

AIRBORNE INFECTIONS

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Abstract. This article provides a complete description of the infectious periods of airborne infections, the causative agent of whooping cough, the causative agent of tuberculosis, and their prevention. The disease development cycle is highlighted. The periodic symptoms of diseases and the pattern of bacterial development are explained.

Keywords. Catarrhal period, AKDS, polymorph, streptomycin, rifampicin, PASK, immunoglobulin.

Introduction. The causative agent of chickenpox was identified in 1905 by scientists J. Bordet and O. Jangu. It is an acute infectious disease of childhood, characterized by a choking and hacking cough. The causative agent of tuberculosis is a small oval-shaped rod, slightly curved at both ends, non-spore-forming, non-motile, capsular, gram-negative, darkly staining on both sides, strictly aerobic, demanding on the nutrient medium, producing 4 proteinaceous toxins, and resistant to external environmental factors. The source of infection is a patient in the catarrhal period and carriers of the bacteria. It is spread by airborne droplets. The disease occurs mainly in children under 5 years of age. For 4-6 weeks, the pathogens are released when the patient sneezes or coughs.

Main part. There are 4 stages of whooping cough: The latent period of the disease - It lasts for 3-8 days without any symptoms, and then passes into the next period.

1. Catarrhal period of the disease - the pathogen, having entered the mucous membranes of the upper respiratory tract, multiplies, the catarrhal inflammatory process and the flu develop. The toxin produced by the pathogen affects nerve receptors in the central nervous system and the mucous membranes of the upper respiratory tract, causing coughing. During this period, a dry cough is observed, signs of bronchitis are visible, so it is difficult to make a diagnosis. It lasts 1.5-2 weeks and then moves on to the next period.

2. Acute phase of the disease - During this period, the choking and hacking cough characteristic of whooping cough occurs. Sometimes, due to repeated coughing, the patient may be unable to catch their breath and may involuntarily urinate or defecate. The patient may cough up dark glassy sputum after coughing hard. This period lasts 4-8 weeks and then progresses to the next period.

3. The period of recovery from the disease - during this period, the cough begins to become less frequent and milder, and then stops completely. This period lasts 2-4 weeks. Along with the more severe forms of the disease, there are also milder, more transient forms. The addition of influenza or pneumonia during whooping cough can lead to a more severe illness and increased mortality. Lifelong antimicrobial immunity is developed after the disease. In general prevention, it is recommended to identify the patient early, isolate him, frequently ventilate the room where the patient is staying, avoid bringing in objects with strong odors, and take the patient for walks in the fresh air. For special prevention, children are vaccinated with the AKDS (pertussis + pertussis-tetanus toxoid) vaccine from the age of 2 months and are

revaccinated up to 12 years of age. The disease is treated symptomatically. In the early stages, immunoglobulin is used, and erythromycin and ampicillin are prescribed.

The causative agent of mumps was identified by T. Klebs in 1883, and its pure culture was isolated by F. Loeffler in 1884. Mumps is an acute infectious disease characterized by fibrinous inflammation of the mucous membranes of the mouth, nose, and pharynx and general intoxication of the body under the influence of toxigenic corynebacteria. The causative agent of streptococci is a straight or slightly curved, slightly expanded, volutin-bearing, gram-positive, facultative anaerobic, strong exotoxin-producing, polymorphic, resistant bacteria, non-motile, non-spore-forming, microencapsulated, arranged in a smear like the number X or V.

There are 3 biovars of streptococci:

1. Gravis – It has high virulence, toxigenicity and invasiveness.
2. Mitis – It has lower virulence, toxigenicity, and invasiveness.
3. Intermedius - Its virulence, toxigenicity, and invasiveness are intermediate.

Research observations. The source of infection is the patient and carriers of the bacteria. It spreads through airborne droplets, airborne dust, household contact, and alimentary routes. In humans, it mainly causes inflammation of the throat and nasal passages, and in rare cases, inflammation of the trachea, bronchi, eyes, ears, vagina, and skin. The disease is more common in young children during the winter and autumn seasons. The latent period of the disease lasts 2-5 days. The pathogen, which enters the body through the mucous membrane of the upper respiratory tract or damaged skin, divides and multiplies there, producing exotoxin, which, in turn, initiates an inflammatory process and causes necrosis. As a result, a membrane containing a large number of ciliates is formed. The veil is firmly attached to the underlying tissue and bleeds when moved with a swab or spatula. Sometimes this membrane can spread to the bronchi. Since the trachea is narrow in young children, diphtheria mucus that accumulates there can block the airway and make breathing difficult. The toxin circulates in the blood and damages the cardiovascular system, central and peripheral nervous systems, kidneys, adrenal glands, and other internal organs. As a result, severe intoxication is observed, edema, necrosis, and fibrinous plaques form, the patient's body temperature rises to 38–40 C, and breathing becomes difficult. In severe cases, the inflammatory process in the mucous membrane spreads through the nasopharyngeal mucus to the bronchi, causing asphyxia and paralysis of the soft palate and heart muscles. Goiter is a toxicoinfection. After the disease, antitoxic and antibacterial passive immunity is formed, therefore, relapse of the disease is observed in 6-7% of cases. Breastfed babies do not get sick because they have passive immunity passed on from their mother. General prevention includes early identification, isolation, treatment, and disinfection of patients and carriers of bacteria. For special prophylaxis, children are vaccinated with ADT toxoid starting at 2 months of age. Revaccination is carried out with ADS. Treatment is with antitoxic serums, antibiotics and sulfonamides. Mycobacterium tuberculosis was discovered by R. Koch in 1882. Mycobacterium tuberculosis is a slender rod-shaped, polymorphic, non-motile, non-spore-forming, Gram-positive, aerobic, fastidious, endotoxin-producing, non-spore-forming, and resistant bacterium.

Common Airborne Diseases

Disease	Causative Agent
Tuberculosis (TB)	<i>Mycobacterium tuberculosis</i>
Measles	Measles virus
Chickenpox	Varicella-zoster virus

COVID-19	SARS-CoV-2
Influenza (Flu)	Influenza virus
Whooping cough	<i>Bordetella pertussis</i>

Airborne infections are infectious diseases that spread through the air by tiny particles released from an infected person. When a person coughs, sneezes, talks, laughs, sings, or even breathes, microscopic droplets and aerosols containing viruses or bacteria are expelled into the air. Larger droplets usually fall to the ground within a short distance, typically within one to two meters, while smaller particles known as aerosols can remain suspended in the air for longer periods and travel greater distances, especially in poorly ventilated indoor spaces. When another person inhales these contaminated particles, the microorganisms can enter the respiratory tract and cause infection.

Airborne transmission is particularly dangerous because it does not require direct physical contact. A person can become infected simply by sharing the same air in an enclosed environment with an infected individual. Crowded places such as schools, hospitals, public transportation, offices, dormitories, and marketplaces are high-risk environments for the rapid spread of airborne diseases. Poor ventilation significantly increases the risk because infectious particles accumulate in stagnant air. Environmental factors such as humidity, temperature, and airflow also influence how long pathogens remain infectious in the air.

Several serious diseases are transmitted through airborne routes. Tuberculosis is caused by *Mycobacterium tuberculosis* and spreads when infected individuals release bacteria into the air through coughing. Measles is one of the most contagious viral diseases and can remain infectious in the air for up to two hours after an infected person leaves a room. Chickenpox, caused by the varicella-zoster virus, spreads easily among children and non-immune adults. Influenza viruses circulate seasonally and spread rapidly in communities. COVID-19, caused by SARS-CoV-2, demonstrated globally how airborne pathogens can lead to pandemics, affecting millions of people within a short period. Whooping cough, caused by *Bordetella pertussis*, also spreads through respiratory droplets and aerosols.

Conclusion. The source of infection is a patient, and in some cases a sick animal. It spreads through airborne droplets, airborne dust, and rarely alimentary and vertical routes. Tuberculosis occurs in the lungs, stomach, intestines, kidneys, brain, and bones. When transmitted through airborne droplets or airborne dust, the tuberculosis pathogen forms a lump in the primary focus. Giant leukocytes harbor tuberculosis pathogens within their tissues. When the body's resistance to disease is high, the bacteria are surrounded by connective tissue. The pathogens inside it remain alive and this is also called the "Gona's Hotbed". This form of the disease is considered a closed form, in which the pathogens do not leave the body. When the body's ability to fight the disease weakens, the connective tissue in the lump, due to the lack of blood vessels, undergoes necrosis and forms cavities, damaging other tissues. As a result, the lump resembles a pimple. This shape is considered an open shape. The pathogen is absorbed into the bloodstream and spreads throughout the body. Now the pathogen begins to emerge into the external environment. Often the disease takes a chronic form and infectious immunity is formed. Promptly diagnose the disease and separate the sick from the healthy. For specific prophylaxis, the live BST vaccine, obtained by French scientists Calmette and Guérin, is used.

Antibacterial drugs: streptomycin, rifampicin, PASK, ftivazid, etc. are given. Patients are admitted to the dispensary, family members are examined, and patients are treated in sanatoriums and resorts. The population should undergo a medical examination once a year.

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