

# COUGH IN CHILDREN. A MODERN APPROACH TO TREATMENT

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**Abstract.** *Cough is one of the most common manifestations of childhood diseases. It is the cough that becomes the main reason for seeking medical help. The article touches upon the modern view of the problem of cough in pediatric practice and the ways of treatment. The epithelium of the respiratory tract, which is a complex multicellular layer extending from the nasopharynx to the small airways, and functions as an immune respiratory barrier at an early age: it develops, matures and regenerates to adapt to changes in the environment. Cough is a protective reaction of the immune system to ingestion of various allergens and pathogens. It is not always a sign of any disease, especially in early childhood. In order to understand whether cough treatment is required in newborns and infants or whether it is simply necessary to adjust the lifestyle, you need to understand the probable causes of the condition.*

**Keywords:** *cough, children, respiratory tract epithelium, immunity, antitussive remedy.*

Cough is a protective and adaptive reaction of the body aimed at removing foreign substances and/or pathologically altered tracheobronchial secretions from the respiratory tract. A doctor of any specialty may face diagnosis, identification of the cause and treatment of cough in pediatric clinical practice, but most often patients seek primary medical care from a district pediatrician. The article examines the problem of cough in pediatric practice from the point of view of modern ideas about the etiology, pathogenesis and treatment approaches. The most likely culprits of coughing in babies are acute respiratory viral infections (influenza, adenovirus, etc.). They affect the upper or lower respiratory tract, causing sputum formation. The body, in an effort to get rid of mucus, triggers a defense mechanism in the form of a cough. Other possible causes may be allergic reactions, primary bacterial infections such as whooping cough, tuberculosis, or secondary bacterial complications of acute respiratory viral infections such as pneumonia, bronchitis, and others.

The culprits of dry and wet cough in an infant are sometimes:

the air in the room where the baby is too dry and warm;

dust;

harsh, suffocating odors, such as the fragrance of laundry detergent or conditioner, air freshener, perfumes, scented candles and oils;

posterior rhinitis is a disease in which mucus flows down the back wall of the pharynx, causing reflex coughing, especially in the supine position;

increased salivation;

regurgitation;

general or local hypothermia of the body.

In some cases, persistent coughing can signal pathologies of the cardiovascular system, reflux disease and ingestion of a foreign body into the respiratory tract. One of the most important criteria determining the diagnostic search is the duration of the cough. Currently, it is customary to distinguish an acute cough with a resolution duration of 1-3 weeks, subacute, or prolonged,

which lasts from 3-4 to 8 weeks, and chronic — more than 8 weeks. Acute cough in 90% of cases occurs due to acute infections of the upper and lower respiratory tract and causes up to 35% of visits to a pediatrician. The cause of subacute (postinfectious) cough is often bronchial hyperreactivity, the development of tracheobronchial dyskinesia due to a previous infection: viral, *Mycoplasma pneumoniae* or chlamydia (*Chlamydophila pneumoniae*). Chronic cough most often occurs as a symptom of various bronchopulmonary diseases (bronchial asthma, chronic obstructive pulmonary disease, chronic bronchitis) and causes from 10% to 38% of requests for medical help from a pulmonologist. Gastroesophageal reflux can be a common cause of chronic cough in children. Also, psychogenic cough occurs mainly in school-age children.

Knowledge of the basic anatomical and functional differences of the respiratory tract in children and adults contributes to the understanding of various respiratory symptoms and painful conditions in childhood. It is necessary for the diagnosis, treatment and prevention of acute and chronic respiratory diseases. Recently, additional cellular subtypes and functions have been identified, which in general has significantly improved the understanding of the work of the epithelium of the respiratory tract during normal and during illness. It became clear that there are at least 7 subcellular populations with different molecular programs and functions inside the pseudomolayer respiratory epithelial barrier. The dynamic multicellular structure of the epithelium of the respiratory tract makes it possible to adapt to the environment. The respiratory barrier must have plasticity during the processes of development and maturation, as well as regeneration in case of damage. One of the most important compensatory processes in the epithelium is the differentiation of progenitor cells into ciliated or mucus-forming cells. It has been shown that differentiation based on the implementation of a genetically determined program determines the fate of ciliated or goblet-shaped cells depending on environmental influences. The epithelium of the respiratory tract means much more than just a protective cellular layer. The identification of multiple immune functions of the upper and lower respiratory tract epithelium has revolutionized our understanding of respiratory immunity, especially in relation to the mucosal barrier. Exposure to pathogens (viral or bacterial) and/or allergens and environmental irritants at an early age has been shown to determine the risk of many respiratory diseases, including asthma, later in life. To a large extent, this risk depends on the structural and functional integrity of the epithelium. Thus, progress in understanding its biology represents an important step in the prevention and treatment of respiratory diseases.

A statistical analysis of the causes of seeking medical help showed that up to 30% of visits to a general practitioner and more than half of all requests from parents for help to a pediatrician are related to cough complaints (data from the European Respiratory Society and the Scientific Society of Pediatric Pulmonology and Allergology, Germany). At the same time, cough is a difficult diagnostic problem, as it can be caused by about 55 causes.

Treatment of cough in children should begin with the identification of its cause and a correct diagnosis. A thoughtful attitude of the doctor towards prescribing drugs is mandatory, excluding a template approach. The choice of the drug and the principles of therapy should be clearly differentiated depending on the type of pathological process. The start of therapy should be timely, and the course should be sufficient in duration. Most often, cough in children is caused by increased viscosity of bronchial secretions, that is, a violation of the "sliding" of sputum along the bronchial tree, and insufficient activity of the atrial fibrillation. Cough is a protective mechanism of the body that promotes the excretion of sputum, but usually one cough is not

enough. The main task of treating a productive cough is the dilution of sputum, bronchial secretions and its excretion. It is in this situation that mucolytics help. Effective antitussive therapy in children should not consist in suppressing cough, but in transferring it from unproductive to productive. Ultimately, this will lead to an improvement in the drainage function of the bronchi, to the restoration of airway patency. Currently, one of the most well-known mucolytics is ACC® (acetylcysteine), a derivative of the amino acid cysteine. The main mechanism of action of acetylcysteine is a proven pronounced mucolytic effect. In addition, it has an antioxidant, detoxifying effect, and in recent years, another very interesting property of it has been revealed and proven — inhibition of the adhesion of the pathogen to the mucous membrane of the upper respiratory tract. That is, the drug is not only a mucolytic, but also has a complex effect on many mechanisms of inflammation of the upper and lower respiratory tract. Acetylcysteine breaks the bonds of mucopolysaccharides of sputum and helps to reduce the viscosity of mucus, dilutes and facilitates its removal from the bronchial tract. Thus, it has a direct mucolytic effect. This is the main difference between acetylcysteine and other mucolytics used.

Acetylcysteine promotes the dilution and excretion of sputum by direct action, but the amount of sputum does not increase. In contrast, indirect mucolytics dilute sputum, but at the same time its volume increases, which is not very good in children's practice. In addition to the mucolytic effect and the effect of sputum on the mucous membrane, it has been proven that acetylcysteine also dilutes pus, stimulating the synthesis of secretions of mucosal cells that lyse fibrin and blood clots, which makes it possible to use it not only for coughing, but also for diseases of the paranasal sinuses. The next very important property of acetylcysteine is antioxidant. The drug is a powerful antioxidant that has both direct and indirect effects even in very low concentrations. It is the antioxidant properties of acetylcysteine that have been recognized as an important factor that has an additional effect on the treatment of pathological processes in the lungs, which creates advantages when using ACC® (acetylcysteine) in inflammatory diseases of the pulmonary system. From a practical point of view, the adhesion stage is the most important, since bacteria that are protected by a matrix film are inaccessible to many antibiotics and the immune system. In children with repeated acute infections, a viral-bacterial association of the disease occurs in 80-90% of cases, 60% of patients develop bacterial complications, in which these biofilms are formed. The most promising currently is the use of antibiotics, but not all, but those that destroy the structure of the biofilm (a group of macrolides) or penetrate through it (fluoroquinolones). However, fluoroquinolones are very rarely used in children's practice. The second group of drugs are direct mucolytics, which can affect the adhesion of bacteria and destroy the structure of the biofilm, enhancing the activity of antibiotics. The strongest link in this scheme is adhesion blocking.

Currently, cough remains a socially significant problem in the health care system. In most cases, cough, which occurs as a symptom of ORI, does not require active medical interventions, since it has a benign and self-canceling course. On the other hand, this is the most common complaint with which patients often go to the doctor, spend large amounts of money on treatment, and with a complicated course of the disease may need hospitalization. Symptomatic treatment of acute cough with antitussive drugs is often necessary to improve the quality of life, restore physical and social activity, and prevent the development of prolonged and chronic cough.

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