

Dangerous infectious diseases in professional activity's conditions of medical personal

Infectious diseases – disorders of human health that result from infection caused by living pathogens (viruses, bacteria, rickettsia, fungi, helminths, ticks, other pathogenic parasites), are transmitted from infected persons to healthy ones, and tend to mass spread.

Dangerous infectious diseases – infectious diseases that are characterized by serious and/or steady disorders of health of individual patients and constitute a danger for their life and health.

Particularly dangerous infectious diseases – infectious diseases (including quarantine diseases such as plague, cholera, yellow fever) that are characterized by serious and/or steady disorders of health in a considerable number of patients, high death rate, and by fast spread of such diseases among population.

Source of infectious disease pathogen (hereinafter referred to as source of infection) – human being or animal infected with pathogens of an infectious disease.

Outburst of infectious disease – several cases of infectious disease interconnected by a common source and/or factor of infection transmission.

Epidemic – mass spread of an infectious disease among residents of a relevant territory during a short period of time.

Epidemic situation – an indicator of epidemic safety of a territory (object) during a certain period of time, characterized by the level and dynamics of human morbidity for infectious diseases, presence or absence of relevant factors of infection transmission, and by other circumstances that affect spreading of infectious diseases.

Favorable epidemic situation – either none or individual cases of infectious diseases are registered, favorable conditions for spread of such diseases being absent.

Unstable epidemic situation – level of human morbidity for infectious diseases does not exceed long-term average indicators; but favorable conditions for spread of such diseases exist;

Unfavorable epidemic situation – level of human morbidity for infectious diseases exceeds long-term average indicators, outbursts of infectious diseases being registered.

Incubation period – maximum period of time elapsing from the moment of person's infection by pathogens of an infectious disease and till emergence of initial symptoms of this disease.

Carrier of infectious disease pathogen (hereinafter referred to as bacteria carrier) – a person in whose organism infectious disease pathogens have been detected in the absence of symptoms of this disease.

Contact persons – persons that have been in contact with the source of infection, and are therefore considered infected with an infectious disease;

Quarantine – administrative and sanitary measures aimed at preventing the spread of particularly dangerous infectious diseases.

Factors of transmission of pathogens of infectious diseases (hereinafter referred to as infection transmission factors) – objects of human environment (air, soil, water, food products, food raw materials, blood, and other biological preparations, medical instruments, household goods etc.), contaminated by pathogens of infectious diseases, as well as living organisms infected by pathogens of infectious diseases that take part in transmission of pathogens of infectious diseases from the infection source to other persons.

Sanitary-anti-epidemic rules and regulations – legal and normative acts (orders, instructions, rules, provisions etc.) issued by a specially authorized central body of executive

power on health issues, and containing requirements aimed at preventing emergence and spread of infectious diseases;

Anti-epidemic measures – a complex of organizational, medical-and-sanitary, veterinary, engineering, technical, administrative, and other measures aimed at preventing spread of infectious diseases, localization and elimination of their areas, outbursts, and epidemics;

Disinfection measures (disinfection, disinsection, deratization) – measures aimed at elimination of pathogens of infectious diseases (disinfection) and their carriers, i.e. insects (disinsection) and rodents (deratization), in the environment of human vital activity.

Medical immunobiological preparations – vaccines, anatoxins, immunoglobulins, sera, bacteriophages, and other medical preparations used in the medical practice for the purpose of specific prophylactics of infectious diseases.

Prophylactic vaccinations– introduction of medical immunobiological preparations in the human organism to develop specific immunity to infectious diseases;

Calendar of prophylactic vaccinations (hereinafter referred to as vaccination calendar) – regulatory-and-legal document issued by a specially authorized central executive body on health, identifying the list of mandatory prophylactic vaccinations and their optimal terms.

Healthcare workers (HCWs) are occupationally exposed to a variety of infectious diseases during the performance of their duties. The delivery of healthcare services requires a broad range of workers, such as physicians, nurses, technicians, clinical laboratory workers, first responders, building maintenance, security and administrative personnel, social workers, food service, housekeeping, and mortuary personnel. Moreover, these workers can be found in a variety of workplace settings, including hospitals, nursing care facilities, outpatient clinics (e.g., medical and dental offices, and occupational health clinics), ambulatory care centers, and emergency response settings. The diversity among HCWs and their workplaces makes occupational exposure to infectious diseases especially challenging. For example, not all workers in the same healthcare facility, not all individuals with the same job title, and not all healthcare facilities will be at equal risk of occupational exposure to infectious agents.

The primary routes of infectious disease transmission (in U.S. healthcare settings) are contact, droplet, and airborne. Contact transmission can be sub-divided into direct and indirect contact. Direct contact transmission involves the transfer of infectious agents to a susceptible individual through physical contact with an infected individual (e.g., direct skin-to-skin contact). Indirect contact transmission occurs when infectious agents are transferred to a susceptible individual when the individual makes physical contact with contaminated items and surfaces (e.g., door knobs, patient-care instruments or equipment, bed rails, examination table). Two examples of contact transmissible infectious agents include Methicillin-resistant *Staphylococcus aureus* (MRSA) and Vancomycin-resistant enterococcus (VRE).

Droplets containing infectious agents are generated when an infected person coughs, sneezes, or talks, or during certain medical procedures, such as suctioning or endotracheal intubation. Transmission occurs when droplets generated in this way come into direct contact with the mucosal surfaces of the eyes, nose, or mouth of a susceptible individual. Droplets are too large to be airborne for long periods of time, and droplet transmission does not occur through the air over long distances. Two examples of droplet transmissible infectious agents are the influenza virus which causes the seasonal flu and *Bordetella pertussis* which causes pertussis (i.e., whooping cough).

Airborne transmission occurs through very small particles or droplet nuclei that contain infectious agents and can remain suspended in air for extended periods of time. When they are inhaled by a susceptible individual, they enter the respiratory tract and can cause infection. Since air currents can disperse these particles or droplet nuclei over long distances, airborne transmission does not require face-to-face contact with an infected individual. Airborne transmission only occurs with infectious agents that are capable of surviving and retaining infectivity for relatively long periods of time in airborne particles or droplet nuclei. Only a limited number of diseases are transmissible via the airborne route. Two examples of airborne transmissible agents include *Mycobacterium tuberculosis* which causes tuberculosis (TB) and the rubella virus which causes measles.

Tuberculosis (TB)

is arguably the most important chronic disease in the world. It affects individuals of all ages and social classes, although those affected most are the socioeconomically disadvantaged. TB can affect any part of the body, but the most significant form of the disease is pulmonary TB, as this can be infectious to others.

Definition

Tuberculosis is a disease caused by organisms classified as *Mycobacterium*. There are three main types:

Mycobacterium tuberculosis: the main cause of tuberculosis globally;

Mycobacterium bovis: causes disease in cattle and other animals, as well as in humans; and,

Mycobacterium africanum: occurs in Africa.

Modes of transmission

The most common cause of TB is from *Mycobacterium tuberculosis*. Human sputum is the most important source of *Mycobacterium tuberculosis*, which is spread through air by droplet infection from coughing, sneezing, or some other form of enforced expiration from the lungs, such as singing or shouting.

Mycobacterium bovis can be transmitted to humans from animals through the air, or indirectly by drinking contaminated milk. Control of cattle TB and pasteurization of milk largely prevents bovine TB in humans, although the disease is still found in low-income countries.

The small droplets may be inhaled and are able to reach the alveoli; they may travel via the bloodstream to distant sites where they may be reactivated later.

Those whose sputum is found to be smear positive microscopically, have the potential to infect others in close contact and should be considered potentially infective until they have completed at least two weeks of treatment (See Treatment). Those whose sputum is found to be smear negative are unlikely to infect others.

Epidemiological summary

TB represents a major health problem and in 1993 the World Health Organization declared a global emergency. In developed countries, the advent of effective anti-tuberculous drugs in the early 1950s was responsible for a decline in the mortality and number of cases of TB, and this decline continued until the mid 1980s when the incidence in disease appeared to plateau. In recent years throughout the world the number of notified cases of TB has risen.

About one third of the world's population is infected by *Mycobacterium tuberculosis*. In 1995, there were about nine million new cases of TB with three million deaths. *Mycobacterium tuberculosis* kills more people than any other single infectious agent. Deaths from TB comprise 25% of all avoidable deaths in developing countries, 95% of TB cases and 98% of TB deaths occur in developing countries. 75% of TB cases in developing countries are in the economically productive age group (15- 40 years).

The main reasons for the increasing global TB burden are:

- poverty and the widening gap between rich and poor in various populations, particularly in developing countries and in inner city populations in developed countries;
- neglect (inadequate case detection, diagnosis and cure);
- changing demography (increasing population and changing age structure); and
- the impact of the HIV pandemic.

Hepatitis B virus (HBV)

is a causative agent of hepatitis infection, which is asymptomatic in most individuals, but it can show features of fulminant, acute, or chronic hepatitis. The acute type produces serious illness and approximately 0.5% of cases are fatal. Chronic infection is often lifelong, and can lead to liver failure and hepatocellular carcinoma.

Transmission of HBV is through the parenteral route, blood transfusion products and sexual contact and vertically from infected mothers to neonates. The virus is found in body fluids such as urine, saliva, nasopharyngeal fluids, semen and menstrual fluids, and can be transmitted through contact with these fluids.

Hepatitis B virus is the most commonly transmitted bloodborne virus in the health-care setting. Transmission generally occurs from patient to patient or from patients to healthcare personnel via contaminated instruments or accidental needle-stick or sharps injuries. The virus can be transmitted directly through body fluids to mucous membranes, cutaneous scratches, abrasions, burns or other lesions. Indirect transmission can occur from surfaces contaminated with blood or body fluids to mucous membranes. HBV has been shown to survive in dried blood on surfaces at room temperature for at least a week. The risk of HBV infection among health-care workers is 3–5 times higher than in the general population: in particular, surgeons, pathologists, physicians, laboratory staff, domestic staff and nurses have the highest risk of infection. Research findings have indicated that 10%–30% of health-care workers show serologic evidence of past or present HBV infection.

Prevention

Transmission of HBV from HCW to patient can be prevented first of all by vaccination of HCW and by implementation of so-called universal precautions for infection control. Breaches of infection control, associated with a possible exposure to HBV/HCV, are still a cause of transmission. HBV carriers among HCW have to be identified by testing all medical personnel and medical students prior their entering a medical school or start of work. HCW who are not vaccinated or are non responders to vaccine should be frequently tested for possible infection during their career. HBeAg-positive HBV carriers should be recommended not to start a career in the health care system or, at least, to select a type of work where the risk of transmission is minimal or absent.