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**Phytogenic drugs at cough in children**

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*Cough in children is an urgent problem not only due to its high frequency and non-specificity, but also because of a multitude of drugs available for treating it. In most cases, cough therapy is aimed at improving bronchial drainage function and facilitating sputum discharge. Expectorative and mucolytic drugs are most often used for this purpose. Phytogenic expectorative drugs are widely used in pediatric practice due to their efficacy and safety of use in children.*

***Keywords:*** *cough, phytogenic drugs, children.*

Cough is one of the most frequent symptoms of acute respiratory viral infections (ARVI) in childhood and one of the most widespread complaints of parents to doctors. Cough causes alarm in parents and doctors and in individual cases requires a long diagnostic search [1, 2].

Most often cough occurs in patients with bronchopulmonary pathology, but may also be observed at several diseases of cardiovascular system, gastrointestinal tract, central nervous system lesion, metabolic disorders and in other rarer clinical situations. Moreover, drugs (their side action), toxic and mechanic action (inhalation of toxic substances, irritants – smoke, dust; endobronchial foreign body; aspiration) may cause cough.

Cough is a unique defense mechanism that secures evacuation of secretion and pathological agents from the airways.

This symptom results from the irritation of cough receptors of nose, back of the throat, trachea, bronchi and *n. vagus* receptors, which innervate external ear, pleura, diaphragm, pericardium, esophagus and stomach. Cough receptors are represented by 2 types of nerve endings: by irritant receptors and C fibers. Irritant receptors located in airways’ proximal segments react to external (mechanic, thermic and chemical) irritants. Irritant factors are: inflammatory (mucosal edema, pathological secretion), mechanic (foreign body, enlarged lymph nodes and space-occupying lesions in mediastinum), chemical and thermal. C-receptors are mainly located in distal respiratory tracts segments and are stimulated by different antiinflammatory transmitters (prostaglandins, bradykinins, substance P etc.). Irritation of cough receptors leads to the transmission of nerve impulses to cough center of medulla oblongata; as a result of cough center irritation a response is formed – a deep breath, and then a synchronic contraction of laryngeal, bronchial, thoracic, abdominal and diaphragmatic muscles with the closed fissure of glottis and its subsequent opening and short, forced jerky exhalation [2-5].

Cough may also be of central origin: at pertussis, mental disorders.

As is known, cough origin mechanisms and clinical manifestations are largely the same in children and adults. However, there are differences caused by the immaturity of airways, muscles of respiration, thorax structure, breathing control peculiarities and immaturity of respiratory reflexes in small children [3, 4].

It is important, though, that cough may also be observed in completely healthy children, as it is a physiological reflex. The studies proved that healthy children have 10 short cough impulses per day at the average, mainly in the daytime. Their number at ARVI may increase; the cough period also extends to 2-3 weeks; this is not a sign of pathology [4, 5].

Cough is classified as follows:

* by character – productive (also called wet, with sputum discharge) and non-productive (dry);
* by duration – episodic, short-term, paroxysmal and constant;
* by course – acute, protracted, chronic.

It is generally assumed that acute cough lasts for 1-3 weeks, protracted – more than 3 weeks, chronic – more than 3 months.

Taking anamnesis of a patient with cough it is necessary to pay attention to the time the symptom appears, pain sensations accompanying cough, connection with physical stress and contact with allergens.

Sputum at cough is an important sign, as cough non-productivity may be caused by the cough reflex reduction, high sputum viscosity, insufficiently deep breathing, bronchial blockade and other causes. Sputum character and color at productive cough are often pathognomonic for one or another disease. Purulent (yellow-greenish) sputum is, as a rule, characteristic of airways’ infections caused by bacterial flora; sputum is viscous and glassy at bronchial asthma; rubiginous sputum usually occurs at heart failure, while purulent and fetid often occurs at lung abscess and bronchiectases.

It is necessary to differentiate between cough causes in children. The diagnostics is usually not very complicated at acute cough; examination and physical examination often give comprehensive information as well, while chronic cough requires comprehensive and complex examination [2-6].

The most frequent cause of acute cough is acute respiratory infections of upper and lower airways, while chronic cough may be a symptom of a range of pathogenetically different diseases – bronchial asthma, chronic bronchitis, bronchial tumor, interstitial pulmonary diseases, tuberculosis, lung cancer, metastatic tumors, mediastinal tumor, mitral stenosis, aortic aneurysm, left ventricular failure, gastroesophageal reflux, postnasal syndrome, mental disorders etc. [2]. Protracted cough after an acute respiratory infection may be caused by bronchial hyperreactivity resulting from postinfectious bronchial inflammation.

Cough treatment should begin with the suppression of its causes. It should be remembered that the treatment should not boil down to cough suppression.

All drugs used to treat cough are distinguished into mucolytics, antitussive and expectorative drugs according to the mechanism of action.

**Mucolytic drugs** are: bromhexine, acetylcysteine, carbocisteine, ambroxol etc. Mucolytics efficiently thin sputum affecting bronchial secretion’s gel-phase without considerably increasing its amount; this favors quick airways’ clearance of the accumulated viscous bronchial secretion. This leads to the fast pathological process’s termination. It should be noted that some mucolytic drugs have several dosage forms (inhalation, oral, endobronchial etc.), thus they may provide different methods of drug’s delivery, which is especially important at the complex cough therapy in children [7]. A number of medicinal plants also have mucolytic features, e.g., thyme, plantain, primula veris, anise, origanum, marsh-mallow, licorice etc.

A group of **antitussive drugs** is subdivided into central and peripheral action drugs.

Mechanism of the central action antitussive drugs is based on the suppression of functional activity of the cough center in medulla oblongata. This group involves narcotic effect drugs and non-narcotic antitussive action drugs of analgesic, sedative and mild spasmolytic effect. Drugs of this group have a big number of side effects; this restricts their application in pediatric practice due to a possible respiratory center suppression and respiratory volume reduction [6, 7].

Antitussive drugs are, as a rule, prescribed at dry frequent cough, which may lead to emesis, sleep and appetite disturbance.

The mainly used antitussive drugs in children with pertussis, dry pleurisy, thorax injuries are non-narcotic central action drugs. An indication to their prescription is the need in suppressing cough reflex.

Peripheral action antitussive drugs may affect only afferent or only efferent cough reflex components, or have a combined effect. Drugs of this group reduce secretion production and its viscosity, relax smooth bronchial muscles [8].

**Expectorative drugs** (alkaline solutions, phytopreparations) reflectively increase the bronchial mucous glands’ secretion, reduce bronchial secretion’s viscosity and increase its volume. Phytogenic drugs are very widely used in pediatric practice.

Medicinal plant therapy is one of the most ancient methods in medicine and it is still relevant. Despite the presence of highly effective synthetic drugs, phytotherapy maintains its position. The groups of medicinal plants used against one or another pathology have been formed in the process of centuries-long empirical selection. Unlike pharmacological drugs, medicinal plants consist of a range of components; that is why 1 plant may have versatile action, e.g. expectorative, antimicrobial, antiinflammatory or diuretic. Another interesting distinction of phytogenic drugs from their synthetic analogs is the possibility of a simultaneous combined use of different medicinal plants. Complementarity and mutual intensification of therapeutic effects of the components comprising the mixture occur in case of the correct selection of phytocombinations; undesirable reactions may also be smoothed over or eliminated [9].

A wide group of plants has long been used to treat cough. This article considers only those of them, which are included in the phytogenic drug produced in a dosage form, which is convenient to use in children – in the form of syrups of 2 types: Herbion primula syrup and Herbion plantain syrup (KRKA, Slovenia). The drugs have been devised taking into consideration the latest pharmaceutical achievements; this guarantees the standardized composition of syrups, stability, efficacy and safety of action of their components [10].

The primula syrup contains primula veris root extract, common thyme extract and levomenthol.

Primula veris has an expectorative, antimicrobial and antiinflammatory action. It also has a spasmolytic action and is capable of intensifying gastric juice secretion.

Thymus serpyllum (or thyme) has a pronounced antimicrobial action due to thymol; moreover, thyme has long been used as an expectorative, mucolytic and spasmolytic drug.

The particular relevance of primula and thyme in treating productive cough with difficult-to-discharge sputum is caused by a combination of expectorative, mucolytic, antiinflammatory and antimicrobial action of these plants. Levomenthol (from Latin *Mentha* – mint) has a bactericidal action caused by the coagulation of microbial cells’ proteins. It also has an antiinflammatory, local anesthetic and analgesic action, thus favoring the alleviation of irritation and pain in the throat.

Plantain syrup consists of an aqueous ribwort plantain (*Plantaginis lanceolata herbae*) extract, aqueous mallow (*Malva sylvestris*) flower extract and ascorbic acid. The drug contains sucrose, methyl parahydroxybenzoate and orange oil as concomitant components and has fine organoleptic properties.

Ribwort plantain is close to common plantain in terms of composition and action. It has expectorative, antimicrobial action, facilitates mucus removal from bronchi, normalizes digestion, stimulates regenerative processes in mucous tunics and skin and intensifies gland secretion, which is especially relevant at dry poignant cough in the early acute respiratory infection period. Mallow flowers contain a big number of substances with coating property; moreover, it also contains tanning agents. The mallow flower and plantain extracts’ reactants secure coating and antiinflammatory action, which lead to the facilitation of dry obtrusive cough. Vitamin C found in this syrup favors strengthening of vascular walls and body intoxication reduction.

Herbion drugs’ effect complexity secures their efficacy in most patients already by the 3rd therapy day and lowers the need in using additional drugs.

Herbion syrups are recommended to use in children of 2 years of age and older. The drug must be washed down with a sufficient amount of warm water.

Thus, phytogenic syrups Herbion act as expectorative, mucolytic and antiinflammatory drugs due to their balanced composition. These syrups may also be used in combined therapy, even with antibiotics (if needed), to treat cough in children due to their high compatibility with other drugs.

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