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INFLUENZA AND OTHER ACUTE RESPIRATORY VIRUS INFECTION IN CHILDREN

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КАФЕДРА ДЕТСКИХ ИНФЕКЦИОННЫХ БОЛЕЗНЕЙ

Е. Н. Сергиенко, И. Н. Ластовка

ГРИПП И ДРУГИЕ ОСТРЫЕ РЕСПИРАТОРНЫЕ ВИРУСНЫЕ ИНФЕКЦИИ У ДЕТЕЙ

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Учебно-методическое пособие

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MOTIVATIONAL CHARACTERISTICS OF THE THEME

Theme: Influenza and other acute respiratory virus infections in children.

The duration of the study subjects: 5 hours.

Influenza and other acute respiratory infections (ARI) currently make up more than half of all child mortality. ARI are uncontrolled infections despite certain achievements in the field of establishment of live and inactivated vaccines, prevention and chemotherapy. The natural evolution of the influenza virus leads to the fact that in the nature of circulating strains, as a rule, leads by their antigenic structure of the viruses that enter the composition of the developed vaccines.

This group of diseases often has a complicated course, which is often the cause of fatal outcomes. Anatomic and physiological features of the respiratory tract and immunological reactivity of children of early age contribute to their high susceptibility to acute respiratory infections. Etiological factors contributing to the development of respiratory can be like viruses, bacterial agents and atypical pathogens. In this regard, it is very important to study of relevant clinical features of infectious diseases involving respiratory syndrome. It'll help to systematize existing knowledge. This will allow making the differential diagnosis of ARI in practice and will help in determining the treatment policy and prevention. All this dictates the need for a detailed study of various clinical variants of ARI in children.

The purpose of the classes: To explore the differential diagnostic criteria for diseases associated with respiratory syndrome, to master the methods of qualitative diagnosis, treatment, and immunization of ARI in children.

OBJECTIVES. The student must know:

– the modern data on the etiological spectrum and epidemiological features of ARI in children;

– the main clinical manifestations of ARI in children (rhinitis, pharyngitis, conjunctivitis, laryngitis, tracheitis, bronchitis, bronchiolitis);

– the main clinical and epidemiological data of infectious diseases associated with respiratory syndrome;

– the criteria of severity of patients, symptoms of common danger (including WHO guidelines);

– the indications for hospitalization of patients with symptoms of ARI;

– the indications for antibiotic therapy and principles of symptomatic treatment of patients with ARI at the ambulance and in the hospital;

– the principles of prophylactic measures to prevent the spread of ARI;

– the modern antiviral drugs for the treatment of ARI.

The student should be able to:

– collect complaints, anamnesis of disease and life;

– carry out a systematic clinical examination of the child with infectious diseases involving the respiratory syndrome;

– establish a preliminary (working) diagnosis;

– make a plan for examination of a child with ARI;

– determine the necessity or compulsory for hospitalization of a child with ARI;

– evaluate the results of the laboratory (clinical, serological, biochemical, immunological, etc.) and instrumental examinations (ultrasound examination, X-ray, etc.);

– carry out inspection and assessment of the patient's secretions and take the material for research;

– draw the medical documentation at ARI in children on the stages of identification, treatment and dispensary observation;

– make a plan of the treatment according to the severity of the disease, the timing of the disease, the course and age.

The student must master the skills:

– learn to estimate the epidemic situation of influenza and other ARI;

– learn to detect of clinical symptoms with an emphasis on atypical, severe and complicated forms of infections;

– learn to estimate the degree of severity of the condition of patients with ARI;

– learn the complex argumentation of the final diagnosis;

– learn to identify indications for isolation, hospitalization, the intensive care unit.

Requirements to initial level of knowledge. Student must repeat from:

– *Human anatomy* — anatomical and physiological features of respiratory tract and immunological reactivity in young children;

– *Microbiology, virology and immunology* — properties and structural features of ARI pathogens: viruses, bacteria, mycoplasma and chlamydia; bases of formation of immunity;

– *Pathological physiology* — basic pathogenesis of viral diseases;

– *Epidemiology* — epidemiology features of ARI;

– *Infectious diseases* — virological and serological methods of diagnosis of ARI;

– *Childhood diseases* — the main manifestations of respiratory syndrome.

Control questions from the related disciplines:

1. What are the anatomical and physiological characteristics of the respiratory tract and immune status in young children?

2. What are the features of the structure and properties of the respiratory viruses, mycoplasma and chlamydia?

3. What are the opportunities of virological and serological methods of diagnosis? What kind of human material can be used for the study and what are the research terms?

4. What are the main links in the pathogenesis of ARI?

5. What are the different types of vaccines? What are the features of post-vaccination immunity?

Control questions of the classes:

1. What is the etiological structure of ARI in children?

2. Describe the epidemiology of ARI: the source of infection, route of transmission, receptive contingent.

3. What are the mechanisms of development of ARI?

4. What is the clinical classification of ARI?

5. What is the topic of the respiratory tract lesions in view of the pathogen and the patient's age?

6. Describe the clinical manifestations of ARI.

7. What are the symptoms of a common danger?

8. The causes of the development and character of complications.

9. What are the mechanisms of development of bronchial obstruction at ARI?

10. What the laboratory tests are used at ARI?

11. What are the indications for hospitalization and prognosis of ARI?

12. The principles of etiological and pathogenetic therapy of ARI.

13. What are the mechanisms of action of antiviral drugs?

14. What are the mechanisms of action and indications for antibiotic therapy?

15. Specific and non-specific prevention of ARI.

INTRODUCTION

Acute respiratory infections pose a significant public health problem worldwide, causing considerable morbidity and mortality among people of all age groups. Children are on average infected two to three times more frequently than adults. There are more than 200 respiratory viruses that can cause ARI. Respiratory syncytial virus (RSV), human rhinovirus (HRV), human metapneumovirus (HMPV), parainfluenza virus, enterovirus, influenza virus, human coronavirus (HCoV), adenovirus and human bocavirus (HBoV) are the most common viral agents associated with ARI, accounting for around 70 % of ARI. The frequency of mixed respiratory viral detection varies from 10 % to 30 % in hospitalized children.

In addition, several new human respiratory viruses have been described in recent years, including HMPV, HBoV and novel HCoV, including severe acute respiratory syndrome coronavirus (SARS-CoV). Although the majority of

ARI are associated with respiratory viruses, antibiotics are often used in the clinical treatment of ARI. As children with ARI often have similar clinical symptoms, studying the clinical hallmarks of children with virus-related ARI and the spectrum of respiratory viruses will help in developing more accurate treatments for ARI. Rapid diagnosis is important not only for timely treatment starting but also for the detection of a beginning influenza epidemic and the avoidance of unnecessary antibiotic treatment.

ARI is a group of diseases of various etiologies, which are characterized by predominant affection of the respiratory tract and symptoms of intoxication which are expressed in various degrees. The source of infection in all ARVI is a sick person or a virus carrier. The major route of spreading the infection is the air-droplet one, but fecal-oral (adenoviral infection) and contact (rhinoviruses infection) ones are not excluded. Susceptibility to infection is high especially in 1-year-old children. General clinical syndromes that are observed in all ARI are syndrome of intoxication and of lesion of the respiratory tract. Intoxication is clinically manifested in weakness, sweating, headache, hyperesthesia, fever of various degree of expression. Syndrome of lesion of the respiratory tract includes congestion or dryness in the nose, sore throat, cough, sneezing, lacrimation and other. Different pathogens of ARVI affect different parts of the respiratory tract: rhinoviruses affect the nose, parainfluenza viruses — affect the larynx, influenza viruses — the trachea, adenoviruses — the pharynx, conjunctiva, lymphoid tissue, respiratory syncytial virus — the lower respiratory tract. Due to that, each disease has specific clinical manifestations that allow to successfully differentiating the diseases of different etiology each from the other.

INFLUENZA

Influenza — it is the disease of viral origin with air-droplet route of transmission that is characterized with intoxication and signs of inflammation of respiratory tract, high level of complications and mortality and ability to epidemic and pandemic.

ETIOLOGY

Pathogen is the influenza virus, which is *Orthomyxoviridae*, and contains RNA. We distinguish 3 serotypes of influenza virus: A, B and C. They are alike in their morphology, but differ in their antigen content. Two antigens, hemagglutinin and neuraminidase provide easy changeability of the virus. There are 18 different hemagglutinin subtypes and 11 different neuraminidase subtypes (H1 through H18 and N1 through N11, respectively). The internationally accepted naming convention for influenza viruses was accepted by World Health Organization (WHO) in 1979 and published in February 1980 in the Bulletin of the WHO. The naming approach uses the following components: the antigenic type (e.g., A, B, C); the host of origin (e.g., swine, equine, etc. For human-origin

viruses, no host of origin designation is given); geographical origin (e.g., Denver, Taiwan, etc.); strain number (e.g., 6, 18, etc.); year of isolation (e.g., 1917, 2009, etc.).

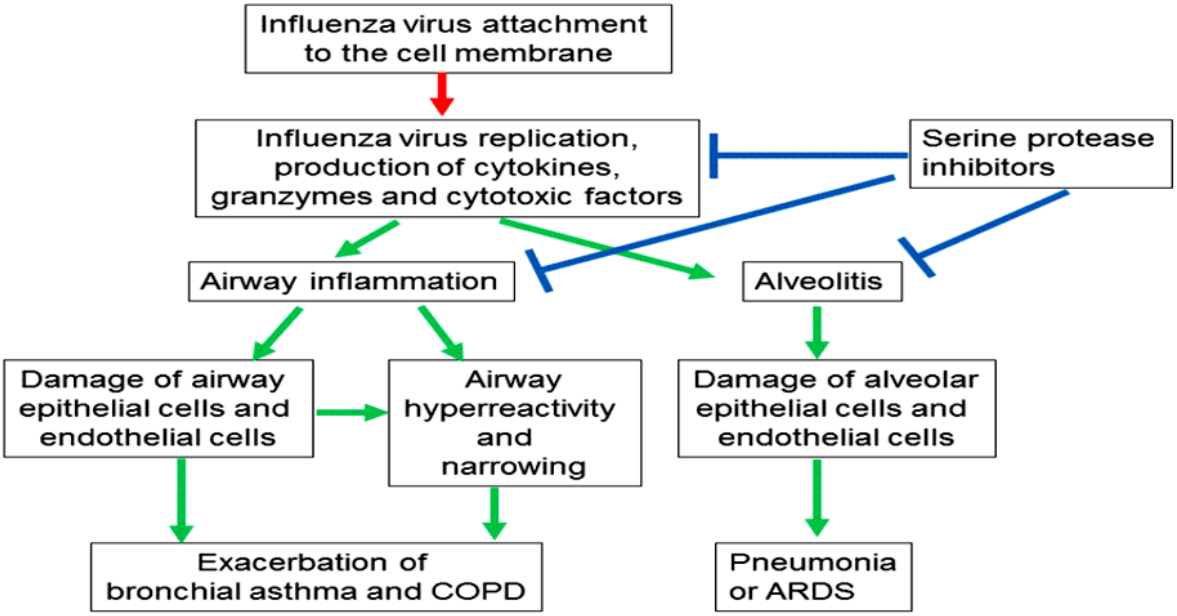
Out of the 3 types of the virus the most changeable one is virus A. Changes of neuraminidase or hemagglutinin cause appearance of new subtypes of virus A. Changes of one antigen (***antigenic drift***), or two antigens (***antigenic shift***) are possible. Appearance of the new strains of a virus leads to an epidemic. The new subtype of virus A causes a pandemic. All antigen variants of type B virus have similar types of neuraminidase and differ only in the structure of hemagglutinin, that provides more stability as compared to influenza A virus. Currently circulating influenza B viruses belong to one of two lineages: B/Yamagata and B/Victoria. Influenza C virus differs in its stability of antigen structure. It causes neither pandemic, nor epidemic; it is a cause of sporadic diseases, especially in children. Influenza viruses possess weak stability to the action of physical and chemical factors are easily destroyed at room temperature, or desiccation. In low temperature it maintains its infectious features during several years.

EPIDEMIOLOGY

The source of infection is the patient, who is particularly infective at the height of the disease, during pyrexia. The contagious period lasts from four to seven days. The aerial-droplet route at relatively close distances from the infected patient chiefly conveys infection. The susceptibility of man to influenza is very high. Only children in the first months after birth are relatively resistant to influenza because of passive immunity from mothers. Children are very susceptible to influenza from six months of age. Immunity against influenza A is effective in man for about two years, and against influenza B, three years. The postinfection immunity protects only from the corresponding antigenic variant of the virus. Epidemics caused by the type A virus are repeated every one or three years, and by type B virus every three to six years.

PATHOGENESIS

The portal of infection is mucosa of the upper airways. Columnar epithelium of the trachea is afflicted selectively. As the virus multiplies in the epithelium it causes its degeneration and necrosis. The underlying tissues are affected by edema; the vessels become permeable to cause epistaxis, blood in the sputum, etc. Toxemia evokes the lesion of the nervous and cardiovascular system. Suppressed immunity facilitates development of secondary complications due to exogenic and endogenic microorganisms; chronic diseases are exacerbated. Multiplication of the virus is inhibited by interferon that is formed from the very first hours of the disease in the infected cells. By the end of the first week, the titer of the specific antibodies increases. The type-specific immunity after the sustained disease persists for many years.



CLINICAL MANIFESTATIONS

Disease is characterized with the abrupt onset of symptoms, associated with toxemia, such as headache, feverishness, chills, myalgia, arthralgia and malaise. The ***temperature*** runs up to the highest level within the first 24 hours of illness as a rule. Myalgia may involve any part of the body but are the most common in the legs and lumbosacral area. These systemic symptoms depend on severity of disease. In severe cases adynamia, sleepiness, significant malaise and signs of intracranial syndrome may occur. Intracranial syndrome is associated with the circulatory disturbances in the CNS and increasing of intracranial pressure. It is characterized by intensive frontal headache, hyperalgesia (photophobia, acusticophobia), vomiting of central origin and includes retroorbital pain, increased on side motion with eyes.

Signs of ***vascular disorders*** develop from the first days of disease. Skin of patient's face is hyperemic, hot and dry; the conjunctiva of eyelids and sclera and mucous membranes of soft palate, uvula and pharynx are hyperemic. In severe cases small hemorrhages are seen there (hemorrhagic syndrome).

Respiratory syndrome is not constant in influenza; it is absent in 20 to 30 % of cases. But in the majority of patients it is the most common syndrome and develops either to the end of the 1-st or on the 2-d day of disease. It often becomes more prominent as systemic symptoms subside. *Rhinitis* usually is not expressed; it is characterized with dryness in nose, sneezing, and moderate nasal secretions. Many patients have a sore throat and persistent cough, which is accompanied by substernal discomfort (signs of *tracheitis*). *Laryngitis* manifests by hoarseness of the voice and hard barking cough. Sore throat in this case is localized at the level of cartilage and grows on swallowing and talk. Very often inflammation process spreads down with development of *bronchitis*. In these

case cough becomes more persistent; it is accompanied by substernal discomfort. Physical finding is usually minimal in cases of uncomplicated influenza. In some patient's influenza provokes an *obstructive bronchitis (or bronchiolitis*) and an asthmatic syndrome expressed in marked expiratory dyspnea, copious whistling and moist non resonant rales and emphysema. There are also marked symptoms of disturbed gaseous exchange. Such signs as dyspnea, hyperpnoea, cyanosis, diffuse rales, changing of sputum from mucous to purulent and signs of consolidation in lungs are indicative of *pulmonary complications*.

Toxic signs in influenza also provoke marked changes of *cardio-vascular system*. A brief period of hypertension is followed by a fall of arterial pressure, tachycardia or bradycardia, diminished heart sounds and sometimes by cyanosis. Collapse occurs in severe cases.

Dynamic of illness: a rapid temperature rise is generally followed by a gradual defervescence over a 2–3 days' period, although, on occasion, fever may last for a 4–5 days. Respiratory symptoms last longer (for 5–10 days and longer).

Blood findings at the beginning of the disease are transitory leukocytosis followed by moderate leucopenia, lymphocytosis, monocytosis and toxic granularity of neutrophils.

CLINICAL CLASSIFICATION OF INFLUENZA

I. Typical forms

1. Mild course;
2. Moderate course;
3. Severe course

II. Atypical forms

1. Acatarrhal form;
2. Afebrile form;
3. Hypertoxic form.

Criteria of influenza severity:

– Hyperthermia (temperature higher than 39.5 °C);

– Presence of hemorrhagic syndrome;

– Marked intracranial syndrome (intensive frontal headache, vomiting, convulsions, psycho-motor excitation, disorders of consciousness);

– Hemodynamic disorders (dizziness, faints, orthostatic hypotension, tachycardia);

– Presence of dyspnea.

COMPLICATIONS

Severe forms of disease may produce collapse and infectious ***toxic shock***; development of ***DIC syndrome*** can cause severe bleedings (nasal, gastrointestinal, uterine, hemorrhages into adrenal glands).

The most common complication of influenza is secondary ***bacterial pneumonia***. It usually follows acute period of influenza (on the 5–6 days of disease), but when the disease is severe, complications occur earlier. Improvement of the

patient's condition over 2–3 days is followed by reappearance of fever along with clinical signs and symptoms of bacterial pneumonia, including cough, production of purulent sputum and physical and X-ray signs of consolidation. The most common bacterial pathogens in this setting are *Streptococcus pneumoniae, Staphylococcus aureus, and Haemophylus influenzae* organisms that can colonize nasopharynx and that cause infection in the bronchopulmonary system. Secondary bacterial pneumonia occurs most frequently in high-risk individuals with chronic bronchitis or pneumonia and cardiac diseases and in elderly individuals. It is the rule that when disease is more severe, complications occur earlier (even on the 2–3 day of disease).

Other pulmonary complications associated with influenza include acute purulent obstructive bronchitis or worsening of chronic obstructive pulmonary disease and exacerbation of ***chronic bronchitis and asthma***.

Among ***other complications***, sinusitis, tonsillitis, otitis as well as extra pulmonary complications such as toxic myocarditis, meningitis, encephalitis mono- and polyneuritis, transverse myelitis and Guillain-Barre syndrome have been reported during influenza.

DIAGNOSIS influenza and other ARVI

Diagnosis is made based on typical clinical manifestations.

The most widespread laboratory method is the method of direct ***immunofluorescent assay***, based on detecting the antigens to influenza virus in the smears of cylindrical epithelium taken from the nose.

Virologist methods are time-consuming. Viral RNA may be discovered in the discharge from the respiratory tract and tissues by PCR method.

Serologic tests using in retrospective diagnostics. For serologic investigations, blood need to take twice: in the beginning of the disease and in interval of 7–14 days. It is diagnostically important when the titer of specific antibodies increases 4 and more times.

TREATMENT

Treatment of influenza starts with general activities for the treatment of influenza (prescription of bed rest, excessive drinking, holding hygiene measures, wet cleaning), as well as the appointment of medication (anti-viral drugs; antipyretics: ibuprofen, paracetamol and other symptomatic drugs).

The two main classes of antiviral drugs used against influenza are ***neuraminidase inhibitors,*** such as *zanamivir and oseltamivir*, or ***inhibitors of the viral M2 protein***, such as *amantadine and rimantadine*. These drugs can reduce the severity of symptoms if taken soon after infection and can also be taken to decrease the risk of infection. The M2 inhibitors are not effective against influenza B, A (H1N1) анв high level of resistance virus A (H3N2). This group of drugs is not used to treat patients with influenza today.

Treatment should be started as soon as possible. Laboratory confirmation of influenza virus infection is not necessary for the initiation of treatment and a

negative laboratory test for influenza does not exclude the diagnosis in all patients, therefore early, empiric treatment is strongly recommended. The evidence from clinical trials in uncomplicated seasonal influenza suggests most patients benefit from antiviral treatment commencing within 48 hours of onset of symptoms.

– ***Oseltamivir*** is indicated for treatment of influenza in adults and children. For adolescents (13 to 17 years of age) and adults the recommended oral dose (based on data from studies in typical uncomplicated influenza) is 75 mg oseltamivir twice daily for 5 days. Oseltamivir treatment doses for children from 14 days up to 1 year of age should be 3 mg/kg/dose, twice daily. For children less 14 days the recommended oseltamivir dose is 3 mg/kg/dose once daily.

– ***Zanamivir*** is indicated for treatment of influenza in adults and children (>5 years). The recommended dose for treatment of adults and children from the age of 5 years (based on data from studies in typical uncomplicated influenza) is two inhalations (i.e. 2 x 5mg) twice daily for 5 days.

With the influenza, as with other ARVI, there is no need to prescribe ***antibiotics***; they are advisable only if there is a suspicion of the bacterial nature of the inflammatory process in the airways. It should be clearly understood that the treatment of influenza with antibiotics does not have a positive effect, since antibacterial drugs are designed to treat infectious diseases that have been caused by bacteria, and influenza develops under the influence of viruses. Moreover, treatment of influenza with antibiotics can harm your body, as with uncontrolled and inappropriate use, the risk of developing infections that are resistant to antibiotics increases.

***Antibiotics for influenza and other ARVI are prescribed according to strict indications*:**

– Bacterial complications (acute pneumonia, otitis, sinusitis, streptococcal or other bacterial tonsillitis/pharyngitis, and etc.);

– Suspicion of bacterial infection in a patient with influenza and other ARVI (when it is difficult to exclude the development of bacterial infections — severe toxicosis, severe sore throat, raids on the tonsils, ear pain, dyspnea without signs of bronchial obstruction, asymmetry of wheezing in auscultation of the lungs, leukocytosis in the blood more than $12–15x10^9$/l);

– Chronic foci of bacterial infection and especially their exacerbation (recurrent otitis media, chronic sinusitis, chronic pyelonephritis, etc.);

– Clinical signs of immunodeficiency.

PREVENTION

Vaccines that include the prevalent strains of influenza viruses effectively reduce the incidence of infection among vaccines for 1 or 2 years after vaccination. Vaccines are prepared as inactivated whole virus or as subunits of the virus, either semi-purified viral hemagglutinin or disrupted virion components. Both types of vaccine are equally protective. Vaccination is especially im-

portant for the young children and the aged and for patients with cardiac, pulmonary or other chronic diseases. Pregnant women whose 3rd trimester occurs during the winter months should be vaccinated also. With the presently available purified vaccines, local or constitutional reactions are uncommon or minor.

PARAINFLUENZA

Parainfluenza viruses are ubiquitous and cause common respiratory illnesses in persons of all ages. They are major pathogens of severe respiratory tract diseases in infants and young children.

ETIOLOGY

R. Chanock firstly discovered parainfluenza viruses in 1956. These viruses belong to family Paramyxoviridae. The morphology of Paramixoviridae resembles that of influenza viruses, but paramyxoviruses are larger (150–300 nm in diameter). In contrast to genome of Orthomyxoviruses, it is not segmented and this negates any opportunity for frequent reassortment. Parainfluenza virus has haemagglutinin (H) and fusion protein (F) antigens. All members of paramyxovirus grope are antigenically stable. There are 5 serotypes of parainfluenza viruses. Of the five serotypes of parainfluenza viruses able to infect humans, only the first three are associated with severe disease. Virus is susceptible to drying, may be kept in home temperature for 3 h.

EPIDEMIOLOGY

Disease is widespread and account about 10 % of all cases of AVRI. The sources of infection are ill humans. Virus is discharged from patients for 3 to 10 days and is transmitted by direct person-to-person contact or by air-droplet way. Morbidity has seasonal character.

PATHOGENESIS

The common scheme of parainfluenza pathogenesis is similar to influenza one. Target cells appear to be ciliated columnar epithelial cells of respiratory tract. Viraemia is short and uncommon. The infection may involve only nose and throat, resulting in harmless common cold syndrome. Infection may be more extensive and, especially with types 1 and 2, involve the larynx and upper trachea, resulting in croup. Croup is characterized by respiratory obstruction due to swelling of larynx and related structures. The infection may spread deeper to the lower trachea and bronchi, culminating in pneumonia or bronchiolitis, especially with type 3. Primarily infection tends to be severe and generally occur during the first 5 years of life. Reinfection is common but usually causes only mild, afebrile upper respiratory infection. Antibodies from previous infection do not confer absolute protection against reinfection but do modify the cause of ensuing illness.

CLINICAL MANIFESTATIONS

Incubation continues from 1 to 7 days. The onset of the disease is moderate and in uncomplicated cases, it persists only for 2–5 days. A second rise in the

body temperature sometimes occurs in the 1–2 day of apyrexia. The symptoms of pronounced intoxication, that are typical of influenza, are relatively rare. Most frequent and typical manifestation of the parainfluenza infection is the catarrh of the upper airways; hyperemia and swelling of the nasal mucosa. A permanent symptom is persistent coughing which is the manifestation of tracheitis or laryngotracheitis.

Laryngitis is typical of parainfluenza infection. It shows in dry coarse cough and a slight or moderate coarseness of the voice. It can sometimes be attended by symptoms of the laryngeal stenosis.

It develops as a result of edema of the larynx below the glottis, expressed in the inspiratory stridor. Edema of the vocal cords is manifested by dysphonia (hoarseness of voice). As a result of a decrease in the diameter of the airways, resistance to the air current increases and the work of breathing increases: tachypnea, the inclusion of additional muscle groups in the work of breathing. With the progression of obstruction, there may be a violation of gas exchange with the subsequent development of hypoxemia, cyanosis and carbon dioxide accumulation. These late signs of croup are precursors of complete obstruction of the respiratory tract and stopping breathing.

Symptoms of stenosing laryngotracheitis often develop at night. Characteristic is the appearance of ***inspiratory dyspnoea*** — elongated, noisy inspiration, dysphonia (***hoarse voice*** and rough, ***«barking» cough***). With an increase in obstruction of the upper respiratory tract, shortness of breath and the involvement of ancillary muscles in the act of breathing increase, there is a tendency of the suppuration of the chest during inspiration, cyanosis, arterial hypoxemia, followed by the accumulation of CO_2 and the development of coma, asphyxia.

The severity of stenosing laryngotracheitis is determined by the degree of narrowing of the lumen of the upper respiratory tract or stenosis of the larynx. ***There are 4 degrees of stenosis of the larynx (table 1).***

Table 1

Clinical manifestations of stenosis of the larynx depending on its severity

Power	Symptoms
I	Rough, «barking» cough, hoarse voice, noisy breathing in the inspiratory phase. The auxiliary musculature is not involved in the act of breathing, manifests with the child's anxiety
II	Breathe noisy, audible at a distance, moderate retraction of pliable places of the chest on inspiration. Often there are bouts of shortness of breath, moderately pronounced inspiratory dyspnea is observed at rest
III	Breathing is constantly difficult, shortness of breath mixed (inspiratory-expiratory), supple places of the chest and sternum are visibly retracted at the time of inspiration. Constant anxiety, pallor with acrocyanosis, sweating, tachycardia, possibly loss of pulse wave on inspiration
IV	Adynamia, lack of consciousness, diffuse cyanosis, decreased body temperature, shallow breathing or apnea, dilated pupils (hypoxic coma)

Pneumonia is the most frequent **COMPLICATION** of parainfluenza in infants.

Blood findings are normal during the first days of the disease; leukocytosis occurs less frequently; moderate neutrophilia is possible; ESR is normal or slightly increased.

TREATMENT

Pathogenic and symptomatic treatment may be administered. No specific antiviral agents have been established as beneficial for treating human parainfluenza virus infections; however, ribavirin is sometimes given. Ribavirin appears safe but is expensive. Its efficiency and effectiveness have not been clearly demonstrated in large, randomized, placebocontrolled trials. At present, routine use of ribavirin cannot be recommended.

Treatment of croup: treatment of laryngeal stenosis of the 1st degree is symptomatic. With increasing stenosis (II–III degree), therapy begins with intramuscular or intravenous dexamethasone injection of 0,5–0,6 mg/kg or prednisolone 1–5 mg/kg; inhaled corticosteroids are indicated with the help of a nebulizer, oxygen therapy with moisturized 40–100 % O_2. With stenosis of the fourth degree, stenosing laryngotracheitis begins to be treated with epinephrine inhalation 0,1 % – 0,01 mg/kg, then dexamethasone 0,6 mg/kg intravenously. With the increase in hypoxia — cardiopulmonary resuscitation, intubation of the trachea, ventilation, oxygen therapy, moistened with 100 % O_2. Conicotomy with backbone stenotic laryngotracheitis, as a rule, is ineffective due to the fact that the stenosis extends below the lining space. If intubation of the trachea is not feasible, a tracheotomy is produced.

RESPIRATORY-SYNCYTIAL INFECTION

Respiratory-syncytial (RS) virus is the most important cause of lower respiratory tract illness in infants and young children, usually, outranking all other microbial pathogens as the cause of bronchiolitis and pneumonia in infants less than 1 year of age. RS-virus accounts for about half of cases of bronchiolitis and one fourth of pneumonia in infants. Respiratory syncytial virus (RSV) is the leading viral cause of acute lower respiratory tract infections in infants and young children in whom this virus is the cause of the primary infection.

ETIOLOGY

RS-virus was first discovered in 1956 by Morris. It belongs to family Paramixoviridae, the genus Pneumovirus and has 1 type and 2 serotypes. Virus contains RNA, has neither H nor N antigen. It is envelop contains 2 glycoproteins: F protein and GP protein; the last one help to bind virus to susceptible cells. Sizes of viruses are average 200–300 nm. Virus is cultivated on the lung tissue of young mammals or human embryos.

EPIDEMIOLOGY

Disease is widespread and accounts about 10–13 % of all cases of ARVI. Season: cold time of the year. Severe disease predominates in newborns, young children and old patients. RS-infection is the problem in pediatric departments as nosocomial infection. The sources of infection are ill humans. Virus is discharged from the patients from the 3 to 8 days of disease and, rarely, up to 3 weeks. RS-virus is transmitted via large droplets, so spread can occur both air-droplets way and by contact with contaminated hands and surfaces. Virus is not stable, it may be kept on the skin nearly 20–25 min. Drying or heating up 55 °C kill virus for 5 min.

PATHOGENESIS

Viral replication occurs initially in epithelial cells of nasopharynx. F antigen (fusion protein) is responsible for cell-to-cell fusion, which permit direct viral spread to lower pars of respiratory tract. This phenomenon causes formation of large syncytia (giant cells), which are characteristic for RS-infection. Viral shedding may persist for 1–3 weeks. Viremia has not been detected. In intact immune system seems to be important to clear an infection, as patients with impaired cell-mediated immunity may become persistently infected with RS-virus and shed virus for months. In the development of bronchiolitis immunopathological processes and immediate hypersensitivity to virus-IgE interaction may be involved. At autopsy, the lung of children who have dead from RS-infection, show extensive bronchopneumonia, accompanied by sloughing of bronchiolar epithelium and infiltration with monocytes and other immunologic cells. There is abundant mucus secretion. These processes result in obstruction of small bronchioles.

CLINICAL MANIFESTATIONS

Incubation period of illness is 4–5 days. Temperature may be subfebrile in adults but is usually high in children, and lasts for 3–5 days. The spectrum of respiratory symptoms range from nasopharyngitis in adults to bronchitis, bronchiolitis and pneumonia in young children. Disease may be mild, moderate or severe. Progression of symptoms may be rapid, culminating in death. Reinfection is common in both children and adults and the infection in these cases is usually limited to the upper respiratory tract, resembling cold.

The lower respiratory tract is very frequently involved in infants. A picture of diffuse bronchitis and bronchiolitis is observed. Bronchiolitis is characterized by a strong dyspnea of the mixed type with prevalence of difficult expiration. The examination of the lungs reveals fine or medium bubbling rules and symptoms of emphysema. The picture of respiratory insufficiency is supplemented by cyanosis. All these symptoms subside completely in 2–6 days.

Criteria of diagnosis: cold time of the year, contact with ill children; rhinitis and involvement of lower parts of respiratory tract in patients with chronic diseases; severe bronchitis and bronchiolitis in young children; whistle rales over

the lung; subfebrile temperature; X-ray examination show bronchitis, interstitial pneumonia.

COMPLICATIONS: bronchoobstructive respiratory insufficiency, pneumonia, purulent otitis, syndrome of sudden death in newborns. Mortality rate — 0,5 %, in immunocompromised children — 20–25 %.

TREATMENT

Good supportive care is of the utmost importance in the management of severely ill infants. Alleviation of the hypoxemia and monitoring of the infant's respiratory status and blood gas levels are essential in the management. Because the hypoxemia is related to an unequal ratio of ventilation to perfusion, most infants respond to relatively low concentrations of inspired oxygen of about 40 %.

Pathogenic and symptomatic treatment is used. Ribavirin, a synthetic nucleoside that is a broad-spectrum antiviral agent, is the only currently approved specific treatment for RSV lower respiratory tract disease in hospitalized infants. The drug is administered as a small-particle aerosol into a tent, oxyhood, mask, or ventilator for a period of 12–20 hours each day, usually for 2–5 days, depending on the time to improvement. Shorter and intermittent periods of treatment may be as beneficial. Ribavirin also inhibits the RSV-specific IgE response in the nasal secretions, which has been associated with the development of wheezing and hypoxemia.

PREVENTION

Palivizumab is a monoclonal antibody to the RSV F protein that inhibits binding of the virus to cellular receptors. When administered preseasonally to high-risk infants, palivizumab reduces the rate and severity of RSV infections and the incidence of RSV bronchiolitis. Because of the high cost of this medication, its use is limited to infants who are at increased risk for adverse outcomes such as hospitalization for bronchiolitis.

ADENOVIRAL INFECTION

Adenovirus infection is spread in all parts of the world. Adenoviruses may infect cells of different tissues and systems and the disease accordingly is characterized with wide spectrum of clinical manifestations.

ETIOLOGY

Adenovirus was firstly isolated from tonsils and adenoids and described by W. Rowe in 1953. Adenoviruses belong to family Parvoviridae, genus Adenoviridae. Virus contains DNA, has 2 types — M (Mastadenovirus — viruses of mammals) and A (Aviadenoviruses — viruses of birds). Viruses of animals are not pathogenic for humans. There are about 50 human's serotypes, among them the most pathogenic are the 3, 4, 7, 8, 14, 21 and 41. Size of virus's average is 70–90 nm. Virus has icosahedral shape appearance and 3 antigens: A, group — specific antigen; B — toxic one which suppresses production of interferon and

increases the severity of disease; C — typospecific antigen. Virus has ability to long persisting in lymphatic tissue and to oncogenic transformation. Among the target cells there are ciliated columnar epithelium cells, cells of conjunctiva, intestinal epithelium, lymphatic tissue, and CNS.

EPIDEMIOLOGY

Disease is widespread and is present year-round. The sources of infection are ill persons. Virus is discharged from the patients with nasal, pharyngeal, conjunctival secretion, feces for a long time — up to 20–25 days of disease and more. The main routes of transmission are air-droplet and fecal-oral, but disease also may be transmitted by contaminated fomites. The disease may cause family outbreaks, predominantly enteric. Infection rates are highest among infants but siblings who introduce the infection into a household are more effective in spreading the disease than are infants. While adenoviruses cause only 2–5 % of all respiratory illness in the general population, respiratory disease due to types 3, 4, 7, 14 and 21 is common among military recruits. Eye infection can be transmitted in several ways, but handto-eye transfer is particularly important. Outbreaks of swimming-pool conjunctivitis are presumably waterborne, usually occur in summer and are commonly caused by types 3, 7 and 8. Adenoviruses may be found in transplant patients. Types 34 and 35 are found most often in renal transplant recipients and in the urine of patients with AIDS.

Virus is stable; it may be kept at home temperature up to 14 days, at −40 °C up to 70 days.

PATHOGENESIS

Adenoviruses can replicate and produce disease in the eye and in the respiratory, gastrointestinal and urinary tract. They usually do not spread b yond the regional lymph nodes, but sometime viremia is preset and it may be protracted. Many adenovirus infections are subclinical; and virus may persist in the host for months. In contrast to most respiratory agents, the adenoviruses induce effective and long lasting immunity against reinfection.

CLINICAL MANIFESTATIONS (CLINICAL FORMS)

Incubation period is 2–5 days. Temperature is usually febrile, lasts for 3–5 days, some times for 14 days and more. Other systemic symptoms (chills, headache, malaise and myalgia) also are present different syndromes of respiratory infection have been linked to adenoviruses. Disease may be mild, moderate or severe.

Isolated or predominant affections of the pharynx or of the conjunctiva (adenoviral tonsillopharyngitis and adenoviral conjunctivitis and keratoconjunctivitis), intestine (intestinal form) and mesenteric nodes (mesadenitis) are less frequent.

The onset of ***pharyngoconjunctival fever*** may be acute or gradual. Temperature rises to 38–39 °C, and there is usually moderate general toxemia. Headache, adynamia, loss of appetite are noted. Constant symptoms are rhinitis with

copious serous or seromucous discharge, bronchitis or tracheobronchitis, pharyngitis, and conjunctivitis. An asthmatic syndrome and laryngitis sometimes develop. The fauces and posterior and lateral walls of the pharynx are hyperemic; lymphatic nodes are swollen. The tonsils are rather enlarged, and a film sometimes covers the lacunae.

Conjunctivitis may appear from the first day, but more often from the second or third. It usually starts on one side and may later spread to the bouts eye. Catarrhal, follicular, and membranous conjunctivitis are distinguished according to the character of the inflammation.

Enlargement of the cervical lymphnodes, and in infants liquid stool sometimes with mucus, are not uncommon. Sometimes there is enlargement of the liver and spleen.

Adenoviral catarrh of the respiratory tract is a frequent form of this infection, and the mildest. There is fever, moderate or mild disturbance of the patient's general condition and marked symptoms of catarrh of the respiratory tract, nasal discharge, bronchitis.

Pneumonia is the most severe form of adenoviral infection occurring mostly in infants. Pneumonia is of viral etiology with subsequent supervention of bacterial flora.

The intestinal form of adenoviral infection occurs mostly in infants. It is characterized by prevalent symptoms of acute gastrointestinal disorders. The body temperature is moderately elevated; catarrh of the respiratory ducts is a constant symptom. The gastrointestinal disorders are present for 3–4 days.

Mesadenitis (inflammation of mesenteric lymphnodes) is a rare manifestation of adenoviral infection which develops either against the background of another syndrome. Mesadenitis is characterized by an acute onset with abdominal pain, fever, nausea, and infrequent vomiting. The pain is felt predominantly in the lower part of the abdomen, often in the right iliac region. Peritoneal irritation is either absent or non-manifest. Appendicitis is often misdiagnosed and the patient is operated.

Epidemic kerato-conjunctivitis is the more serious disease. It is highly contagious and characterized by acute conjunctivitis, with enlarged tender and painful preauricular nodes, followed by keratitis that leaves round subepithelial opacities in the cornea. It is caused by types 8, 19 and 37.

Other forms: immunocompromised patients may suffer from adenoviral infection. The most common problem, caused with these infections in transplant patients is severe pneumonia which may be fatal (types 1–7). Patients, receiving liver transplants, may develop adenoviral hepatitis in the allograft.

COMPLICATIONS (otitis, sinusitis, bacterial pneumonia, pleurisy) are caused by secondary bacterial infection. They are the most common in infants with a severe course of the disease.

TREATMENT

Currently, specific therapy for adenovirus infection, other than supportive and symptomatic treatment, is not recommended. Most infections are self-limited in the setting of a normal immune response. Treatment of adenovirus infections in immunocompromised patients is widely discussed.

RHINOVIRAL INFECTION

Rhinoviral infection is the main cause of common cold.

ETIOLOGY

W. Price and W. Pelon firstly isolated and described virus in 1956–57 years. Rhinoviruses belong to family Picornaviridae, genus Rhinoviridae, which includes more than 110 serotypes and subtype 1 A. Some are cross-reacting. Antigenic drift is possible. There are 3 types of viruses: H-(human) which is cultured on the human tissue; M (monkey) — is cultured on the monkey tissue and O, which is cultured on tissue from ciliated epithelium cells.

EPIDEMIOLOGY

Rhinoviral infection is widespread disease, which account about 40 % of all cases of ARVD. Infection more frequently is registered in spring and autumn. The sources of infection are ill persons. Virus is discharged from the patients mostly on the 2–3 days of disease and up to 2 weeks. The infection is transmitted through air droplet way and close contact by large droplets. Me bers of isolated communities form highly susceptible groups. Cold in children spread more easily than do colds in adults. Virus is susceptible to drying, may be kept on the skin average 3 h.

PATHOGENESIS

The virus enters via the upper respiratory tract. Optimal temperature for replication of viruses is 33–35 °C; so maximal replication took place in nose. Viremia is absent because temperature of 37 °C kills virus. Histopathologic changes are limited to submucosa and surface epithelium of nasal cavity. These include engorgement of blood vessels, edema, mild cellular infiltration and desquamation of surface epithelium. Nasal secretion increases in quantity and protein concentration.

CLINICAL MANIFESTATIONS

The incubation period is 12–72 hours. Nasal dryness or irritation may be the first symptom of RV infection. A sore throat or throat irritation is also a common initial symptom and is frequently the most intense of the early symptoms. This is followed by nasal discharge, nasal congestion, and sneezing, which intensify over the next 2–3 days. Nasal secretions typically become thicker and colored after the first few days of illness. Other associated complaints include headache, facial and ear pressure. Systemic signs and symptoms, such as fever and malaise, are unusual.

Secondary bacterial infection may cause various **COMPLICATIONS** (sinusitis, otitis, pneumonia) sometimes supervenes.

TREATMENT

No specific treatment is available. Symptomatic treatment is used. Patients with secondary bacterial sinusitis or otitis media require appropriate antimicrobial therapy.

BOCAVIRAL INFECTION

Human bocavirus (HBoV) is one of many types of viruses that cause the common cold, respiratory infections, and gastroenteritis in humans.

ETIOLOGY

There are four genotypes in the genus Bocavirus that medical researchers have identified in the past several years since discovery of this virus in human specimens: $HBoV_1$, $HBoV_2$, $HBoV_3$, and $HBoV_4$. HBoV is a small single-stranded DNA virus in the Parvoviridae family of viruses. Health care professionals discovered HBoV in 2005 in nasal washing specimens from children with respiratory infection of unclear cause. About 3 % of the specimens contained a bocavirus now called $HBoV_1$.

Health care providers have found human bocavirus throughout the world, mostly in pediatric cases, but it is not clear how significant or common a role it plays in human disease. Physicians often find HBoV along with another respiratory virus in sick individuals, there are no known HBoV infections in animals that health researchers can study, and it is very difficult to grow HBoV in the laboratory. Like parvoviruses, young children may shed HBoV for several weeks. It may be an innocent bystander in many individuals, it may cause infections by itself, or it may add to or worsen other viral infections. Recent cases suggest that it is capable of causing disease on its own, most often in individuals with underlying lung abnormalities or weak immunity.

EPIDEMIOLOGY

Most bocavirus infections are respiratory and associated with $HBoV_1$. Symptomatic disease affects the very young, between ages 6 and 24 months. Bocaviruses can infect adults, but adults seem much less likely to have symptoms. Transmission probably occurs from respiratory secretions from a person's nose, throat, and mouth.

CLINICAL MANIFESTATIONS

The HBoV infection is clinically indistinguishable from other respiratory infections and can solely be proven by molecular assays. The spectrum of HBoV infections ranges from asymptomatic to mild upper respiratory infections up to serious and life threatening lower respiratory tract infections in all age groups. The immune response against HBoV starts with an IgM response fol-

lowed by the formation of IgG, but no lifelong immunity is generated in at least 40 % of patients due to the original antigenic sin.

HBoV is able to infect the central nervous system and it has been identified as a putative cause of idiopathic lung fibrosis supported by the fact that a set of profibrotic cytokines were upregulated during HBoV infection in adults and their HBoV dependent upregulation was confirmed in cell culture.

It is not clear what the incubation period for bocavirus infections may be. It may be shed for several weeks by asymptomatic children, and over 70 % of HBoV respiratory infections involve another virus, as well. It is not possible as yet to pinpoint when a sick person became infected with HBoV, so it impossible to determine a typical time frame between infection and start of symptoms. Human bocavirus infections have been associated with colds and upper respiratory infections, as well as gastroenteritis. Symptoms most often appear as a cold, with fever, runny nose, and cough. Diarrhea may occur with gastroenteritis.

Patients also reported wheezing and bronchiolitis, and this can progress to pneumonia (lower respiratory infection). Signs include shortness of breath (dyspnea), wheezing of the lungs on examination, blue lips (cyanosis), and low oxygen (hypoxia) in more serious disease. Medical professionals may see mild inflammation changes with bronchopneumonia on X-rays of the lungs.

Many other viruses may cause wheezing and bronchiolitis, and testing for even common respiratory viruses is not routinely available, so it is not clear how often bocaviruses may cause serious disease.

TREATMENT

The treatment for human bocavirus infections is supportive at this time. There is no antiviral treatment known to be helpful at this time.

METAPNEUMOVIRAL INFECTION

ETIOLOGY

Human metapneumovirus is a nonsegmented, single-stranded, negative sense RNA virus belonging to the Paramyxoviridae family, Pneumovirinae subfamily, and Metapneumovirus genus. The virus was first described by investigators in the Netherlands in 2001 when researchers isolated this previously unknown virus from children with bronchiolitis.

EPIDEMIOLOGY

HMPV has been shown to have worldwide circulation with nearly universal infection by age 5. Similar to influenza and respiratory syncytial virus, activity is greatest during the winter in temperate climates. Most of the available data on the clinical manifestations of hMPV infection are from studies of children where the virus causes upper respiratory tract infections, bronchiolitis, and pneumonia. Reinfections with hMPV occur throughout adult life and hMPV infection has been documented in 1–9 % of adults each year. Illness is generally

mild in young adults with serologic evidence of asymptomatic infection in many cases. Adults at highest risk of serious sequelae as a result of hMPV include the elderly, adults with underlying pulmonary disease, and those who are immune-compromised. Outbreaks of hMPV have been documented in long term care facilities with mortality of up to 50 % in frail elderly residents. In addition, 6–12 % of exacerbations of chronic obstructive pulmonary disease have been associated with hMPV and underlying lung disease is common in patients hospitalized with hMPV. Lastly, hMPV has been linked with severe idiopathic pneumonia in recipients of hematopoietic stem cell transplants. Although the true spectrum of adult hMPV remains to be defined, it is clear that hMPV can result in severe illness the frail elderly and adults with underlying diseases.

CLINICAL MANIFESTATIONS

Epidemiologic studies indicate that hMPV is a ubiquitous pathogen that infects almost all children by 5 years of age. Primary infection with hMPV occurs at a slightly older age than children with RSV. Among children hospitalized with respiratory illnesses rates of hMPV detection range from 5,5 % to 25 %. Although hMPV accounts for a significant proportion of respiratory illnesses in young children, the overall frequency is less than other childhood pathogens such as RSV. The clinical manifestations of hMPV infection in children are similar to RSV and range from mild upper respiratory infections (URI) to bronchiolitis and severe pneumonia requiring mechanical ventilation. The spectrum of disease seems to be dependent on the age and the health of the host. Fever and febrile seizures seem to be more common with hMPV than with RSV. Wheezing is another common symptom with rates ranging from 28 % to 83 %, whereas otitis media, conjunctivitis, pharyngitis, and laryngitis all occur with variable frequencies. Radiographic findings include peribronchial cuffing, patchy opacities, and hyperinflation, findings similar to those in children with RSV infection.

TREATMENT

There is no antiviral treatment known to be helpful at this time. Pathogenic and symptomatic treatment is used.

CORONAVIRAL INFECTION

Coronavirus infection — an acute viral disease that affects primarily the upper respiratory tract, expressed as rhinitis or affects the gastrointestinal tract in the form of gastroenteritis.

ETIOLOGY

Coronaviruses are species of virus belonging to the subfamily Coronavirinae in the family Coronaviridae, in the order Nidovirales. Coronaviruses are enveloped viruses with a positive-sense single-stranded RNA genome and with a nucleocapsid of helical symmetry. The genomic size of coronaviruses is the largest for an RNA virus. The name «coronavirus» is derived from the Latin coro-

na, meaning crown or halo, and refers to the characteristic appearance of virions under electron microscopy with a fringe of large, bulbous surface projections creating an image reminiscent of a royal crown or of the solar corona.

EPIDEMIOLOGY

Pathogenic for man are intestinal and respiratory coronaviruses, while dominated by respiratory, which often superficially diagnosed as the flu or SARS. Reservoir and source of infection is a sick man. The mechanism of infection is airborne and fecal-oral method. Sensitive to the pathogen is high among people of all age groups.

Coronavirus infections are quite common (up to 9.4 % of all cases of SARS). It is noted the family nature of the incidence. Mainly affects children and adolescents. For infections of this type are characterized by a seasonal occurrence with peaks in winter and spring seasons.

CLINICAL MANIFESTATIONS

Non-SARS coronavirus infections are commonly associated with acute respiratory illnesses that are usually mild and consistent with the common cold but can also result in the full range of acute respiratory illnesses including pneumonia, croup, bronchiolitis, and bronchitis. The best studied of the non-SARS coronaviruses, human coronaviruses 229E and OC43, cause respiratory symptoms, such as rhinorrhea, nasal congestion, sore throat, and cough, as well as systemic symptoms, including fever, headache, and malaise. Symptoms usually persist for about 1 week but sometimes for as long as 3 weeks. Previous infection does not induce high levels of protective immunity. Humans can be reinfected with respiratory coronaviruses throughout life, and human volunteers can be symptomatically reinfected with the same strain of coronavirus 1 year after the first infection. As with other infections, the severity of disease varies among individual patients during the same outbreak and among groups of patients during different outbreaks in the same community. Patients with compromised cardiac, pulmonary, or immune systems are at increased risk of more serious lower respiratory tract illness, and outbreaks of human coronavirus infections in elderly patients in chronic care facilities can cause severe lower respiratory illnesses and deaths.

In contrast to the mild illness associated with 229E and OC43, ***SARS coronavirus infection*** nearly always results in a serious illness that requires hospitalization, often in an intensive care unit, and a high fatality rate. Radiologic evidence of pneumonia was seen in nearly all SARS coronavirusinfected persons, and acute respiratory distress syndrome requiring admission to an intensive care unit and mechanical ventilation developed in 20 % or more of patients. Nearly 10 % of outbreak-associated patients died. The death rate was especially high, approaching 50 %, in elderly patients and patients with underlying illnesses. The initial clinical manifestation of SARS was often systemic symptoms of fever, malaise, and myalgia from 2 to 10 days (rarely longer than

10 days) after exposure. Several days after the onset of systemic symptoms, lower respiratory tract symptoms of nonproductive cough and shortness of breath were noted. Unlike patients with other respiratory virus infections, the majority of patients never experience upper respiratory tractsymptoms such as rhinorrhea, sore throat, or nasal congestion. As with other infections, the expected signs and symptoms with SARS coronavirus infection may be obscured or not present in elderly patients or patients with underlying chronic illnesses. SARS coronavirus-infected patients with severe complications also often suffered.

COMPLICATIONS associated with intensive supportive care, such as secondary bacterial infections.

TREATMENT

There are no currently available antiviral agents with demonstrated clinical activity against coronaviruses in humans.

SELF-CONTROL OF MASTERING THE TOPIC

TASK 1:

The patient of 12 years old. Was ill abrupt. Disease began from fever, rise of temperature up to 39 °C, pains in muscles and joints, a headache in frontal-temporal area and superciliary arches, pains in eyeballs. By the end of day has appeared tickle in throat. On the next day have appeared infringement nasal breathing and mucous effluent from nose, the dry often cough accompanying with pains behind sternum. On examination: face of person is puffy, hyperemic, eyes shine, and sclera is injected. Mucous of the back wall throat and soft palatine is hyperemic, edematous. Pulse — 92 per mines, satisfactory qualities. Tones of heart are muffled, rhythmical. In lung — rigid breath. Abdomen is soft, painless at palpation. The liver and a spleen are not palpated.

1. What diagnosis is most probable?

a) Meningococcal infections;
b) Epidemic typhus;
c) Influenza;
d) Leptospirosis;
e) Virus hepatitis.

2. What clinical symptoms are typical for this disease?

a) Headache in frontal-temporal area and eyeballs;
b) Disseminated headaches;
c) Tickle in throat;
d) Hoarse dry cough;
e) Pain in lumbar area.

3. What are methods of laboratory diagnostics we may apply at this disease?

a) Bacteriological;
b) Microscopy in dark field;
c) Virological;
d) Immunofluorescent;
e) PCR.

4. What drugs we may apply for specific treatments of disease?

a) Tamiflu;
b) Remantadin;
c) Penicillin;
d) Cotrimoxazol;
e) Tusuprex.

TASK 2:

The patient of 5 years old. Disease began gradually from temperature 37,6 °C, cold, dry barking cough have appeared, and then there was hoarseness of voices, which change aphonic. On examination: general condition is satisfactory. There was difficult nasal breath, moderate hyperemia of mucous pharynx and the soft palate. Pulse — 108 per mines, satisfactory qualities. In lung by auscultation from both parties — rigid breath.

1. *What diagnosis is most probable?*

a) Influenza;
b) Adenovirus infection;
c) Rhinovirus infection;
d) Parainfluenza;
e) Respiratory-syncytial infection.

2. *What symptoms are most typical for disease?*

a) Muscular pain and pain in joints;
b) Cold;
c) Rough "barking" cough;
d) Hoarseness of voice;
e) The temperature is more often subfebril.

3. What methods of laboratory diagnostics we may apply at this disease?

a) Immunofluorescent;
b) The clinical analysis of blood;
c) Bacteriological method;
d) PCR;
e) Biological test.

4. *What drugs we may apply for specific treatment of this disease?*

a) Remantadin;
b) Arbidol;
c) Euphyllin;

d) Tamiflu;

e) Codeine.

TASK 3:

Patient of P., 8 years fell ill sharply. Illness began from stuffiness in nose and increasing of body temperature to 37,8 ºС. On the next day a moderate pharyngalgia appeared during swallowing, rubbing in an area of back wall of gullet, colic and feeling of sand in a right eye. Objectively: there are hyperplasic follicles on the back wall of gullet, tonsils are moderately swollen up, hyperemic, soft elastic, painless, not soldered between itself and surrounding fabrics lymphatic knots are palpated, eye crack of right eye, ages, are swollen up, hyperemic and edematous conjunctiva

1. Formulate a preliminary diagnosis.

2. Plan of examination

3. Treatment.

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