is essential for control measures.

Respiratory infections spread easily between people. That is why they are among the most widespread. Airborne transmission of infectious pathogens can occur in a wide variety of conditions, including occupational conditions. The risk associated with exposure to infectious aerosols or droplet nuclei depends in part on the characteristics of the source, pathogen, and aerosol droplets, as well as the host's susceptibility.

The assimilation by students of information on the epidemiological characteristics of pathogens of aerosol infections (influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox), the study of the mechanism of development and manifestations of the epidemic process of these infections will allow them to purposefully search for the source of infection, transmission factors, determine the boundaries of the epidemic focus and the time of its existence, navigate the activity of the epidemic process, plan anti-epidemic measures in a specific epidemic situation taking into account the activity of the transmission mechanism and the susceptibility of the contingents, those who were in communication with the identified source of infection.

The aim of the lesson: to learn the scientific and organizational foundations of epidemiological surveillance of aerosol infections in accordance with their epidemiological characteristics, the potential effectiveness of preventive measures and anti-epidemic measures in the focus of infection.

The tasks of the lesson:

1. To study:

– epidemiological characteristics of pathogens of aerosol infections (influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox);

– factors, mechanism of development and manifestations of the epidemic process of aerosol infections (influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox);

– directions for the prevention of aerosol infections;

– the content and potential effectiveness of anti-epidemic measures in foci of aerosol infections.

2. Familiarize with the requirements of regulatory documents regulating the procedure for anti-epidemic measures in the foci of aerosol infections in the Republic of Belarus.

3. To learn how to apply theoretical knowledge to draw up a plan of anti-epidemic measures in foci, the selection of effective preventive measures against aerosol infections.

Requirements for the initial level of knowledge. To successfully master the topic, the student needs to know from the course of microbiology, virology and immunology: morphology and characteristics of the causative agents of influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox, their resistance in the external environment, their effect on the human body, postinfectious immunity, laboratory research methods.

Control questions from related disciplines:

1. Describe morphology and characteristics of pathogens of aerosol infections (influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox).
2. Describe the resistance of these pathogens to environmental factors.
3. List the methods of laboratory diagnosis of bacterial and viral aerosol infections.
4. Define the notion of «immunity». Describe the notion of «postinfectious immunity».

Control questions on the topic of the lesson:

1. Give a general epidemiological description of aerosol infections, name their role in human infectious pathology.
2. Formulate the definition of the disease for each nosological form (influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox).
3. Describe the etiology and epidemiological features of the causative agents of influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox.
4. Name the sources of infection of influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox; describe their epidemiological features.
5. Describe the susceptibility of children and adults to aerosol infections, as well as post-infectious immunity.
6. Describe the main clinical manifestations for each nosological form (influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox).
7. Specify the methods used for laboratory diagnosis of these infections.

8. Name the manifestations of the epidemic process for influenza, acute respiratory infections, whooping cough, group A respiratory streptococcal infection, meningococcal infection, measles, rubella, mumps, chickenpox.

9. Describe the nonspecific prevention of aerosol infections.

10. Describe the specific prevention of influenza, whooping cough, meningococcal infection, measles, rubella, mumps and chickenpox.

11. Name and characterize anti-epidemic measures in the focus of aerosol infection aimed at the source of infection.

12. Name and characterize anti-epidemic measures in the focus of aerosol infection aimed at the mechanism of transmission of the pathogen.

13. Name and describe anti-epidemic measures in the focus of aerosol infection aimed at people who have communicated with the source of infection.

EPIDEMIOLOGICAL CHARACTERISTICS OF AEROSOL INFECTIONS

Aerosol infections are a group of human infectious diseases characterized by the penetration of the pathogen into the body through the respiratory tract, the predominant localization of the pathogen in the respiratory tract, leading respiratory tract damage syndromes and general infectious intoxication.

Aerosol infections are widespread and have a wide range of pathogens. They are characterized by high rates of morbidity in the population. Aerosol infections are one of the leading causes of death in the world, particularly among children under the age of five. Up to 80 % of the world's population suffers from respiratory infections every year. Acute respiratory infections account for more than 90 % of all diseases of the respiratory system in children. About 10 % of the world's population gets sick during annual seasonal flu epidemics, and up to 50 % during pandemics. More than 80 % of doctors' home calls are for seasonal acute respiratory infections. High epidemic potential of aerosol infection pathogens to cause epidemic outbreaks, epidemics and pandemics. Aerosol infections are characterized by periodicity and seasonality. Over the past 20–30 years, the clinical and epidemiological manifestations of aerosol anthroponoses have changed, new, previously unknown and poorly studied infectious agents have appeared: coronaviruses (SARS-CoV, MERS-CoV, SARS-CoV-2), Metapneumoviruses, Bocaviruses, Moraxella catarrhalis, etc.).

Risk factors for aerosol infections:

– living in populated areas with high population size and density;

– air pollution of populated areas;

– stay in organized groups and organizations with round-the-clock type of stay;

– being in rooms with unsatisfactory sanitary and hygienic conditions;

– centralized ventilation and air conditioning systems increase the risk of spreading aerosol infections over the height of buildings, especially in multi-storey residential complexes;

– chronic lung diseases, diabetes mellitus, HIV infection, allergopathology, immunosuppression, thoracic surgery;

– hypothermia, smoking, stressful conditions;

– low level of sanitary culture and lack of conditions for observing the rules of personal hygiene;

– the influence of natural factors (landscape, temperature, humidity, intensity of ultraviolet radiation).

CLASSIFICATION OF AEROSOL INFECTIONS

There are several approaches to classifying aerosol infections. The classification of aerosol infections by etiological factor and localization of the pathological process is of practical importance in epidemiology (Table 1, 2).

Table 1

Classification of aerosol infections by etiological factor

Groups of infectious diseases	Nosological forms
Bacterial	Diphtheria, scarlet fever, meningococcal infection, streptococcal infection, whooping cough, parapertussis, pneumococcal infection, hemophilic infection type B, tuberculosis of the respiratory system, respiratory chlamydia mycoplasma respiratory infection
Viral	Measles, rubella, parvovirus infection, mumps, chickenpox, infectious mononucleosis, influenza, coronavirus infection. Acute respiratory viral infections (parainfluenza, rhinovirus infection, adenovirus infection, respiratory syncytial virus infection, metapneumovirus infection, bocavirus infection, reovirus infection)
Infections caused by pathogenic fungi and protozoa	Pneumocystis pneumonia, aspergillosis, histoplasmosis, coccidiosis

Table 2

Classification of acute respiratory infections according to the principle of localization of the pathological process

Groups of infectious diseases	Clinical forms
Acute respiratory infections of the upper respiratory tract	Pharyngitis, laryngitis, rhinopharyngitis + rhinitis, sinusitis, tonsillitis, tracheitis
Acute respiratory infections of the lower respiratory tract	Bronchitis, bronchiolitis, pneumonia

INFLUENZA (FLU)

Influenza is an acute infectious disease characterized by damage to the respiratory tract (mainly the trachea) and manifested by intoxication, catarrhal and hemorrhagic (less often) syndromes.

Etiology and epidemiological characteristics of the pathogen. The causative agent is an RNA-containing virus of the genus Influenzavirus of the Orthomyxoviridae family. Internal proteins surrounding RNAs make up the structurally stable internal S-antigen. Three types of S-antigen are known and, accordingly, three types of influenza viruses are differentiated: A, B, C. The vast majority of influenza epidemics and pandemics are caused by viruses belonging to type A. Three proteins, which are surface antigens, are embedded in the shell of influenza viruses (lipid membrane):

1) hemagglutinin — ensures the attachment of the virus to the cell;

2) neuraminidase — ensures virus penetration into the cell;

3) ion channel (M2 protein) — plays a major role in the infectious process.

Differences in hemagglutinin and neuraminidase form the basis for the classification and division of influenza A viruses into sub-clusters — H1N1, H3N2, H2N2, etc.

Hemagglutinin and neuraminidase play an important role in the formation of the human body's immune response to influenza. A feature of influenza viruses is their ability to antigenic variability. It can be implemented by drift (partial variability of antigenic determinants) or shift (complete substitution a fragment of the genome encoding the synthesis of hemagglutinin or neuraminidase). The most common drift occurs in influenza virus type A, but it also occurs in type B. An antigenic shift is a specific feature of the influenza virus type A, leading to the appearance of its new subcovars. The high variability of influenza viruses explains the unpredictability of disease epidemics.

Influenza viruses are poorly resistant to physical and chemical factors and die within a few hours at room temperature. The pathogen is quite resistant to low temperatures (at –70 °C it remains viable for several years). Heating, drying, and the usual concentrations of disinfectants have a detrimental effect on influenza viruses.

The source of infection. The source of the infection is a sick person. The epidemic risk of a person infected with the influenza virus is determined by two factors: the amount of virus in the mucus of the upper respiratory tract and the severity of catarrhal syndrome. The infecting dose of the virus is contained in 0.0001 ml of nasopharyngeal mucus. During the incubation period, influenza viruses are isolated in isolated cases due to the absence of catarrhal syndrome. At the height of the disease, viruses are released quite intensively. Virus isolation is also possible during the convalescence period after temperature normalization,

this is ensured by the presence of residual catarrhal phenomena in the respiratory tract. The maximum contagiousness of flu patients is noted in the first 5–6 days of the disease. After day 7, most patients are not contagious.

The transmission mechanism. Influenza viruses are transmitted by an aerosol transmission mechanism. The transmission mechanism is realized as a result of the continuous natural act of inhaling and exhaling. During exhalation, sneezing and talking, pathogens mainly enter the mucus droplets from the upper respiratory tract (mucous membranes of the mouth, nose and nasopharynx) of the patient. When coughing, viruses from deeper parts of the respiratory tract are released into the air along with mucus. Aerosol particles larger than 100 microns (large droplet phase) spread to a distance of 1–2 m from the patient and settle quickly. Therefore, they become infected with influenza viruses mainly in closed rooms with direct contact with the patient. In most cases, they become infected during the cold season, when people's communication changes and they spend most of their time indoors.

Sensitivity and immunity. People's natural susceptibility is high, but it has individual characteristics. The susceptibility to new sub-strains of the influenza virus is particularly pronounced. In children who are on natural feeding, maternal anti-influenza antibodies are detected within 9–10 months, and in those on artificial feeding — only 2–3 months. Post-infectious immunity in influenza caused by type A virus lasts 1–3 years, and type B virus lasts 3–4 years. Developing cellular immunological memory, especially after repeated contact with one or another subcutaneous influenza virus, it persists for a long time.

The main clinical manifestations. The incubation period is 12–48 hours. The disease begins acutely. During the first day, the body temperature reaches 38–40 °C. There are phenomena of general intoxication and symptoms of damage to the respiratory tract. There is general weakness, weakness, adynamia, excessive sweating, muscle pain, severe headache with a characteristic localization in the frontal region and brow ridges. There is pain in the eyeballs, which increases with eye movement or pressure on them. The flu is often accompanied by complications caused by both the virus itself and the secondary infection. These include pneumonia, tracheobronchitis, otitis media, meningoencephalitis, sinusitis, and frontitis.

Laboratory diagnostics. Virological, luminescent microscopic and serological methods are used to confirm the diagnosis of influenza. The influenza virus can be isolated from the nasopharyngeal mucus within 3 days after the onset of the disease. Rapid diagnosis of influenza is based on the detection of viral antigens in the cells of the cylindrical epithelium of the upper respiratory tract by immunofluorescence and enzyme immunoassays. Serological studies are designed to detect specific antibodies in paired sera taken at intervals of 10–14 days. An increase in the number of antibodies by 4 times or more has

a reliable diagnostic value. The complement binding reaction reveals differences between the antigens and makes it possible to determine the type of virus (A, B, C). The hemagglutination inhibition reaction is used to identify differences between surface antigens and, thus, to determine the subserovars of the influenza A virus. Recently, the polymerase chain reaction method has been widely used, which is the most accurate for diagnosis and serotyping of influenza viruses

Manifestations of the epidemic process. Influenza refers to diseases that are widespread. The epidemic process of influenza is manifested by sporadic cases, seasonal increases in morbidity, epidemics and pandemics. Flu epidemics usually involve a large number of people in one country. Epidemics develop, as a rule, in autumn and winter in the Northern Hemisphere, and in spring and summer in the Southern Hemisphere. The duration of the epidemic is 1–3 months, after which the virus disappears from the human population. In flu pandemics, the population is involved in the epidemic process. a number of countries, continents, or the entire globe. Diseases during a pandemic are caused by new subcovars of the influenza virus, to which the vast majority of the population is susceptible. The virus spreads at a very high rate and causes the disease in a very severe form. The risk groups for influenza infection and illness are children, the elderly, and people suffering from chronic diseases of the cardiovascular and pulmonary systems. In cities, the incidence of influenza is significantly higher than among rural residents.

Prevention. The system of preventive measures for influenza includes three components: vaccination, the use of special drugs, basic measures.

Vaccination is an essential component of the flu prevention system. Inactivated influenza vaccines are used. Influenza vaccines include 3 types of viral antigens — type 2 A and type 1 B. Annually, based on the results of monitoring the antigenic structure of influenza viruses circulating among humans, experts from the World Health organizations provide recommendations to vaccine manufacturers on the antigenic composition of influenza vaccines for the upcoming epidemic season. In the Republic of Belarus, vaccination against influenza is included in national calendar of preventive vaccinations. Vaccination is recommended for all persons over the age of 6 months.

ACUTE RESPIRATORY INFECTIONS

Acute respiratory infections are an etiologically diverse group of infectious diseases characterized by inflammation of the mucous membranes of the respiratory tract with hyperproduction of secretions, intoxication and manifested by fever, cough, runny nose, as well as symptoms of damage to the respiratory tract at different levels.

Etiology and epidemiological characteristics of the pathogen. Acute respiratory infections are caused by a large number of pathogens — taking into account individual serovars, there are about 300. A significant part of the microbial flora is constantly vegetating in the upper respiratory tract, causing disease when it enters deeper parts of them or when infected with a new type of pathogen for humans. The main causative agents of ARI are various viruses. The second group of ARI pathogens consists of bacteria, including atypical ones (mycoplasmas, chlamydia), fungi (Candida albicans Pneumocysta jurovici (carinii). Viruses are the causative agents of acute respiratory viral infections. The total number of viruses and their serovars that cause acute respiratory infections reaches 180, and they account for 95 % of all cases of acute respiratory tract infections. The main causative agents of acute respiratory viral infections are respiratory syncytial virus, adenoviruses, rhinoviruses, coronaviruses, enteroviruses, and reoviruses.

The main bacterial pathogens of acute respiratory viral infections are conditionally pathogenic pneumotropic microorganisms that are part of the common flora of the respiratory tract. Streptococcus pyogenes (beta-hemolytic streptococcus group A) is of the greatest importance in acute tonsillitis. Infections of the middle ear and lungs are most often caused by pneumococcus (Streptococcus pneumoniae), S. pyogenes, as well as the capsule-free form of Haemophilus influenzae. With infection of the paranasal sinuses, capsular H. influenzae is released more often than pneumococcus H. influenzae type b colonizes the respiratory tract in 3–5 % of children, being the cause of epiglottitis, meningitis (in 40 % of children under 6 years of age) and pneumonia complicated by pleurisy (about 10 %). S. aureus and Moraxella catarrhalis are significantly inferior in frequency to the above pathogens; their role, however, increases in patients who have recently been treated with antibiotics. The vast majority of these microorganisms produce beta-lactamases and are therefore insensitive to such common drugs as ampicillin and amoxicillin.

The source of infection. The source of infection is a person with a clinically pronounced or erased form. Transmission of the infection occurs by airborne droplets and through contaminated hands or objects containing respiratory viruses.

The transmission mechanism. Pathogens of acute respiratory infections are transmitted by an aerosol transmission mechanism. The transmission mechanism is realized as a result of the continuous natural act of «exhaling». During exhalation, sneezing and talking, pathogens mainly enter the mucus droplets from the upper respiratory tract (mucous membranes of the mouth, nose and nasopharynx) of the patient. When coughing, pathogens from deeper parts of the respiratory tract are released into the air along with mucus. Droplets of mucus «hover» around the patient at a distance of 1–2 m, rarely further. Therefore, in most cases they become infected. pathogens of acute respiratory infections in enclosed spaces in direct contact with the patient. The implementation of the aerosol transmission

mechanism is facilitated by a change in the nature of human communication during the cold season — more frequent stay in enclosed spaces. Household items are of limited importance in the spread of pathogens of acute respiratory infections. First of all, this is due to the low resistance of most pathogens of acute respiratory infections in the external environment. The importance of these transmission factors increases with fresh contamination of household items. secretions of the patient (droplets of sputum, nasopharyngeal mucus), as well as if contaminated objects come into contact with the mucous membranes of susceptible patients (children take toys in their mouths, touch the conjunctiva, oral mucosa, nose with their fingers). The spread of acute respiratory infections is facilitated by close contacts with patients at their place of residence or work, unsatisfactory hygienic condition of housing, crowding, population migration, non-observance of cough and sneezing hygiene by patients, untimely identification and isolation of patients.

Sensitivity and immunity. The human population is extremely diverse in its susceptibility to pathogens of acute respiratory infections. Susceptibility is influenced by age, the state of general resistance, the state of the immune system, the presence of chronic processes, the type of pathogen and its virulence. Postinfectious type-specific immunity in acute respiratory infections of various etiologies has its own characteristics. Respiratory syncytial infection, as a rule, leaves behind a short-lasting immunity, so repeated diseases can occur every 3–5 years and even more often. Relatively stable immunity is developed to adenoviruses and rhinoviruses, but the abundance of their serovars causes repeated cases of diseases. Conditionally pathogenic bacterial pathogens (both in the case of disease and carriage) stimulate the production of immunity, leading to the elimination of this pathogen. However, the abundance of serovars (in pneumococci, staphylococci) or antigenic variability (in capsular hemophilic bacillus) contribute to the re-colonization of the respiratory tract by these species. The disease caused by a new serovar is more severe than when infected with one that a person has already met.

The main clinical manifestations. Almost all pathogens of acute respiratory infections cause clinically similar symptoms — catarrhal symptoms, runny nose and cough with fever. However, many of the pathogens cause more or less characteristic syndromes, which allow us to assume the etiology of an infectious disease with a sufficient degree of probability according to clinical data (see the tables). A unified approach to the detection and registration of cases of acute respiratory diseases is important in the epidemiological surveillance system. To implement this approach the standard definition of acute respiratory infections is used.

Laboratory diagnostics. The following research methods are used in the laboratory diagnosis of acute respiratory infections: serological, virological, microbiological, immunochemical (reaction of immunochromatography and immunofluorescence) and molecular biological (polymerase chain reaction).

Manifestations of the epidemic process. Acute respiratory infections are widespread, characterized by the highest incidence rates and account for more than half of all acute diseases. 30–50 % are associated with acute respiratory infections loss of working hours among adults and 60–80 % of school absences among children. The widespread and high incidence of acute respiratory infections is largely due to the aerosol mechanism of transmission of pathogens, which is the most active in comparison with all other transmission mechanisms. Along with thus, a large number of pathogens of acute respiratory infections (more than 300 variants) and only type-specific (usually short-term) immunity in those who have been ill leads to the fact that a large number of susceptible individuals are always present in the human population. It also contributes to the formation of high rates of acute respiratory diseases.

Acute respiratory infections are generally characterized by the highest incidence in the cold season. Its rise begins in October, peaks in February, and declines by April. An increase in the incidence of acute respiratory viral infections in the cold season is associated with a change in the nature of communication and a more frequent presence of people in enclosed spaces, which contributes to the implementation of the aerosol transmission mechanism.

Prevention. Measures for the prevention of acute respiratory infections include: compliance with sanitary and hygienic standards; limiting population crowding during periods of rising incidence of acute respiratory infections; reducing the use of urban transport for trips (especially with children); prolonging the time spent outdoors; wearing masks by family members with signs of acute respiratory infections; thorough hand washing after contact with a patient with acute respiratory infections or care items; restriction of visits to children's institutions children with recent catarrhal symptoms. Interferons can be used for preventive purposes.

MEASLES

Measles is an acute anthroponotic infectious disease characterized by fever, intoxication, enanthema, the gradual appearance of spotty papular rash, catarrhal rhinitis, laryngitis and conjunctivitis.

Etiology and epidemiological characteristics of the pathogen. The causative agent is an RNA-genomic virus of the genus Morbillivirus of the Paramyxoviridae family. The virion has a spherical shape. The nucleocapsid is surrounded by a shell containing 3 layers — a protein membrane, a lipid layer and external glycoprotein projections. The virus has hemagglutinating, hemolytic, and symplast-forming activity. A characteristic feature is the absence of neuraminidase. There are no differences between the strains in the antigenic structure of the measles virus,

and they all belong to the same serovar. Measles virus is neurotropic, can persist in the human brain, has a mutagenic effect on chromosomes. The measles virus is unstable in the external environment. It does not tolerate drying well, quickly collapses in an acidic environment (pH 2–4), reduces activity at a temperature of 37 °C, inactivates at 56 °C after 30 minutes, but tolerates low temperatures well. The measles virus is sensitive to direct sunlight.

The source of infection. The source of infection is only a sick person in the last 1–2 days of the incubation period, to the maximum extent — in the prodromal (catarrhal) period (3–4 days), and to a much lesser extent in the first 4 days of the rash period. With the development of measles pneumonia, the period of contagiousness is prolonged to 10 days from the moment the rash appears. Cases of asymptomatic measles infection have been described.

The transmission mechanism is aerosol. The transmission route is airborne. Droplets of mucus and exudate released by coughing, sneezing, screaming, crying, talking and containing the measles virus from the patient enter the mucous membranes of the nasopharynx and upper respiratory tract of susceptible people through the air, both in close contact with the patient and with the air currents of neighboring rooms. The measles virus can spread by air currents from one room to another, located not only within one floor, but also on different floors. Due to the low resistance of the virus in the external environment, measles infection through contaminated objects practically does not occur. If a pregnant woman gets measles before giving birth, transplacental infection of the fetus (vertical transmission mechanism) is possible.

Sensitivity and immunity. Children born to immune mothers are immune to measles in the first months of life due to maternal antibodies. Further susceptibility depends on the availability of measles vaccination. The unvaccinated and those who have not previously had measles have almost absolute susceptibility. After an infection, a stable lifelong immunity is developed.

The main clinical manifestations. The incubation period usually lasts 7–17 days, and in individuals who have received immunoglobulin, it is extended to 15–21 days. The catarrhal period is characterized by an acute onset with an increase in body temperature to 38–39 °C, symptoms of intoxication, and the development of serous or serous-purulent inflammation of the upper respiratory tract. A few days before the onset of the rash, measles enanthema appears in the form of small red spots located on the mucous membrane of the soft and hard palate, and Belsky–Filatov–Koplik spots that are pathognomonic for measles. The duration of the catarrhal period is 1–8, more often 3–4 days. The rash period is characterized by the appearance of a copper-red mottled papular exanthema prone to fusion and the stages of the rash: on the first day, the elements appear on the face, on the second — on the trunk, arms and thighs, on the third — on the shins and feet. The rash subsides in the same order: from top to bottom for 3 days. The elements

of the rash take on the appearance of brown, and then brown spots with fine bran-like peeling. Pigmentation persists for 1.5–3 weeks. Measles most often occurs in a moderate form. Measles in adults occurs with severe symptoms of intoxication and more frequent complications. If a woman catches measles during pregnancy, this can result in her baby being born prematurely with a low birth weight.

Laboratory diagnostics. Diagnosis is usually clinical based on acute febrile illness, characteristic rash and/or Belsky–Filatov–Koplik's spots. Laboratory diagnostics of measles includes virological and serological methods. The virological method is based on the isolation of the measles virus from blood, nasopharyngeal flushes, conjunctival secretions and urine. Measles virus can also be isolated by polymerase chain reaction. The serological method makes it possible to detect antibodies to the measles virus of IgM and IgG classes in the blood serum. To confirm the diagnosis, the titer of specific antibodies in paired sera should differ by at least 4 times. Neutralization reactions, complement binding, hemagglutination inhibition, enzyme immunoassay, etc. are used for serological studies.

Manifestations of the epidemic process. In the pre-vaccination period, the spread of measles was widespread, and this infection was one of the main causes of death in young children. Measles is one of the infections subject to regional elimination in accordance with the WHO program. However, an increasing risk of measles being introduced into and spreading through communities has been observed due to increased international travel and decreased vaccination rates, even in countries that have been verified to be measles-free. After the introduction of routine vaccination, the incidence in the Republic of Belarus decreased by 5 times. In the annual dynamics, the peak incidence shifted to the spring months, and the number of cases among school children and adults increased significantly. Measles cases registered in the Republic of Belarus after 2010 are of an imported nature or are associated with infection from imported cases.

Prevention. The WHO has set goals to eliminate measles by 2030 and has identified maintaining and strengthening vaccination rates, strengthening quarantine measures, patient surveillance, public health education, and information sharing through international collaboration as the key strategies. Community-wide vaccination is the most effective way to prevent measles. All children should be vaccinated against measles. The vaccine is safe, effective and inexpensive. Children should receive two doses of the vaccine to ensure they are immune. The first dose is usually given at 9 months of age in countries where measles is common and 12–15 months in other countries. The second dose of the vaccine is most often administered to a child at the age of 6 years. The measles vaccine is given alone or often combined with vaccines for mumps, rubella and/or varicella. The measles vaccine is also used in emergencies to stop outbreaks from spreading.

RUBELLA

Rubella is an acute anthroponotic infection characterized by damage to the lymphatic tissues and epithelium of the skin. It is manifested by generalized lymphadenopathy, a fine-spotted rash, moderate fever and a high risk of fetal damage during the development of the disease in pregnant women.

Etiology and epidemiological characteristics of the pathogen. The causative agent is rubella virus, belonging to the genus Rubivirus, family Togaviridae. The virion of the rubella virus measures about 70 nm in diameter and is a nucleocapsid surrounded by a lipoprotein membrane. The virus genome is represented by single-stranded positive RNA. The rubella virus has a teratogenic effect on the human fetus. The causative agent of rubella is poorly resistant in the external environment. It remains viable for several hours at room temperature. However, it can remain frozen for several years. The virus is easily inactivated by heat, disinfectants, or pH limits. The presence of protein in the medium significantly increases resistance to high temperatures.

The source of infection is a patient in clinically pronounced or asymptomatic forms. In a rubella patient, the release of the virus from the nasopharynx begins 7–10 days before the rash (in 90 % of patients) and lasts about 5–7 days after the onset of the rash. In mild and asymptomatic forms, the source of infection is dangerous to others for no more than 3–4 days. In case of congenital rubella, despite the circulation of antibodies in the child's blood, the virus persists for a long time (more than 2 years) it persists in his body. During all this time, a child with congenital rubella is a source of infection.

The transmission mechanism is aerosol. The transmission route is airborne. The implementation of the transmission mechanism in rubella requires long-term communication with the source of infection. The relatively low contagiousness of rubella is largely due to the low severity of symptoms such as cough and runny nose, which contribute to the transmission of pathogens. Rubella spreads easily where people are in close and repeated contact with each other — in the family, kindergarten, school, hospital, etc. Hands and care items have no epidemic significance. The exception is toys, which can be used to transmit the virus from mouth to mouth by young children. The causative agent of rubella can be transmitted vertically (from mother to fetus), resulting in intrauterine infection of the fetus. Rubella is especially dangerous in the first 15 weeks of pregnancy, when the virus penetrates the placenta and affects the embryonic tissues. As a result, fetal death, miscarriage, or the birth of a child with various, most often severe, pathologies are possible.

Sensitivity and immunity. The susceptibility to rubella is high, especially in childhood. After a disease, intense and lifelong immunity is formed. Acquired passive immunity in the form of maternal antibodies provides protection against

rubella during the first few months of life and may influence the formation of an immune response to rubella vaccination. Currently, immunity to rubella is formed mainly as a result of vaccination against this infection. Serological examinations indicate a large percentage (30 % or more in some countries) of seronegative women of childbearing age, especially those aged 20–29 years.

The main clinical manifestations. The incubation period ranges from 11 to 24 days, with an average of 16–21 days. Rubella disease begins with a slight increase in body temperature, intoxication and mild inflammatory phenomena in the upper respiratory tract. The cold period lasts 1–3 days and is manifested by rhinitis, lacrimation, photophobia, sore throat, and sometimes a dry cough. Intoxication is manifested by malaise, headache, myalgia, decreased appetite. Arthralgias are possible. The lymph nodes, usually occipital, parotid, and posterior cervical, enlarge and become painful on palpation. Lymphadenopathy persists for up to 2–3 weeks, but its absence is also possible. The rubella rash can be spotty and knotty, first it appears on the face, behind the ears, on the scalp and spreads throughout the body within 10–12 hours, and by the time it appears on the body, the rash on the face has already passed. The rashes are localized on the extensor surfaces of the extremities, buttocks and back. Rashes are more rare on other parts of the body, and there is no rash on the soles and palms. The exanthema is observed for no more than 4 days, disappears without a trace. The appearance of enanthema in the form of small single specks is possible on the hard palate and the mucous membrane of the oral cavity. Hepatomegaly and splenomegaly are possible. Body temperature during the period of exanthema is usually normal or subfebrile. In adults, the disease is more severe than in children.

Laboratory diagnostics. Because of the rather nonspecific nature of the illness, a diagnosis of rubella cannot be made on clinical grounds alone. The virus may be isolated from respiratory secretions in the acute phase (and from urine, tissues, and feces in congenitally infected infants) by inoculation into a variety of cell cultures, or detected by polymerase chain reaction. Serologic diagnosis is most commonly used in acquired infections; paired acute and convalescent samples collected 10 to 21 days apart are used. Hemagglutination inhibition, indirect immunofluorescence, EIA, and other tests are available.

Manifestations of the epidemic process. Rubella has a global spread. The long-term dynamics of morbidity shows periodic ups and downs, alternating with intervals from 3–5 to 10–12 years. There is a marked uneven distribution of diseases by seasons. In recent years, there has been a shift in the incidence to an older age: mostly schoolchildren and women of childbearing age are ill. Thanks to the vaccination in the Republic of Belarus in recent years the rubella incidence rates have been less than one case per 100 000 population.

Prevention. Rubella is an infectious disease for which a regional elimination program is being implemented — the elimination of infection in the countries of

the European region. Given the high susceptibility to rubella virus and the aerosol transmission mechanism, vaccination is the basis for the prevention of this infection. There are three principal approaches to the elimination of rubella and congenital rubella syndrome: vaccination of children; vaccination of adolescent girls; vaccination of women of childbearing age who plan to have children. Vaccination of women is very effective in combating congenital rubella syndrome, but it also does not solve the problem of rubella itself. WHO recommends combining all three strategies whenever possible. Currently, in the Republic of Belarus, rubella vaccination has been introduced into the National Vaccination Calendar, and includes 2 doses of the vaccine. According to the results of laboratory control of immunity, groups of people with insufficient immunity are periodically vaccinated against rubella. Pregnant women should avoid contact with rubella patients.

MUMPS

Mumps is an acute anthroponotic infectious disease characterized by intoxication and inflammation of the salivary glands. It is manifested by fever, enlargement of one or more salivary glands, and often symptoms of damage to the central nervous system and other organs.

Etiology and epidemiological characteristics of the pathogen. The causative agent is a virus belonging to the Paramyxovirus genus of the Paramyxoviridae family. Viruses of the Paramyxoviridae family are characterized by a linear genome represented by PHK. The mumps virus has a spherical shape with a diameter of 100–300 nm, a spiral-shaped nucleocapsid, and is covered with a lipoprotein shell with spike-like outgrowths. The antigenic structure of the virus is stable. There is only one known serovar of the virus, which has two antigens: V (viral) and S (soluble).

The virus is unstable and rapidly inactivates under the influence of environmental factors. The virus is sensitive to elevated temperatures: at 56 °C, it loses its infectious properties, hemolytic and hemagglutinating activity within one hour; at 70 °C is completely inactivated within 10 minutes. It tolerates low temperatures much better, at –20 °C it can persist in the environment for up to several weeks. Virus is sensitive to the action of disinfectants and ultraviolet radiation.

The source of infection. The only source of infection in mumps is a person with a manifest, erased, or asymptomatic form of the disease. The period of contagiousness begins with the last days of the incubation period, even before the appearance of symptoms of damage to the salivary glands, and lasts until the end of the inflammatory process in them (up to the 9th–10th day from the onset of the disease). At the same time, the most active release of the virus into the environment

occurs in the first 3–5 days of the disease. In some cases, convalescents may remain contagious for 1–2 weeks of convalescence. Patients with erased or asymptomatic forms of the disease, which are often undiagnosed, are of particular epidemic importance.

The transmission mechanism is aerosol. The transmission routes are airborne and household contact. The pathogen is released when coughing, sneezing, talking in any form of the disease, including asymptomatic. The intensity of virus release into the environment is low due to the absence of catarrhal phenomena. One of the factors accelerating the spread of the mumps virus is the presence of concomitant acute respiratory infections, which increase the release of the pathogen into the environment. Mumps infection can also occur through household items (most often toys, towels) contaminated with the patient's saliva shortly before contact with a healthy person. The infection is facilitated by the closeness and duration of communication, especially in children's organized groups. The vertical mechanism of transmission of the mumps virus from a sick pregnant woman to the fetus is described. If pregnant woman becomes infected with mumps in the first trimester of pregnancy, miscarriage is possible. Mumps disease in later pregnancy does not affect the fetus and does not lead to premature birth.

Sensitivity and immunity. The susceptibility to infection in both children and adults is high and persists throughout life in those who are not ill and have not been vaccinated. Maternal antibodies persist in a child from 6 months to a year. In the future, the sensitivity increases and approaches absolute. Immunity after the disease is long-lasting and persistent, including in people who have suffered erased forms. Recurrent diseases occur in 0,4–2,2 % of cases.

The main clinical manifestations. The incubation period is 11–26 days, usually 15–20 days. The prodromal period is usually short (no more than 1 day): weakness, malaise, muscle pain, headache, fatigue, sleep disorders, and appetite are noted. The disease can occur in both mild and severe form. Depending on this, the body temperature can range from subfebrile to 40 °C, the severity of intoxication also depends on the severity of the disease. A characteristic manifestation of the disease is damage to the salivary glands, more often the parotid glands. The gland increases, soreness appears on palpation, which is especially pronounced in front of the ear, behind the earlobe and in the mastoid process. The skin above the inflamed gland is tense, shiny, and the swelling may spread to the neck. The enlargement of the gland usually lasts for 3 days, the maximum swelling lasts for 2–3 days. Possible complications: meningitis, orchitis, pancreatitis, labyrinthitis, glomerulonephritis.

Laboratory diagnostics. The serological diagnosis of mumps is based on the study of paired blood sera in complement binding reactions or hemagglutination inhibition. The first serum sample should be taken in the first days of the disease, the second — in the 2–3th week. An increase in antibody titers by four times or more confirms the diagnosis of the disease. For early laboratory diagnosis, starting

from 3–5 days after the onset of the disease, the method of enzyme immunoassay is used to detect class IdM antibodies to the mumps virus.

Manifestations of the epidemic process. Mumps is widespread everywhere. Periodic increases in morbidity are noted with an interval of 7–8 years. In the pre-vaccination period, the incidence was recorded mainly among children aged 3–6 years. In recent years, there has been a shift in the incidence to older age groups of the population (5–15 years old). Men suffer from mumps more often than women. Mumps diseases are registered at any time of the year, but most often the increase in incidence occurs in autumn and winter, i. e. during the period of crowding of children indoors. Among the adult population, increased morbidity is also recorded in closed and semi-closed groups (barracks, dormitories, etc.). The decrease in the incidence of mumps in recent years in many countries has been due to increased vaccination coverage for children under one year of age. In the Republic of Belarus, in the pre-vaccination period, the incidence of mumps was quite high and ranged from 1968 to 1980 in the range of 176,5–500,1 cases per 100 000 population. Thanks to the vaccination against mumps, a sharp decrease in the incidence has been achieved and in recent years the incidence rates have been less than one case per 100 000 population.

Prevention. Vaccination is the basis for the prevention of mumps. Currently used mumps vaccines are highly effective — they ensure the development of immunity to this disease in more than 96 % of vaccinated people. Moreover, the duration of the vaccine is 12–20 years, depending on the individual characteristics of the human body's immune system. Mumps vaccines are used in monovalent, bivalent, or trivalent forms. In the vast majority of cases, vaccinations are made with a trivalent vaccine that contains components against measles, mumps and rubella. The first dose of the mumps vaccine should be given to children at least 12 months old. If mumps vaccination is given to a child under the age of one year, its effectiveness will be insufficient (65–68 %) due to the neutralization of the vaccine strain of the virus by maternal antibodies. To maximize the effectiveness of mumps vaccinations, it is necessary to administer a second dose of the vaccine after the initial immunization. The second dose of the mumps vaccine is most often administered to a child at the age of 6 years.

CHICKENPOX

Chickenpox is an acute anthroponotic disease characterized by moderate general intoxication, benign course, vesicular exanthema and prolonged persistence of the virus in the form of latent infection, which is activated by shingles.

Etiology and epidemiological characteristics of the pathogen. The causative agent of chickenpox (and shingles) Varicella-zoster virus belongs to

the genus Varicellovirus of the Alphaherpesvirinae subfamily of the Herpesviridae family. The virus is a DNA-containing virus measuring 150–200 nm, surrounded by a shell containing lipids. The chickenpox virus is not stable in the external environment, it dies within 30 minutes at a temperature of 60 °C. It is sensitive to ultraviolet radiation, solutions of disinfectants in normal operating concentrations. Virus is resistant to low temperatures, repeated freezing and thawing.

The source of infection in chicken pox is a patient with a manifest form of chickenpox or shingles. Erased and asymptomatic forms of chickenpox are rare. The period of contagiousness begins with the last 1–2 days of the incubation period and lasts until the 5th day after the appearance of the last elements of the rash. During the period of drying of the bubbles, formation of crusts and falling off of the crusts, the patient is not contagious. Chickenpox and shingles are different forms of the same infectious process. With close and prolonged contact with a patient with shingles, it can be a source of infection with chickenpox. The period of contagiousness of shingles patients is shorter compared to the primary infection and is 5–7 days from the moment of the appearance of rashes along the course of the sensory nerves involved in the process.

The transmission mechanism. Chickenpox is characterized by an aerosol transmission mechanism and mainly an airborne transmission route. The transmission factor is air containing viral particles. When talking, coughing, or sneezing, the pathogen is released into the environment as a fine aerosol, which ensures its high volatility and ability to be transported over a relatively long distance. Due to the low resistance of the virus to environmental factors, household contact transmission has no epidemic significance. Viral particles are found in the contents of vesicles on the skin, but their dispersion is less intense. It is possible to infect a person if contaminated material gets on the conjunctiva. The risk of contracting chickenpox through contact with shingles is significantly lower. The presence of a widespread skin rash in patients with shingles contributes to the transmission of the virus by airborne droplets and through household contact through objects and underwear contaminated with the contents of the bubbles. There may be a vertical mechanism of transmission of chickenpox during pregnancy. Chickenpox infection of the mother at the end of pregnancy (the last 14 days before delivery) leads to the development of chickenpox in newborns.

Sensitivity and immunity. Human susceptibility to chickenpox is high, with a secondary infection rate of up to 90 % among family contacts. Since the subclinical form of infection is rare, 95 % of people usually get chicken pox. Children born to immune mothers have passive protection against infection during the first 12 months of life. Chickenpox induces lifelong immunity. People with immunodeficiency who have had the disease in a subclinical form or under the age of 12 months may develop chickenpox again.

The main clinical manifestations. The incubation period is 10–21 days, with an average of 14–16 days. Chickenpox is generally a benign, self-limited disease in immunocompetent persons. The risk of severe presentation increases by more than 15-fold for adults. Prodromal signs are usually absent or mild (subfebrile temperature, and a certain general discomfort for 12–24 hours). The outbreak of rash happens with a rise of temperature or follows a few hours later. There is no definite order of appearance of the rash; it may develop on the face, scalp, trunk or limbs. At first maculo-papular, the elements within a few hours turn into vesicules, round or oval, differ in size, their wall is tense, and they are filled with a clear fluid. A narrow erythematous corona surrounds the vesicles. Vesicles dry up in one or two days, forming flat brown crusts that are shed in one to three weeks, leaving no scars. Chickenpox eruption is polymorphous, i. e. the lesions are in different stages of development (papules, vesicles, crusts) at any time on a given area of the skin. The itch is disturbing. In some patient's eruption is often seen on the mucous membranes of the mouth, nasopharynx, larynx, and genital organs. The rise of temperature in chickenpox usually usually goes up to 38 °C, and may become high (39 °C or 40 °C). The temperature curve is irregular, each peak reflecting the dynamics of the eruption.

Laboratory diagnostics. The diagnosis of varicella and herpes zoster is usually made clinically. Polymerase chain reaction (PCR) testing can confirm the presence of varicella-zoster virus. The enzyme immunoassay (EIA) screen detects both the immunoglobulin M (IgM — acute infection) and immunoglobulin G (IgG — chronic infection). Serologic testing can show the presence of varicella-zoster virus antibodies, which corresponds to a history of varicella or vaccination.

Manifestations of the epidemic process. Chickenpox is widespread. High incidence rates are typical for countries where chicken pox immunization is not carried out. In recent years, the incidence of chickenpox in the population of the Republic of Belarus has been about 500 cases per 100 000 population. In addition to sporadic cases, chickenpox diseases are characterized by an outbreak in organized child groups and hospital health organizations. In temperate countries, chickenpox occurs throughout the year, but in the winter and spring season, there is an increase in the incidence. In the tropical climate zone, the incidence remains stable at any time of the year, without any seasonality. The highest incidence of chickenpox in the Republic of Belarus is observed in children aged 1–2 and 3–6 years old who attend organized groups. The incidence of chickenpox in urban populations is higher than in rural populations.

Prevention. Vaccination is a leading factor in reducing chickenpox morbidity, reducing the severity of the clinical course and the number of complications, and reducing mortality. Routine immunization of children against chickenpox can be applied in those countries where the infection is an important problem for public health and socio-economic development, where such a vaccine is affordable and

where it will be possible to ensure and maintain a high (85–90 %) coverage rate. In addition, vaccination is used for selective administration to patients at high risk of developing severe chickenpox and those at high risk of exposure to the virus. Emergency immunization in the foci of infection can prevent the development of severe forms of chickenpox and reduce the outbreak rate.

MENINGOCOCCAL INFECTION

Meningococcal infection is an acute anthroponotic disease characterized by damage to the mucous membrane of the upper respiratory tract, inflammation of the soft meninges, the development of septicemia, intoxication and manifested by nasopharyngitis, fever, headache, meningeal symptoms, hemorrhagic rashes on the skin.

Etiology and epidemiological characteristics of the pathogen. The causative agent of meningococcal infection is Neisseria meningitidis, gram-negative bacterium belonging to the genus Neisseria of the Neisseriaceae family. In smears from cerebrospinal fluid and blood, meningococci are detected in the form of coffee or bean grains, typically located in pairs, with convex edges outward and located intracellularly.

Meningococci are diplococci, typical strains are covered with a capsule consisting of high-molecular-weight polysaccharides, which determine the serogroup by their chemical structure. Based on group-specific antigens, meningococci are divided into 13 serological groups (A, B, C, D, N, X, Y, Z, W135, etc.), but only 3 of them — A, B, and C — are responsible for the development of more than 90 % of generalized forms of meningococcal infection.

The main pathogenicity factor of the pathogen is the lipopolysaccharide complex (endotoxin). Meningococci are not very stable in the external environment and quickly die when drying, as well as when the temperature deviates from 37 °C. At room temperature in dried sputum, they die after 3 hours, at 0 °C — after 3–5 days, the duration of preservation of the pathogen increases slightly in a humid environment. Boiling kills them instantly. Disinfectants in working concentrations cause the death of the pathogen within a few minutes. Meningococci are highly sensitive to antibiotics and sulfonamides, but there is currently a process of acquiring resistance to these drugs, including penicillin. Under the influence of antibiotics, meningococci transform into L-forms, which are associated with a prolonged course of meningococcal infection and a decrease in the effectiveness of antibiotics.

The source of infection. The source of infection is patients and carriers of meningococcus. There are two groups of sources of meningococcal infection among patients: with generalized forms and with meningococcal nasopharyngitis.

Patients with generalized meningococcal infection (meningitis, meningococcemia, meningoencephalitis, etc.) are the most dangerous source of infection. Firstly, this is due to the massive release of the pathogen by patients with severe clinical manifestations. Secondly, patients with a generalized form of meningococcal infection secrete highly virulent strains of the pathogen. These patients secrete the greatest amount of the pathogen in the prodromal period, which lasts 4–6 days.

Significant epidemic importance belongs to patients with meningococcal nasopharyngitis. This category of infection sources is associated with the occurrence of 10–30 % of new cases of meningococcal infection. The duration of the infectious period in patients with nasopharyngitis is about two weeks. Cough and runny nose, which are noted in the majority of patients with nasopharyngitis, increase the contagiousness of patients with nasopharyngitis.

Carriers of meningococcus have a significantly lower infecting capacity, but they are the main source of meningococcal infection. The proportion of meningococcal carriers in the structure of established sources of infection is 70–80 %. This is due to the fact that, depending on the epidemic situation, there are from 100 to 2000 carriers per patient with clinically pronounced signs of the disease.

The prevalence of carriage increases from 4.5 % in infants to a peak of 23.7 % in 19-year-olds, gradually decreasing with age to 13.1 % in 30-year-olds and 7.8 % in 50-year-olds.

The transmission mechanism. The causative agent of meningococcal infection is transmitted by an aerosol transmission mechanism. Meningococci are released from the source of infection with droplets of mucus when coughing, sneezing, or talking. The mild severity of catarrhal phenomena on the mucous membranes of the respiratory tract leads to the fact that meningococci are released as part of the large-drop aerosol phase, which quickly settles on environmental objects. Human infection is possible only at the time of isolation of the pathogen with close and prolonged communication with the source of infection. Close and prolonged contact includes kissing, sneezing and coughing towards another person, as well as living in close proximity to an infected human carrier.

Sensitivity and immunity. The low incidence of generalized forms of meningococcal infection indicates a low sensitivity of people to meningococcus. The probability of developing a generalized form depends mainly on individual resistance, the infecting dose, and the virulence of the pathogen. Most children in the first two years of life are not immune to meningococci and are at risk. In subsequent years, immunity is gradually formed due to natural immunization as a result of an encounter with the pathogen. A meningococcal infection leads to the production of specific antibodies, among which bactericidal antibodies are of the greatest importance in protection. Immunity is developed not only in

patients, but also in carriers. Postinfectious immunity in meningococcal infection is quite tense, which causes the rarity of relapses and repeated cases of the disease. Repeated diseases are noted in people with congenital deficiency of complement components C7–C9.

The main clinical manifestations. The duration of the incubation period is from 1 to 10 days, more often — 3–5 days. The most common clinically pronounced form is meningococcal nasopharyngitis. Generalized forms of meningococcal infection are characterized by an acute onset, a sharp increase in body temperature, chills, agitation, and a sharp headache, which is often accompanied by vomiting that does not bring relief. Meningeal phenomena are rapidly increasing: symptoms of Kernig, Brudzinsky, stiffness of the occipital muscles. Already in the first days of the disease, there are disturbances of consciousness from mild deafness to coma. With meningococcemia, a hemorrhagic rash appears on the 1–2 day of the disease, which is usually localized on the lower extremities, buttocks, and lateral surfaces of the trunk, hemorrhages into the sclera, conjunctiva, and pharyngeal mucosa are possible, and in severe cases, nasal, gastrointestinal, and renal bleeding.

Laboratory diagnostics. Laboratory diagnostic methods are represented by bacteriological and serological methods and molecular biological (PCR diagnostics). Bacteriological examination is aimed at detecting and identifying the pathogen in the material from the mucous membranes of the nasal cavity and oropharynx, as well as in blood and cerebrospinal fluid (with generalized forms). The serological method is used to detect meningococcal antigens in biological fluids of the human body (cerebrospinal fluid, blood, etc.). Enzyme immunoassay, latex agglutination reaction, indirect hemagglutination reaction are used. PCR testing of cerebrospinal fluid, blood, and other normally sterile areas for N. meningitidis is a more sensitive and specific diagnostic method.

Manifestations of the epidemic process. Meningococcal infection is registered everywhere, but the incidence rate varies widely on different continents and in different countries. The highest incidence in the last 50 years has been noted in the countries of the so-called meningitis belt. The meningitis belt stretches in sub-Saharan Africa from Senegal in the west to Ethiopia in the east.

In the Republic of Belarus, the incidence of meningococcal infection has been consistently low for many years. The average incidence rate is less than 1 case per 100 000 population. Over the past 10 years of follow-up, the proportion of children with meningococcal infection is 78.3 %, with the maximum proportion in the group of children aged 0–2 years (56.5 %).

Prevention. The complex of measures to prevent the incidence of meningococcal infection includes careful implementation of sanitary and hygienic requirements in preschool institutions and other organized groups (daily filtration of children, wet cleaning, ventilation, toy handling, rational filling of groups, isolation between groups, etc.). Treatment of chronic nasopharyngeal

diseases is important. The most effective way to prevent meningococcal infection is vaccination. Conjugated vaccines against meningococcal groups A, C, Y and W135 and a recombinant vaccine for the prevention of meningococcal infection of serogroup B are currently registered in Belarus. The vaccines are safe and effective, providing long-term protection against meningococcal infection.

WHOOPING COUGH (PERTUSSIS)

Whooping cough is an anthroponotic infectious disease characterized by intoxication, respiratory tract damage, and coughing fits.

Etiology and epidemiological characteristics of the pathogen. The causative agent of whooping cough, Bordetella pertussis, belongs to the genus Bordetella. B. pertussis is an immobile gram-negative rod, has a capsule, is strict aerobic, and is extremely demanding of nutrient media. According to the combination of factor antigens, pertussis microbe serovariants are distinguished, designated as 1,2,3; 1,2,0; 1,0,3; 1,0,0. Pertussis toxin determines the virulent properties of B. pertussis. Pertussis microbe virulence factors also include filamentous hemagglutinin, pertactin, fimbriae, adenylate cyclase hemolysin, tracheal cytotoxin and endotoxin. Pertussis microbes are very sensitive to external influences, their resistance in the external environment is extremely low. They are rapidly destroyed by disinfectants, antiseptics and other adverse factors. They are sensitive to ultraviolet radiation.

The source of infection. The source of infection is a patient with an acute form of the disease, which becomes contagious with the appearance of the first clinical manifestations. The patient's contagiousness is maximal in the catarrhal period and in the first week of a convulsive cough, when pertussis bacillus can be isolated in 90–100 % of cases. In the second week of a spasmodic cough, the pathogen is released in 60–70 % of cases, and from the third week the patient's contagiousness decreases sharply. As a rule, after the 25th day of the disease, the pathogen cannot be isolated.

The transmission mechanism. The causative agent of whooping cough spreads through an aerosol transmission mechanism. Pertussis bacillus multiplies only in the deep parts of the respiratory tract (larynx, trachea, bronchi) and is excreted from the body with secretions of the respiratory tract during coughing and other expiratory acts. When coughing, the patient releases a coarse aerosol into the environment, which settles in the immediate vicinity of the source of infection. Infection occurs only through direct contact with the source of infection at a distance of no more than 2 meters. Thus, close and prolonged contact with the patient is necessary for the spread of infection. Due to the pronounced instability

of the pathogen in the environment, transmission of pertussis bacillus through contaminated household items or third parties is practically excluded.

Sensitivity and immunity. A person is susceptible to whooping cough from the first days of life. The probability of maternal antibody transmission to the fetus ranges from impossibility to a half-life of 6 weeks. Repeated cases of diseases are possible. Epidemiological studies show that active immunity decreases over time. Only during the first 2 years after vaccination (revaccination), children do not develop either carriage or seroconversion upon contact with the patient. If 3–5 years have passed since vaccination, carriage or an erased form of the disease and seroconversion occur; 6–12 years — prolonged cough (often other symptoms of whooping cough); more than 12 years — active immunity disappears completely.

The main clinical manifestations. The incubation period for whooping cough ranges from 4 to 21 days, averaging 5–8 days. There are three stages of the disease: catarrhal, convulsive cough, and resolution. The catarrhal stage lasts 1–2 weeks, its characteristic signs are a runny nose, hyperemia of the conjunctival membrane, lacrimation, mild cough, slight increase in body temperature, rarely copious viscous discharge from the nose of a mucous nature, sometimes leading to blockage of the upper respiratory tract. Whooping cough is usually not diagnosed at this stage. The stage of convulsive cough lasts for 2–4 weeks or more. There are characteristic repeated series of 5–10 strong coughing shocks during one exhalation, followed by an intense and sudden inhalation, accompanied by a whistling sound due to the forced passage of air through the narrowed glottis. At the same time, the child's face turns red or bluish, the eyes bulge, lacrimation appears, the tongue droops, salivation is observed, and the veins in the neck swell. Vomiting is typical at this stage. The resolution (recovery) stage takes place within 1–2 weeks. During this period of time, coughing attacks, reprises, and vomiting are easier and occur less frequently. The cough may last for several months.

Laboratory diagnostics. The main method of laboratory diagnostics is bacteriological. The material for the study is mucus from the back of the pharynx, which is taken on an empty stomach or through 2–3 hours after eating. Due to the slow growth of pertussis bacillus on nutrient media, the bacteriological study continues for 5–7 days. Currently, an immunofluorescence method has been proposed (as an express diagnostic method), which allows obtaining a response 2–6 hours after sampling the material. The polymerase chain reaction is highly sensitive and it can be carried out with the same biological samples as for bacteriological examination. With prolonged coughing and the absence of bacteriological confirmation of the diagnosis, a serological diagnostic method is used. The agglutination reaction, complement binding reaction and passive hemagglutination reaction are used.

Manifestations of the epidemic process. In modern conditions, most of the cases are unvaccinated children. Vaccinated children can get whooping cough,

but their disease proceeds in an erased, low-symptom form, which leads to the identification of a significant proportion of patients. There has also been a shift in morbidity towards older age. When whooping cough is introduced into preschool institutions, a sluggish, prolonged development of the epidemic process is characteristic. In the absence of appropriate anti-epidemic measures, the outbreak may last for several months until the non-immune system is exhausted. a stratum in this team. The incidence of whooping cough in cities is 4–5 times higher than in rural areas. The incidence of whooping cough is characterized by the autumn-winter seasonality, which is typical for the manifestations of the epidemic process of aerosol infections.

Prevention. The basis for the prevention of whooping cough is the active immunization of children with the adsorbed pertussis-diphtheria-tetanus vaccine. Immunization is carried out from 2 months, three doses of the vaccine are administered with an interval of 1 month, booster doses are given at 18 months, 6 years. In those vaccinated with the vaccine, whooping cough is easy and uncomplicated. In recent years, some countries have used cell-free vaccination against pertussis. pertussis vaccine, which is a low-reactogenic and effective drug. Despite significant differences in content, the manufacturing method Comprehensive clinical trials have shown that the most effective vaccines in either category protect 85 % of vaccinated individuals from the clinical manifestations of the disease. The duration of immunity after administration of the initial three doses of the vaccine to infants and at least one year after one booster dose averages 6 years or more, both with whole-cell and cell-free pertussis vaccines.

SCARLET FEVER (STREPTOCOCCAL INFECTION)

Scarlet fever is a form of streptococcal infection characterized by intoxication, sore throat and fever, small-point rash, and the likelihood of developing infectious and allergic complications.

Etiology and epidemiological characteristics of the pathogen. The causative agents of scarlet fever are immobile facultative anaerobic gram-positive cocci of the genus Streptococcus of the Streptococcaceae family. According to the structure of group-specific polysaccharide antigens (substance C) of the cell wall, streptococci are divided into 17 serological groups, denoted by Latin letters (A–O). In the etiology of scarlet fever, group A streptococci (β-hemolytic streptococci of group A (Streptococcus pyogenes) are important. Obligate human parasites, they have a wide range of superantigens: erythrogenic toxins, exotoxin (mitogenic factor), streptococcal superantigen (SSA). An important component of group A streptococci is protein M, which resembles the structure of the fimbriae of gram-negative bacteria. Protein M is the main virulence factor and type-specific

antigen. One of the factors of streptococcal virulence is the capsule, which protects bacteria from the effects of phagocytes and facilitates adhesion to the epithelium. Streptococci are relatively stable in the external environment and can remain viable on household items, clothing, and bedding for several weeks to several months. Streptococci are not very resistant to temperature influences — heating to 56 °C causes their death after 30 minutes. Disinfectants used in widespread anti-epidemic practice have a detrimental effect on these microorganisms.

The source of infection. Scarlet fever refers to anthroponotic infections, therefore, the source of infection in this disease is only a sick person, a convalescent, a carrier of streptococci. Among the patients, as sources of infection, patients with scarlet fever, sore throats, nasopharyngitis and other diseases of streptococcal etiology are distinguished. Streptococci begin to be isolated from patients with scarlet fever from the first day of the disease. The maximum release of pathogens is noted in the first week of the disease, and then as the clinical symptoms subside. there is a decrease in the release of streptococci and by 3–5 weeks the contagiousness decreases sharply if the patient does not become a carrier.

The transmission mechanism. The primary localization of streptococci in the upper respiratory tract determines the aerosol mechanism of transmission of pathogens in scarlet fever. Streptococci are released when coughing and sneezing as part of the aerosol droplet phase. In the implementation of the transmission mechanism, small droplets are important, first of all, which float in the air for a long time and, when they get on the mucous membranes of the upper respiratory tract, lead to infection of susceptible individuals. Through the large-drop phase of the aerosol, infection with the pathogens of scarlet fever is possible only with close contact when communicating with the source of infection, when droplets immediately after discharge fall on the mucous membranes of the communicating persons. It should be borne in mind that at a distance of more than 3 m this transmission pathway is practically not realized and pathogens do not spread to neighboring rooms. Large droplets containing streptococci settle relatively quickly on various surfaces, dry out, and rise back into the air as part of the dust.

Household items infected with streptococci are factors of transmission of these microorganisms mainly in cases where they have been recently contaminated and come into contact with mucous membranes (toys that children take in their mouths).

Group A streptococci, once in certain foods (milk, dairy products, cakes, butter, boiled egg, salads, etc.), are able to multiply and remain in a virulent state for a long time.

Sensitivity and immunity. People who are susceptible to scarlet fever are those who do not have antitoxic immunity to this infection. In turn, immunity is formed as a result of a previous scarlet fever disease or as a result of an asymptomatic streptococcal infection (mute immunization). The variety of clinical manifestations

of streptococcal infection, as well as the presence of a healthy carrier, contribute to the fact that the human population is characterized by pronounced heterogeneity in susceptibility to scarlet fever. The transferred disease leaves behind intense antitoxic and antimicrobial immunity. Antibodies to protein M have protective properties, which are found in almost all patients at the 2nd–5th week of the disease; they persist for a long time (10–30 years old).

The main clinical manifestations. The incubation period for scarlet fever varies from 1 to 7 days, is more often 2–4 days, and can be extended up to 12 days. The disease begins acutely. Within a few hours, the body temperature rises to 38–39 °C, general weakness, headache, and sore throat appear. As the disease progresses, the effects of intoxication increase, and nausea and vomiting occur in children. In typical cases, 6–12 hours after the onset of the disease, a rash appears — first on the face, then on the neck, trunk and limbs. Scarlet fever is characterized by small-point rash on the background of hyperemic skin. A permanent sign of scarlet fever is angina with a characteristic bright hyperemia of the pharynx («flaming pharynx»). A white nasolabial triangle is very characteristic, capturing the upper lip and chin, which is clearly revealed against the background of the bright coloring of the cheeks.

Laboratory diagnostics. Laboratory confirmation of the diagnosis of scarlet fever is based on the bacteriological method of isolating hemolytic streptococcus in pharyngeal flushes. Serological studies are aimed at detecting an increase in the titer of antibodies against streptococcal antigens — M-protein, A-polysaccharide, streptolysin-O, etc. A promising method of rapid diagnosis of scarlet fever is the coagglutination reaction, which makes it possible to detect the antigen of hemolytic streptococcus in material from any focus within 30 minutes. The PCR diagnostic method is also used for diagnosis.

Manifestations of the epidemic process. Scarlet fever is widespread, but the vast majority of diseases are registered in countries located in northern latitudes. According to research results, almost every child who has reached the age of 5 has a history of pharyngeal infection caused by group A hemolytic streptococci, and a 13-year-old has up to 3 episodes of the disease. In the long-term dynamics, periodic rises and falls in morbidity alternate at intervals of 3–4 years. The incidence of scarlet fever has a pronounced autumn-winter seasonality. The main contingent that is involved in the epidemic process are children under the age of 7 (the maximum incidence is in the age group of 3 years). The highest incidence of scarlet fever is observed among children attending preschool institutions.

Prevention. In the complex of preventive measures, an important role belongs to the rational implementation of sanitary and hygienic requirements in preschool institutions and other organized groups (reducing the size of the team, its crowding, general sanitary measures, disinfection regime, daily filtration of children, wet cleaning, ventilation, toy handling, rational filling of groups, isolation between

groups, etc.). Sanitary-anti-epidemic (preventive) measures in organized children's and adult groups, as well as in hospitals These conditions reduce the likelihood of airborne and household contact transmission of the pathogen. Early and active detection, isolation and full-fledged etiotropic treatment of patients play a crucial role in these conditions.

PREVENTION OF AEROSOL INFECTIONS

Preventive measures against aerosol infections are divided into specific and non-specific. Specific prevention — routine vaccination of the population in accordance with the National Schedule of Preventive Vaccinations and also immunoprophylaxis for epidemic indications.

Non-specific preventive measures. To prevent the occurrence of cases of aerosol infectious diseases at the place of work, study, service, and temporary stay of the population, the following general sanitary and anti-epidemic measures are carried out:

– ensuring the serviceability of ventilation systems, vents and window sashes, other devices for ventilating rooms, and air disinfection systems;

– ventilation of premises during the absence of employees (students and others), taking into account weather conditions — while people are in the premises;

– carrying out daily wet cleaning of premises, including sanitary facilities, using approved detergents and/or disinfectants;

– compliance with personal hygiene rules;

– during the period of increasing incidence of acute respiratory diseases, the use of medical masks, social distancing, and restriction on visits to places of mass residence;

– placing visual information on the prevention of infectious diseases in publicly accessible places for the public (on information stands, placards, and otherwise);

– information and educational work among the population about the danger of the disease, ways of infection and prevention measures, the importance of vaccination as the most effective protection against infection.

SANITARY AND ANTI-EPIDEMIC MEASURES IN THE FOCUS OF AEROSOL INFECTIONS

Table 3

Sanitary and anti-epidemic measures in the focus of aerosol infections

Name of anti-epidemic measures	The content of anti-epidemic measures in the focus of aerosol infection
1. Measures aimed at the source of infection	
Identification	Carried out by medical workers of healthcare organizations: – when seeking medical help; – during medical examinations; – during medical supervision of persons who have been in contact with patients who have been diagnosed with, or suspected of an aerosol infection or carrier (contact persons)
Diagnostics	It is carried out according to clinical, epidemiological data and laboratory research results (virological, bacteriological, molecular biological (PCR), serological tests). The material for the study is taken before the start of antibiotic therapy (bacterial infections)
Records and registration	After the diagnostics of the infectious disease has been established, the physician records and registers it and sends the information about it to the territorial (district or city) Center of Hygiene and Epidemiology (CHE). In case of the disease detection that is subject to the individual registration in the district (city) CHE, or if it is suspected, employees of an outpatient or medical institution are required to inform the CHE by phone and send there «Emergency notification of an infectious disease, acute occupational, food poisoning or unusual reaction to the vaccination»
Isolation	This measure can be carried out at home or there should be hospitalization in an infectious hospital. The solution of the question of the nature of isolation depends primarily on the nosological form of the disease. Clinical indications are the severity of the clinical course. Epidemic indications for hospitalization (isolation) of patients in an infectious hospital are: – measles, rubella, mumps, whooping cough in children in institutions with round-the-clock stay; – mumps, whooping cough in people living in a family with children who are not immunized or have not received a full course of preventive vaccinations; – mumps infection in people living in a family where there are pregnant women who are not immunized or have not received a full course of preventive vaccinations against mumps; – the disease is caused by laboratory-confirmed meningococcal nasopharyngitis, diphtheria, measles, rubella in people staying in institutions with round-the-clock stay, dormitories, as well as in the absence of the possibility of isolating the patient in a separate living room at the place of residence

Continuation of the Table 3

Name of anti-epidemic measures	**The content of anti-epidemic measures in the focus of aerosol infection**
Treatment	In accordance with protocols (standards) for the examination and treatment of patients with infectious and parasitic diseases, until clinical recovery and cessation of pathogen release
Discharge and admission procedure to organized groups and to work	Discharge of persons who have had **measles** and **rubella** — after clinical recovery, but not earlier than 5 calendar days (7 calendar days for rubella) from the date of the rash. Those who have been ill are allowed to join an organized team at their place of work, study, or service after clinical recovery, including in the presence of secondary cases of measles and (or) rubella in the outbreak. Discharge of **whooping cough** survivors — after clinical recovery, but not earlier than 14 calendar days after the onset of the disease; children and adults who go to institutions with round-the-clock stay are subject to laboratory examination before discharge. Discharge of persons who have suffered **meningococcal infection** — after clinical recovery and a negative result of laboratory examination of mucus from the nasopharynx, conducted 3 calendar days after the end of the course of treatment. Persons who have had a **hemophilic infection** are discharged after completion of treatment and clinical recovery; persons from children's homes and educational institutions with round-the-clock stay are subject to laboratory examination before discharge and admission to an organized team. Discharge of persons who have suffered from **diphtheria** — after clinical recovery and a double bacteriological examination with a negative result, conducted at intervals of 1–2 calendar days and no earlier than 3 calendar days after discontinuation of antibacterial drugs. Discharge of persons who have had **chickenpox** — after clinical recovery, but not earlier than 5 calendar days after the appearance of the last fresh element of the rash
2. Measures aimed at the transmission mechanism	
Current disinfection	It is carried out in an apartment hearth or in an organized team during the maximum incubation period. Activities: daily wet cleaning (at least 2 times a day) with the use of detergents and disinfectants, regular ventilation of rooms, disinfection of the air environment; disinfection of dishes, toys, linen, personal hygiene items
Final disinfection	It is performed during the first day after the patient's isolation in the foci of certain infectious diseases, for example, diphtheria. In children's educational institutions, disinfection is carried out by specialists of the territorial CGE, in apartment centers — by the patient's relatives after the briefing. Disinfection measures should take into account the etiology of the pathogen (bacteria, viruses) that caused the outbreak of the infectious disease

Continuation of the Table 3

Name of anti-epidemic measures	The content of anti-epidemic measures in the focus of aerosol infection
3. Activities aimed at people who have communicated with the source of infection	
Identification	The identification of contact persons is carried out by the doctor who made the diagnosis. Contact persons may be: – family members and caregivers of the patient; – persons who regularly visited the patient's home; – persons working with the patient; – children and staff of the school, kindergarten; – employees of the healthcare institution who had close contact with the patient
Clinical examination	It includes a survey, assessment of the general condition, examination of the pharynx, skin, mucous membranes, measurement of body temperature, etc.
Collection of an epidemiological history	Data on previous illnesses, the presence of similar diseases at the place of residence, study (work) are being clarified
Medical supervision	Medical supervision is established during the maximum incubation period from the day of isolating the patient and conducting the final disinfection: – in the focus of measles, rubella, mumps, chickenpox for 21 calendar days; – in the center of whooping cough — 14 calendar days; – in the focus of meningococcal infection, hemophilic infection — 10 calendar days; – in the focus of diphtheria — 7 calendar days; It is carried out for the earliest detection and subsequent isolation of sick people and includes their regular clinical examination, thermometry, health questionnaire and, if necessary, laboratory examinations
Laboratory examination	Persons who communicate with an infectious patient are subject to the laboratory examination, which is appointed by an epidemiologist (bacteriological, virologic, serological examination). The following persons are subject to laboratory examination from among the contact persons: – pregnant women in the rubella outbreak; – in the outbreak of whooping cough — children and adults coughing for more than 7 calendar days at home, children attending educational institutions, as well as children in hospital and health-improving organizations, in institutions with round-the-clock stay, as well as employees in hospital and health-improving organizations, educational institutions; – in the focus of meningococcal infection — persons at the place of residence (apartment, room (block) of the dormitory), work, study (class, group), treatment (ward); – all contact persons are in the focus of hemophilic infection, diphtheria

End of the Table 3

Name of anti-epidemic measures	The content of anti-epidemic measures in the focus of aerosol infection
Regime-restrictive measures	Regime-restrictive measures in the epidemic focus are more often performed in the children's team, are organized by an epidemiologist and include: – stopping the admission of new and temporarily absent children in the group (class) from which the patient is isolated, during the maximum incubation period after isolation of the patient from this group; – a ban on the transfer of children from this group to another group during the maximum incubation period after the isolation of a patient from this group; – prevention of communication between children from the group where the patient is identified, with children from other groups of children's institutions during the same period of time; – isolation of patients detected during the outbreak observation period
Emergency prevention	According to epidemic indications, vaccination is carried out in the foci of certain infectious diseases (diphtheria, measles (from 9 months), rubella, mumps): – to persons who do not have documented information about a previous illness; – to persons who do not have information about the availability of preventive vaccinations in accordance with age (including persons who more than 5 years have passed since the last preventive vaccination against diphtheria); – children who have reached the deadline for the next vaccination in accordance with the National Schedule of Preventive Vaccinations; – persons who do not have laboratory results confirming the presence of a protective titer (concentration) of antibodies to the causative agent of the disease
Information and educational work	A conversation is held about the danger of the disease, its prevention measures, and the importance of vaccination as the most effective protection against infection

SITUATIONAL TASKS FOR PRACTICING PRACTICAL SKILLS

Task 1

3 cases of mumps have been registered among first-year medical university students. The students got sick on 24.02, 25.02 and 28.02, and sought medical help at the university polyclinic on the first day of their illness. They all live in the same dormitory block with two other students, one of whom returned a month

ago from a trip to Thailand, where he was with his parents. He is not vaccinated against mumps. The second student was vaccinated twice at 12 months and 6 years old. Students who have fallen ill have not been vaccinated against mumps. All three patients study in the same course in different student groups and attend the basketball section. Students attended classes daily until the date of the illness, and basketball practice was held on 23.02 (two patients) and 27.02 (one of the patients).

1. Indicate the possible source of infection, pathways and transmission factors.

2. Make a plan of anti-epidemic measures in the epidemic focus.

3. List the measures for the prevention of mumps.

Task 2

A newborn child with congenital cataracts and heart disease was tested for rubella on the second day of life and IgM was found to be resistant to rubella virus. During pregnancy, the mother was not tested for rubella. According to the epidemiological history, it was established that the woman had no contact with rubella patients and had not been vaccinated against rubella. She traveled several times during her pregnancy; she had symptoms of a respiratory infection.

1. Name the source of the infection, the mechanism of transmission, and the route of transmission.

2. Make a plan of necessary anti-epidemic measures in the epidemic focus.

3. What are the preventive measures that have the greatest potential effectiveness against rubella?

Task 3

The bacteriological laboratory informed the polyclinic about the release of toxigenic corynebacteria in patient N., 35 years old, a supermarket cashier. She got sick on 10.01 she went to the doctor on 13.01. The initial diagnosis was «follicular angina». Upon repeated treatment due to deterioration of the general condition — 15.01 — the material was taken for research on diphtheria. There are three other people in the patient's family: her husband is 38 years old, a manager, her son is 15 years old, a college student, vaccinated in accordance with the terms of the vaccination calendar, her daughter is attending preschool for 4 years, is not vaccinated against diphtheria, and has a history of asthmatic bronchitis. 20.01 medical supervision was established for family members, and an examination for diphtheria was conducted.

1. Specify the possible source of infection, routes and transmission factors.

2. Determine the boundaries of the epidemic outbreak.

3. Draw up a plan of anti-epidemic measures in the epidemic outbreak.

Task 4

In March of this year, an outbreak of meningococcal infection was registered in a children's home in the city of N. The total number of sick children aged 2–3 years was 8 people. Of these, one child was diagnosed with meningococcemia, 2 with meningitis, and 5 with meningococcal nasopharyngitis. Three children have been diagnosed with meningococcal disease. Serogroup B meningococcus was isolated in patients and carriers. All patients and carriers live in two adjacent rooms. Due to frequent boiler room accidents, the living quarters are poorly heated. There is high humidity in the premises of the children's home. 4–5 people were accommodated in the bedrooms where sick children lived. This year, in the microbiological laboratory, meningococci of group B were isolated in 4 cases from patients with nasopharyngitis. During an epidemiological examination, it was found that one of the patients with nasopharyngitis visited a children's home at the end of February.

1. Specify the possible source of infection, routes and transmission factors.

2. Determine the boundaries of the epidemic outbreak.

3. Draw up a plan of anti-epidemic measures in the epidemic outbreak.

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CONTENTS

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