

SORE THROAT

Sore throat is a frequent symptom associated with acute respiratory viral diseases (cold).

Most frequent sore throat causes:

- Angina (acute tonsillitis: acute infectious disease with predominant lesion of the tonsils) – severe pain during swallowing is common, it is accompanied by performance disturbance, fever, cervical lymph nodes size increase (lymphadenopathy).
- Chronic tonsillitis (long-lasting inflammatory process in the tonsils) – sore sensation in the throat, foreign body sensation in the tonsils area, bad breath, minor pain during swallowing, low-grade fever (subfebrile mildly increased body temperature), cervical lymph nodes size increase.
- Pharyngitis (acute or chronic inflammation of pharyngeal mucosa) – pain during swallowing is common. The pain is more intense during saliva swallowing compared to food swallowing.
- Laryngitis (larynx and vocal cords inflammation) – sensation of dryness, soreness, scratching in the throat is common, hoarseness, dry **whooping** cough.

The most threatening pathogen is the group A β -hemolytic Streptococcus (it is also the scarlet fever pathogen). Sometimes diphtheria bacillus is isolated (it is also the diphtheria pathogen). In Streptococcus angina serious complications such as rheumatism, glomerulonephritis, in diphtheria angina nervous, cardiovascular systems, post-streptococcal glomerulonephritis can occur.

If an OTC-drug for sore throat symptomatic treatment is used it is necessary to identify if the patient has any **threatening* symptoms* that allow to suspect a serious disease which requires a doctor's consultation. These symptoms are:

1. Labored (hard to breathe) breathing, being unable to say several words between inspirations
2. Inability to swallow saliva
3. Sharp tonsils enlargement, plaque and tonsils ulceration
4. Bright **blazing** throat redness
5. Lymph nodes enlargement and soreness during palpation
6. Temperature rise up to 38,5-39°C
7. Sore throat associated with skin rash
8. Sore throat associated with severe headache, ear pain, stomachache
9. Sore throat associated with urine color change

In absence of these **threatening** symptoms a symptomatic treatment is done and the pharmacist proceeds to the next stage of pharmaceutical care – choice of symptomatic treatment direction and definition a pharmacological group.

Symptomatic treatment directions in patients with sore throat complaints:

- gargling with astringents
- gargling with antiseptic remedies
- local administration of antiseptic, herbal and homeopathic medicines in the form of candies and lozenges

OTC-drugs used in sore throat: conditions of their rational administration

The pharmaceutical companies propose a lot of OTC-drugs for symptomatic sore throat treatment. Most often the active ingredients are mild antiseptics, essential oils, and in some cases local anesthetics and anti-inflammatory substances.

Main active ingredients contained in OTC-drugs for symptomatic sore throat treatment

| Active ingredient | Pharmacological characteristics |
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| Ambazone | Provides topical antimicrobial (bacteriostatic) effect |
| Amylmetacresol | Provides bactericidal effect against gram-positive and gram-negative microorganisms, anti-fungi activity |
| Acetylamino nitropropoxy benzene | Disinfectant, mild topical anesthetic and deodorizing effect. Inhibits cough and gag reflex (The gag reflex, also known as the pharyngeal reflex or laryngeal spasm, is a contraction of the back of the throat triggered by an object touching the roof of the mouth, the back of your tongue, the area around the tonsils, or the back of the throat.) |
| Biclotymol | Possesses antibacterial activity against Staphylococcus, Streptococcus, Micrococcus and Corynebacteria. Beside antibacterial effect, it provides anti-inflammatory and topical anesthetic effect. |
| Benzalkonium chloride | Lozenges containing benzalkonium chloride are used for the treatment of superficial infections of the mouth and throat. Benzalkonium chloride is a quaternary ammonium antiseptic and disinfectant with actions and uses similar to those of other cationic surfactants. Provides bactericidal action on gram-positive and gram-negative microorganisms, fungicidal action on Candida albicans |
| Benzoxonium chloride | Provides bacteriostatic and bactericidal effect |

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| | against gram-positive, and less against gram-negative bacteria. Possesses anti-fungi and mild anti-viral activity. It enters into the pathogenic cells. |
| Hexetidine | Has a wide range of antibacterial and anti-fungi action. Provides only a local activity, is not absorbed into systemic blood circulation. |
| Dequalinium chloride | Provides bactericidal and fungistatic activity. Range of action includes gram-positive and gram-negative bacteria, fungi, spirochetes. |
| 2,4-dichlorobenzyl alcohol | Provides topical antiseptic effect and possesses mild anti-viral activity |
| Thymol | Provides antibacterial and anti-inflammatory effect |
| Chlorhexidine | Antiseptic for external use only. Provides rapid bactericidal activity against gram-positive and gram-negative bacteria, Trichomonada, gonococcus (Neisseria gonorrhoeae). Simultaneous administration with iodine preparations is not recommended. |
| Cetylpyridinium | Inhibits some bacteria, fungi and viruses growth. |
| | Other antiseptics |
| Iodine, Povidone-Iodine | Possesses pronounced bactericidal, fungicidal, sporocidal, selective anti-viral activity, is active against protozoa |
| | Local anesthetics |
| Benzocaine | It is characterized by a rapid effect |
| Dibucaine | Provides rapid topical anesthetic effect. In local administration systemic resorption is insignificant. |
| Lidocaine | Causes topical anesthesia during 60 minutes and in some preparations up to 3 hours, does not have local irritating effect. |
| Tetracaine | Topical anesthetic |
| Chlorobutanol | In topical administration possesses moderate antibacterial, anti-fungi, anti-inflammatory effect, and mild local anesthetic (analgesic) effect as well. In systemic administration it depresses central nervous system and induces sedation. |
| | Essential oils |
| Eucalyptus oil | Provides topical anti-inflammatory and mild antiseptic effect. It has mild sedative effect. |
| Aniseed oil | Provides topical anti-inflammatory and mild antiseptic effect. |
| Peppermint oil | It works by providing a cooling feeling and |

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| | increasing saliva secretion in the mouth. These effects are mediated by the menthol. Possesses mild deodorizing effect. |
| Anethole | Antiseptic of natural origin obtained from aniseed oil, potentiates antibacterial effect of dichlorobenzyl alcohol. |
| Menthol | Possesses mild antiseptic properties, mild anesthetic and deodorizing effects. |
| | Anti-microbial remedies |
| Lysozyme chloride | It is a natural non-specific organism resistance factor of mucopolysaccharide structure. It shows antibacterial activity against gram-positive and gram-negative bacteria, viruses, fungi. It has a local anti-inflammatory effect. |
| Nitrofurantoin (Furacilin) | Nitrofurantoin derivative. Possesses bacteriostatic activity. |
| Gramicidin C | Antibiotic, possesses bacteriostatic and bactericidal effect. |
| Sulfanilamide soluble (streptocide) | Antibacterial remedy of sulfonamides group, possesses bacteriostatic effect. |
| Sulfathiazole (norsulfazole) | Antibacterial remedy of sulfonamides group, possesses bacteriostatic effect against gram-positive and gram-negative bacteria. |
| Tyrothricin | Combination of various cyclic and linear polypeptides showing anti-bacterial activity; contains up to 70-80% of tyrocidines (main cyclic decapeptides) and up to 20-30% of gramicidins (neutral linear pentadecapeptides). It is active against gram-positive bacteria <i>Staphylococcus haemolyticus</i> , <i>Streptococcus pyogenes</i> , <i>Streptococcus viridans</i> , <i>Enterococcus faecalis</i> , <i>Diplococcus pneumoniae</i> , <i>Corynebacterium</i> spp., <i>Neisseria meningitidis</i> , some strains of <i>Neisseria gonorrhoeae</i> , <i>Trichomonas</i> , and against some gram-negative bacteria as well, against many types of fungi including <i>Candida</i> . Tyrothricin shows bactericidal activity against microorganisms like <i>Clostridia</i> . Like cationic detergents tyrothricin destroys bacterial cells membranes. Due to this tyrothricin mechanism of action, unlike systemic antibiotics, cross resistance does not arise. |
| | Others |
| Ascorbic acid | Water-soluble vitamin. Natural antioxidant, increases organism resistance to infections. |

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| Benzydamine chloride | Possesses anti-inflammatory and topical anesthetic effect. |
| Flurbiprofen | Shows anti-inflammatory and analgesic effect. |
| Choline salicylate | Possesses anti-inflammatory, analgesic and mild bactericidal effect. |

Clinical pharmacological characteristics of OTC-drugs used in symptomatic sore throat treatment

For the symptomatic sore throat treatment active ingredients are used in special forms for topical administration: aerosols (sprays), lozenges, dragees, solutions for gargling.

Aerosol medicines for symptomatic sore throat treatment

The main advantage of the aerosol form use is the delivery of a high concentration of the active ingredient at the local site of the inflammation.

It is recommended to rinse your mouth with warm water before use. In pharynx and larynx diseases aerosol cans without metering valve are used. The safety cap is removed from the spray gun (or wear the nebulizer supplied with the drug). Press 2-3 times until the solution is in the nebulizer and start to spray after pressing. Once the nebulizer is introduced into the mouth, press the base of the nebulizer and hold your breath. This is done once to the right side, once to the left side. The medicine should be kept in the mouth for 3-5 minutes, no liquid or food intake is allowed within 1-2 hours after the administration. The spray-applicator should be washed with hot water before and after use.

Aerosols for sore throat treatment should not be inhaled. So, this medicine form can be administered only in children over the age of 6-8, when they are capable to manage their breath, the child does not refuse the introduction of a foreign object into the mouth and is ready to cooperate.

Aerosols are contraindicated in patients with COPD (chronic obstructive pulmonary diseases).

Lozenges, dragees for symptomatic sore throat treatment

These dosage forms are indicated for topical use. Lozenges should be kept in the mouth until total dissolution. It is strictly forbidden to chew them.

Beside an active ingredient medical lozenges contain sweeteners (sugar or sorbitol) and flavors (cherry, lemon, honey). These excipients give these medicines a nice refreshing taste. Special production technology provides an extended release of the active ingredients in the mouth and thus a prolonged local effect of the active ingredient.

In patients with diabetes doctor's consultation is required before prescribing drugs in this dosage form, especially when the sweetener is sugar. Lozenges can be prescribed to children when they are able to suck them independently. Attractive and confectionery-looking lozenges should be kept away from children to prevent poisonings in case of large amount intake. No liquid or food intake is allowed within 1-2 hours after the administration.

OTC-drugs for sore throat treatment characteristics

| Ingredients | Trade name | Form | Application features |
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| Ambazone | Faringosept | Lozenges | It is recommended to refrain from food and liquid intake for 3 hours |
| Biclotymol | Humex Hexaspray | Lozenges, Spray | Very slow absorption through mucous membranes provides prolonged medicine presence in the mouth cavity. Adults and children over 2 years old are prescribed 2 sprayings per day. Prolonged (over 5days) administration can lead to normal mouth cavity microflora disturbance. Any other antiseptics administration should be excluded (unwanted interaction risk). |
| Benzalkonium chloride | Beechams | Lozenges | Can be used in pregnant and lactating women |
| Benzydamine hydrochloride | Septabene Diffлам | Lozenges, Spray Mouthwash | Numbness and burning sensation can be observed in mouth cavity, allergic rash. It is contraindicated for children under the age of 4. It is recommended for patients who cannot gargle the throat. Can be used in pregnant and lactating women except the mouthwash because it contains over 10 % of ethanol. |
| Hexetidine | Hextril | Mouthwash, Spray | 10-15 ml of undiluted solution is used for gargling, repeating the procedure 2-3 |

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| | | | times a day. In children the local treatment is applied using a cotton swab. It is not recommended for children under the age of 6. *Stopangin* has hemostatic, analgesic, enveloping effects. |
| Gramicidin C | Gramidin Neo | Lozenges | Contraindicated in pregnancy. |
| Povidone-Iodine | Betadine, Iodex Bucc | Mouthwash | Contraindicated in case of hypersensitivity to iodine, hyperthyroidism, thyroid adenoma, in infants, in pregnant women starting 3 rd month of pregnancy, lactating women. Discoloration of the solution is accompanied by reducing of its antibacterial effect. In prolonged use iodism symptoms may develop. |
| Flurbiprofen | Strefen Strepsils Dolo | Lozenges Spray | Maximal daily dose is 5 lozenges (43,75 mg). It should not be administered more than 3 days. It is contraindicated in children under the age of 12, in pregnant women, in case of gastrointestinal tract diseases, asthma |
| Chlorhexidine | Medica Corsodyl Medica | Spray Mouthwash Lozenges | Not recommended for children under the age of 5. Does not contain sugar. |
| Choline salicylate | Bonjela Teejel | Mouth gel | Should be used in caution in children under the age of 12, in case of gastrointestinal tract diseases, asthma, in patients with phenylketonuria (contains aspartate). It is also used for mouth ulcers treatment. |
| Cetylpyridinium | Cepacaine | Mouthwash | Contraindicated in children |

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| chloride | Codral | h Lozenges | under the age of 4. It should not be used in case of mouth cavity damage. Simultaneous administration with milk is forbidden. |
| Complex antiseptics | | | |
| Amylmetacresol+ 2,4-dichlorobenzyl alcohol | Strepsils Neo-Angine | Lozenges Spray | Natural ingredients, contained in the medicine, reduce throat soreness and provide additional healing activity. In case of several tablets intake discomfort in the stomach is possible. |
| Amylmetacresol+ 2,4-dichlorobenzyl alcohol+Lidocaine | Strepsils Plus | Lozenges, Spray | Provides topical anesthetic effect. |
| Amylmetacresol+ 2,4-dichlorobenzyl alcohol+Levomenthol | Strepsils Menthol | Lozenges | Provides rapid effect, does not damage teeth enamel, possesses analgesic and deodorizing effects, has a nice taste. Strepsils can be used starting the age of 5, Neo-Angin is contraindicated in children under the age of 6. Patients with diabetes must remember that Strepsils contains sugar. |
| Benzalkonium chloride+Menthol+ Peppermint oil+ Eucalyptus oil+ Thymol | Septolete Plus Septolete D | Spray Lozenges | Daily dose: Adults and children over the age of 12: up to 8 lozenges. Children between the age of 10 to 12: up to 6 lozenges per day. Children over the age of 4: up to 4 lozenges per day. Septolete D does not contain sugar. Sweeteners that do not cause caries - maltitol and mannitol – are used in this preparation. Does not destroy teeth enamel. |
| Hexetidine+ Choline salicylate+Clorobutanol | Givalex | Mouthwash | Should not be administered in children under the age of 2.5. It should not be administered |

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| | | | simultaneously with other antiseptics. Duration of treatment should not exceed 5 days without the advice of a doctor. |
| Dequalinium chloride | Dequadin | Lozenges | Should not be administered in children under the age of 10. It doesn't contain sugar, doesn't cause caries. Antibacterial effect is reduced in simultaneous use with toothpastes. |
| Dequalinium chloride+Ascorbic acid | Efizol | Lozenges | Due to analgesic effect absence it is not recommended in case of severe soreness. Should not be administered in children under the age of 4. Can be administered in pregnant and lactating women. |
| 2,4-dichlorobenzyl alcohol+Menthol+Anethole+Peppermint oil | Dr. Theisse Angi Sept | Lozenges | Should not be administered in children under the age of 6. Duration of treatment should not exceed 2-3 days. |
| Iodine+Potassium iodide+glycerine | Lugol's Solution 1% with Glycerine | 25 ml bottle | Contraindicated in case of hypersensitivity to iodine. The preparation should not be swallowed! In prolonged use iodism symptoms may develop. In case of overdose iodism symptoms may develop. |
| Lisozyme chloride+pyridoxine hydrochloride | Lysobact | Lozenges | Pyridoxine has protective effect on oral mucosa, preventing candidiasis development. It can be administered in pregnant and lactating women, children above the age of 3. It is also used in dentistry (gingivitis, stomatitis). |
| Povidone-Iodine+Allantoin | Jox | Spray Solution for gargling | Allantoin has an anti-inflammatory effect. Contraindicated in case of hypersensitivity to iodine, |

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| | | | hyperthyroidism, thyroid adenoma, in infants, in pregnant women starting 3 rd month of pregnancy, lactating women. It is not compatible with reducing agents (hydrogen peroxide), acidic substances. |
| Tyrothricin+ Chlorhexidine digluconate+ Lidocaine hydrochloride | Trachisan | Lozenges | Possesses antibacterial, antiseptic and anesthetic effects. Provides bactericidal activity against gram-positive and gram-negative bacteria, viruses, fungi. Does not contain sugar. Should not be administered in children under the age of 4. Avoid food and liquid intake 1-2 hours after use. |
| Herbal preparations | | | |
| Icelandic moss extract | ISLA-Mint ISLA-Moos | Lozenges | Provides antimicrobial, enveloping and immunostimulating effects. Contraindicated in patients with phenylketonuria, intolerance to fructose, in children under 4. |
| Complex herbal and homeopathic preparations | Angin (Heel) 50 Homeopathic c Tablets | Lozenges | Provides complex therapeutic effect: immunomodulatory, anti-inflammatory, detoxification, anesthetic, drainage effect on the matrix of tonsils, antibacterial (indirect action). It promotes the insertion and outflow of purulent plugs from the gaps of the tonsils. It also provides rapid anesthetic effect. |
| | Tonsilgon-N | Tablets, drops for oral administration 100 ml bottle. | It is recommended to administer at least during 6 weeks in basic therapy of chronic diseases. Dragees should be swallowed. In infants and small children |

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| | | | liquid form (drops) is recommended. |
| | Tonsipret | Tablets, drops for oral administration 30 ml or 50 ml bottle | Provides anti-inflammatory, analgesic, immunomodulatory and warming effects. Can be used in children over the age of 1 and adults. Contraindicated in lactose intolerance. Tonsipret drops contain alcohol. |
| | Tonsilotren | | Provides anti-inflammatory, lymphotropic, immunomodulatory and reparative effects. Stimulates organism's defense reactions in viral and bacterial infections of the pharynx and the tonsils in different inflammation stages. Can be used in children over the age of 1 and adults. In chronic tonsillitis several treatment courses per year with 6-8 weeks duration are recommended. In hyperthyroidism it can be administered only after a doctor's consultation. |
| Other remedies | | | |
| Propolis | Comvita | Spray | It enhances immune function and shows antioxidant activity |

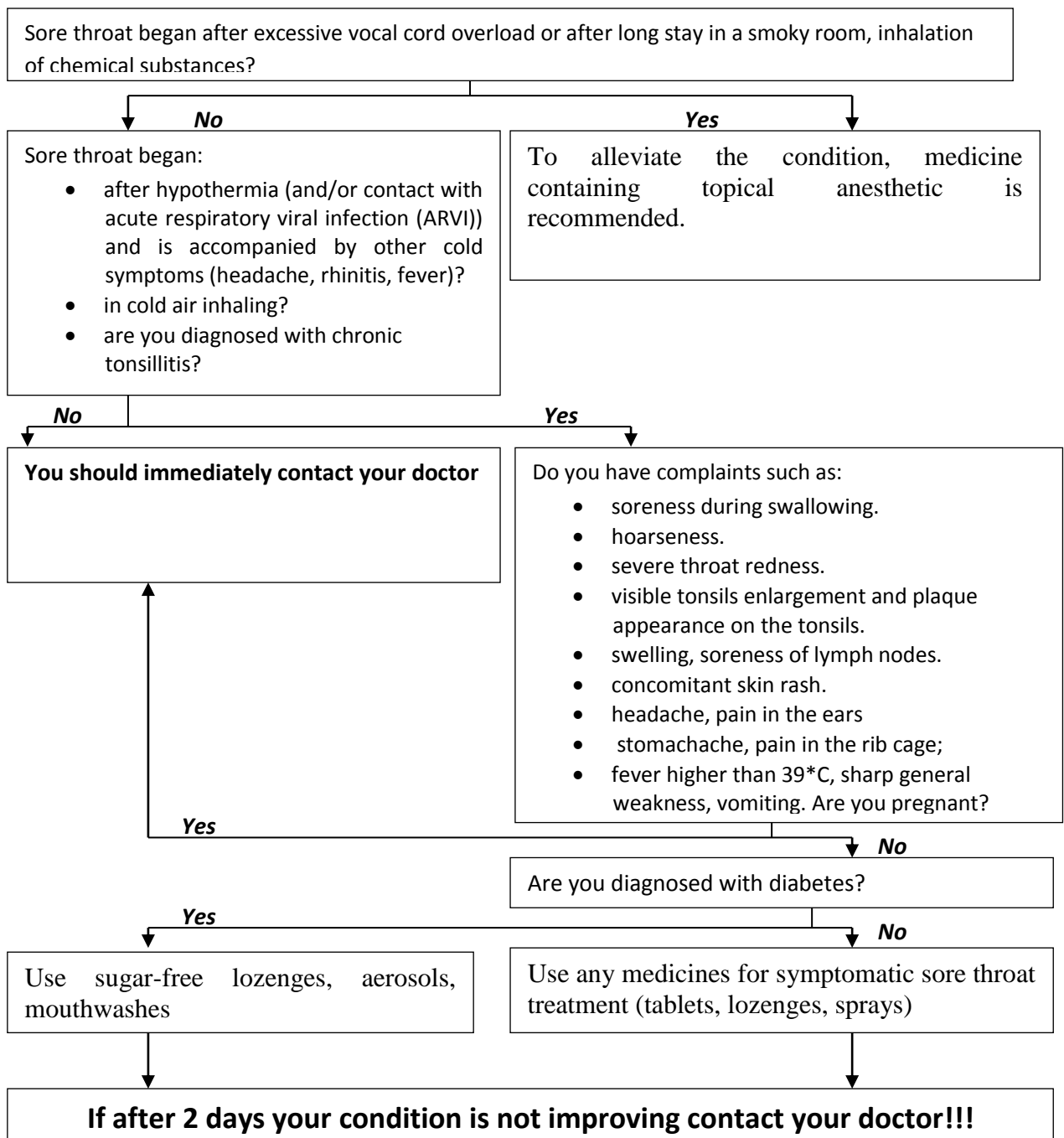
PHARMACEUTICAL CARE IN SYMPTOMATIC SORE THROAT TREATMENT

- In case of tonsil plaque you should immediately contact a doctor for prescription of microbiological examination (sowing throat swab) with the aim of timely detection of streptococcal tonsillitis or diphtheria.
- In sore throat associated with general performance disturbance bed rest is recommended.
- Intake of large amounts of warm liquid is recommended.
- Patients should stop smoking, alcohol, spicy, cold or excessively hot food intake.

- In children of younger age plentiful warm liquid intake, gargling with herbal infusions, inhalations and warming compresses are the best treatments.
- In small children who cannot gargle, gargling can be replaced with frequent (every 1-2 hours) warm tea drinking or warmed fruit juice.
- Gargling with antiseptic solutions should be performed every 2-3 hours.
- If inhalations with essential oils are done then the water temperature should not exceed 60°C.
- Prior to the topical administration of medicines used for sore throat symptomatic treatment the mouth should be rinsed with warm water.
- After the topical administration of medicines used for sore throat symptomatic treatment the patient should refrain from food or liquid intake (3-5 minutes after use of a spray, 1-2 hours after use of a lozenge).
- In pregnant and lactating women administration of topical medicines, containing benzalkonium chloride (Beechams), Dequalinium chloride (Efizol), Benzydamine chloride (Diffiam, Septabene) are recommended. Antiseptic solutions for gargling (mouthwashes) can be used in pregnant and lactating women but since they contain up to 11% of alcohol, they should be used carefully. (Do not swallow!) Herbal decoctions and infusions are allowed.
- Decamethoxin can cause hypersalivation.
- Medicines containing iodine and potassium iodide are contraindicated in case of hypersensitivity to iodine, hyperthyroidism, thyroid adenoma, in infants, in pregnant women starting 3rd month of pregnancy, in lactating women. In case of overdose iodism symptoms may develop.
- Medicines containing iodine and potassium iodide are not compatible with reducing agents (hydrogen peroxide), acidic substances.
- Medicines for sore throat symptomatic treatment containing NSAID (flurbiprofen, choline salicylate) are contraindicated in children under the age of 12, pregnant women, patients with gastrointestinal tract diseases, asthma.
- Concomitant use of tablets containing amylmetacresol and 2,4-dichlorobenzyl and alcohol intake can lead to discomfort in the stomach.
- Medicines for sore throat symptomatic treatment (especially herbal preparations) can cause development of allergic reactions leading to swelling of the mucous membranes, bronchospasm (essential oils based medicines)
- Aerosols containing menthol are contraindicated for children under the age of 3 due to laryngospasm risk.
- Alcohol containing preparations should be used carefully in patients doing activities requiring a lot of attention (e. g. driving, risky activities).
- In case of long term use of preparations containing chlorhexidine, teeth and tongue color can change to yellow or light brown.
- Milk reduces antimicrobial activity of benzalkonium chloride and cetylpyridinium chloride.

- When homeopathic remedies are used a temporary deterioration is possible at the beginning of treatment.
- Antiseptic and antimicrobial substances administration should not exceed 3 to 10 days (on the average 5 days). In case of long term use of these medicines natural microbial equilibrium disturbances in the mouth and throat are possible.
- In patients with diabetes medicines that do not contain sugar are to be used.
- Topical anesthetics can lead to a sensation of numbness in the mouth. This is not considered to be a side effect.
- If the sore throat lasts for more than 2 days, the patient must consult a doctor.

Algorithm of sore throat pharmaceutical care



RHINITIS

Most frequent rhinitis causes:

- acute respiratory viral infections (ARVI);
- Vasomotor (allergic) rhinitis – bouts of sudden nasal congestion with abundant watery-mucous discharge, sneezing are common. Seasonality connected to certain plants blossoming is possible (hay fever).
- Adenoids (pathological proliferation of the nasopharyngeal tonsil) – nasal breathing disturbance, nasal tone of voice, sleeping with open mouth, abundant watery-mucous discharge, which fill the nasal airways and flows into the nasopharynx are common.
- Foreign objects in the nasal airways are common mostly in children, unilateral nasal breathing troubles, purulent discharge from one half of the nose, nose bleeding are possible.
- Sinusitis (acute or chronic inflammation of the sinuses) - nasal breathing troubles, sense of smell disturbance, pressure around the eyes, cheeks and forehead, migraines or tension headaches, subfebrile temperature is possible also.
- The classic triad of an ozena infection is crusting, interior nasal atrophy resulting in a roomy cavity, and a fetid discharge. This leads to a loss of clearance of mucous, contributing to further infection and progression of disease. The bacteria itself lead to the destruction of the cilia. There is a sharp atrophy of the mucous membrane and a discharge, which dries into fetid crusts, excruciating dryness and itching in the nose, sharp decrease in sense of smell, bad smell from the nose.
- The medication rhinitis is a condition associated to prolonged topical decongestants use. It is believed that the condition close to ischemia occurs due to strong vasoconstrictive effect of this drug group. It leads to metabolic accumulation of substances causing vasodilating effect, which are responsible for compensational blood vessels dilatation. The situation may get irreversible with vessel dystopia development. It is clinically characterized by nasal breathing difficulty and psychological dependence on the drug (in decongestants use). Classic rhinitis symptoms such as rhinorrhea and itching are much more rare. Medication rhinitis can occur during the use of iodine preparations, acetylsalicylic acid, oral hormone contraceptives.

****Threatening* symptoms*** suggesting a serious disease and requiring doctor's consultation are:

- rhinitis associated to fever over 38,5°C
- bad smell from the nose
- purulent discharge
- unilateral discharge (especially in children)

- rhinitis and cough lasting over a week (especially in cases of increased cough, asthma attacks, increasing fatigue, sick sputum discharge or sputum with blood discharge is observed as time passes by).

Symptomatic treatment with OTC-drugs is allowed only in allergic rhinitis and rhinitis caused by acute respiratory infections. The patient should consult a doctor in all the other cases.

Principles of symptomatic treatment of rhinitis as ARVI symptom:

1. nose flushing with physiological solution using a pipette 3-4 times a day
2. topical forms application (nose drops, ointments, gels, intranasal sprays), containing vasoconstrictors.
3. administration of complex oral preparations for ARVI treatment containing vasoconstrictors.
4. complex homeopathic preparations administration.

Principles of symptomatic treatment of allergic rhinitis:

1. nose drops, ointments, gels, intranasal sprays, containing vasoconstrictors.
2. topical application of H₁-histamine receptors blockers.
3. cromoglicic acid preparations for topical use (intranasal sprays and aerosols).
4. anti-histamine oral preparations.
5. intranasal sprays and aerosols containing steroid hormones (under prescription).
6. complex homeopathic preparations.

Forms of OTC-drugs used in symptomatic rhinitis treatment:

Medicines for rhinitis symptomatic treatment are sold in various forms, each of them having their own features, defining medicine of choice for each particular patient.

Nasal drops

Nasal drops is a traditional and until today most widespread medicinal form for rhinitis treatment. In most cases drops contains an active substance solution in aqueous medium. Drops in the form of oil solutions also exist but they are used much less frequently in rhinitis treatment. The advantages of this form are its simplicity of use and rapid effect.

Downsides of nasal drops:

- only water-soluble active substances can be used.
- accurate dosage is impossible
- difficulty of selecting an individual dose

- may enter into nasopharynx and cause irritation and cough (especially in small children).
- use in small children is difficult
- in case of abundant mucous discharge from the nasal cavity drops leave the nose.

Method of application of nasal drops: the nose should be properly cleaned before the application. Then, 1-2 drops of the preparation are introduced into the nostrils with the head tilted back. This position should be kept for several minutes.

Nasal sprays (aerosols)

Sprays (aerosols) are one of the varieties of pharmaceutical aerosols. Compared to the drops they have the following advantages:

1. use of less active substance (so the cost is lower).
2. equal spreading of the active ingredient along the nose mucosa.
3. ability to use in different conditions (at home, at work, outside, in public places);
4. delivery of a high dose of a substance directly where the pathological process occurs.

Downsides of nasal sprays:

1. propellants can irritate the nose mucosa.
2. mandatory synchronization of preparation introduction and inhalation is required, which is hardly achievable in children, elderly patients, patients with low impaired cerebral function.
3. in inept use there is a danger of nasal passage mucosa damage by the spray nozzle.
4. during spraying there is a risk of contact with the eyes and the face skin.

Method of application of nasal sprays: the nose should be carefully cleaned before the application. The spray nozzle should be held in a vertical position with the tip up. While holding the head straight, the nozzle is introduced into the nasal passage. Then, the spray is sharply pressed once. During the spraying the patient must inhale with his/her nose. One should not tilt back the head and turn the vial upside down during spraying into the nose.

Nasal gels

The gel is a soft medicinal form for topical application. Its biopharmaceutical characteristics are close to ointments and creams but there are several differences though. From a physical colloidal chemistry point of view the gels are aqueous solutions of high molecular weight compounds in bond-dispersed condition.

Advantages of nasal gels:

- prolonged effect
- possibility of applying just before going to bed.
- moisturizing effect of the nasal mucosa.
- beneficial effect on the nose mucosa in case of dryness, crusts.
- in case of contact with the clothes or the skin the gel can be easily removed without leaving traces (unlike ointments).

Downsides of nasal gels:

1. not all the active ingredients used as gels.
2. a gel is not a stable medicinal form, delamination to high molecular weight compounds and aqueous phase may occur during the storage.
3. the active substance diffusion from the gel to the tissues is more slowly than a solution. However, this property allows to achieve a prolonged effect.
4. gels have a pronounced systemic effect, which is not always desirable.
5. gels are hard to use in case of abundant mucous discharge.

Method of application of nasal gels: the nose should be properly cleaned before application. Then a small amount of preparation is introduced into the nostrils alternately as deep as possible. The gel is distributed in the nostrils. Cotton swabs or tampons can be used to spread the gel.

Nasal ointments

An ointment is a medicinal form for topical application, intended for skin or mucosa application by smearing or rubbing, applying ointment dressings. At room temperature ointments are a viscous motionless mass, and in application to absorption surface it creates a smooth continuous film that becomes a viscous liquid. Nasal ointments are prepared in aseptic conditions. Since they are applied to the wet mucosa, surface active substances are added to increase their absorbability.

Advantages of nasal ointments:

1. prolonged effect: ointment base provides prolonged active substances impact on nasal mucosa.
2. exhibit a softening effect on nasal cavity mucosa.

3. systemic effect is much lower compared to gels.
4. allow to introduce active substances of both hydrophobic and hydrophilic nature into one preparation
5. provide beneficial effect in case of nasal mucosa dryness, crusts.

Downsides of nasal ointments:

1. low release of active ingredients.
2. in case of contact with the skin or clothes ointment leaves greasy spots.

Nasal creams

A cream is a medicinal form for topical application which position is between gels and ointments. Creams' main advantages are a high degree of active substances absorption and a prolonged effect.

Method of application of nasal creams and ointments: a dose of ointment or cream 0,5 cm long is applied to a cotton swab, introduced into the frontal part of nasal cavity 3-4 times a day. Then, the wings of the nose are moderately squeezed and the medicine is evenly spread on the mucous membrane.

Oral medicinal forms for rhinitis treatment

Tablets are a medicinal form, convenient to use, can be stored for a long time, not losing their therapeutic properties.

Capsules contain multilayer granules that provide gradual controlled release of active components and allow a stable concentration in blood plasma. Complex medical preparations for symptomatic colds treatment are sold as capsules. As a rule they contain decongestants, anti-histamine substances and NSAID. Capsules may be prescribed to both children and adults. Active ingredients fall into all parts of the nasal passages with blood flow. The effect of the drug develops slowly but lasts for a long time.

Powders for hot drink preparation are a solid dosage form obtained after blending and mixing of bulk active substances (one or several). The powder is dissolved in hot water before use. If active ingredients are blended their adsorption activity and solubility is increased. A powder active substance has a strong healing activity since the particles are more dispersed. Absorption of soluble and especially sparingly soluble substances is higher and accelerated. Powders are convenient to use, easily and precisely dosed, easy to prepare. The disadvantages of powders is their ability to erode and their hygroscopy. Powders' active ingredients inactivation can be accelerated by carbon dioxide, humidity, light. Powders may acquire a foreign smell due to volatile substances fumes absorption. All these downsides can be avoided by the maintaining powders storage rules. Rapid effect development

and systemic action are common for this dosage form, which must be taken into the account in treating patients with concomitant diseases.

OTC-medicines for symptomatic rhinitis treatment and their rational use

The range of modern medicines for symptomatic rhinitis treatment is quite wide.

Sympathomimetics

The mechanism of action of this group of medicines is a stimulation of the adrenoreceptors. This mechanism of action determines common properties. They all:

- provide decongestant effect in topical application.
- promote the decrease of both the nasal mucosa hyperemia and swelling .
- decrease the amount of sputum (matter coughed up and expectorated from the mouth).
- facilitate nasal breathing.

This group of preparations can be distinguished by their impact on α - and β -adrenoreceptors, by the severity of systemic effect, and consequently by the severity and frequency of adverse effects. Common adverse effects are:

- central nervous system stimulation.
- headache, dizziness.
- high blood pressure.
- increased excitability, irritability.
- tremor.
- loss of appetite.

Due to these side effects, decongestants of the α , β – adrenomimetics group (stimulating both types of adrenoreceptors) are prescription drugs.

Vasoconstricting preparations, containing α , β – adrenomimetics

| <i>Active ingredient</i> | <i>Preparations</i> |
|---------------------------------|----------------------------|
| Phenylpropanolamine | Decolgen Forte |
| Pseudoephedrine | <i>Sinutab</i> |

Sympathomimetics affecting α -adrenoreceptors (selective α_1 and α_2 – adrenomimetics), unlike preparations of previous group, affect CNS much less. As a result of selective impact on α -adrenoreceptors:

- possess decongestant effect in topical application;
- promote nose cavity mucosa swelling and hyperemia decreasing;
- decrease the amount of discharged secretion;
- facilitate nasal breathing.

Vasoconstricting preparations, containing α -adrenomimetics:

| Active ingredient | Preparations |
|---|--|
| <i>α_1-adrenomimetics</i> | |
| Phenylephrine | Rhinathiol antirhinitis |
| <i>α_2-adrenomimetics</i> | |
| Xylometazoline | Nasa Rhinathiol, Otrivine |
| Nafazoline | Derinox (+ prednisolone – prescription drug in EU) |
| Oxymetazoline | Nesivine |
| Tramazoline | Rhinospray |

If all the rules of administration are followed these preparations facilitate nasal breathing and are well tolerated by patients. In patients with arterial hypertension, hyperthyroidism, cardio-vascular pathology, diabetes, and in case of overdose (excessively frequent application) arterial pressure increase and other complaints are possible.

The decongestants' vasoconstricting effect is changed after a while, and then there is an increased blood flow to the nasal mucosa (reactive hyperemia) and renewal secretion discharge. In prolonged decongestants use ciliated epithelium normal functioning may be disturbed and nasal mucosa atrophy may occur.

Vasoconstricting (decongestants) preparations recommended for symptomatic rhinitis treatment in children

- drops for children under 6 years old: oxymetazoline 0,01%.
- drops for children over 6 years old: oxymetazoline 0,025%.
- intranasal spray for children over 6 years old: oxymetazoline 0,05%; xylometazoline 0,05% ; 0,1%.
- dosed xylometazoline aerosol.

Allergic (seasonal) rhinitis is one of the most widespread forms of allergy. Allergic rhinitis might be the first step leading to asthma manifestation. For allergic rhinitis treatment anti-histamine preparations, mast cells stabilizers are used along with vasoconstricting medicines. In severe cases steroid hormones for topical application are used.

Medicines containing corticosteroids can be prescribed only by a doctor.

H1-histamine receptors blockers

Preparations of this group exhibit the following effects:

- inhibition of the inflammation and the release of allergy mediators
- anti-allergic, anti-swelling and anti-itching effect.
- sedation.

Decongestant preparations, containing H1-histamine receptors blockers

| Active ingredient | Preparations |
|-------------------|------------------------------|
| Azelastine | Azelastine Nasal, Allergodil |
| Desloratadine | Aerinaze |
| Dimetindene | Vibrocil |
| Diphenhydramine | Nustasium |
| Ketotifen | Zatiden |
| Levocetirizine | Xyzall |
| Loratadine | Claritine, Rupton |
| Promethazine | Phenergan (i/m) |
| Fexofenadine | Allegratab, Telfast |
| Cetirizine | Zyrtec |
| Ebastine | Estivan |

Mast cells stabilizers

Mast cells stabilizers (for topical application) decrease allergic reactions manifestation, stabilize labrocytes membranes (mast cells), prevent inflammation and the release of allergy mediators.

Decongestant medicine containing mast cells stabilizers

| Active ingredient | Preparations |
|-------------------|---------------------|
| Cromoglicic acid | Cromabak, Lecrollyn |

Steroid hormones for topical application

If steroid hormones administration is required then steroids specifically developed for topical application are to be used. They decrease the inflammatory process and have a special place in allergic rhinitis treatment. They are the most commonly prescribed drugs in other chronic diseases of the nose and sinuses , such as allergic rhinitis and chronic rhinosinusitis. They can be prescribed in year-round allergic rhinitis treatment (with permanent nasal hyperreactivity symptoms, severe swelling, when all the other preparations are not sufficiently effective).

Preparations of this group possess the following effects:

- anti-allergic, anti-inflammatory, anti-swelling effects.
- facilitate nasal breathing.

- decrease sputum secretion.

Preparations for rhinitis treatment containing topical steroids

| Active ingredient | Preparations |
|-------------------|------------------------|
| Beclomethasone | Beconase |
| Budesonide | Budesonide Sandoz |
| Dexamethasone | Dexa Rhinospray |
| Momethasone | Momepax, Nasonex |
| Fluticasone | Avamys, Flixonase Aqua |

Other preparations for rhinitis treatment

Sinupret (coated tablets, oral drops, syrup) is a herbal preparation based on standardized extract BNO 101 (gentian root, primrose flowers, sorrel grass, elderberry flowers, verbenas grass). The herbal components of the preparation composition have a complex action, consisting of secretolytic effect, bronchoconstriction elimination, anti-inflammatory, immunostimulating and antiviral effects. It is used in acute and chronic paranasal sinus diseases (sinusitis).

Cinnabsin is a complex homeopathic preparation sold as lozenges, manufactured especially for the treatment of rhinitis, acute and chronic sinusitis (paranasal sinus inflammation), acts on all the pathological components of the disease. Cinnabsin restores the nasal breathing and the connection of paranasal sinuses and nasal cavity, providing decongestant effect, liquefies the secretions and normalizes natural nasal cavity and paranasal sinuses cleansing due to secretolytic and secretokinetic effects. It also strengthens the immunity and reduces the frequency of disease relapses.

Rhinital, which is sold as lozenges is a complex homeopathic preparation containing three active ingredients: Galphimia glauca, Luffa operculata, Cardiospermum. It is used to treat and prevent seasonal and year-round rhinitis. Rhinital can be used in children over 2 years old and adults. Rhinital relieves nasal congestion, nose and pharynx itching, sneezing, lacrimation, burning sensation in the eyes. Rhinital is well tolerated by patients, does not cause drowsiness and sedation, prolonged administration is allowed. Rhinital administration is recommended to prevent seasonal allergic rhinitis exacerbation, starting 6 weeks before the beginning of blossoming and during all the blossoming period of the plants involved in allergies.

Saline (Sodium chloride 0,65% solution) can be used in children and in adults for nasal cavity cleaning.

Pinosol: oil drops, nasal cream, nasal ointment (pine oil, eucalyptus oil, thymol, tocopherol acetate). Pinosol possesses anti-microbial (antiseptic), anti-inflammatory, decongestant effects. It is administered every hour at the beginning of the treatment, then 3-4 times per day. It is beneficial to combine it with

vasoconstricting preparations. Burning sensation, itching, hyperemia or mucosa swelling are possible. It is contraindicated in allergic rhinitis, in children under the age of 1.

Complex preparations for rhinitis and cold symptoms treatment

Majority of these preparations is a combination of analgesic antipyretic paracetamol and decongestants (histamine blockers and/or sympathomimetics). The severity of these medicines side effects is directly correlated to their composition, and primarily presence of components showing histamine blocking mechanism of action. In some cases additional active ingredients are added to these combinations: caffeine, ascorbic acid, dextromethorphan.

Complex anti-cold preparations are fast-acting remedies for rhinitis and symptomatic ARVI treatment. They possess decongestant, anti-inflammatory, anti-allergic and anti-pyretic (due to paracetamol) effects. They should not be combined with alcohol. Driving should be avoided when histamine-blockers are used. The most frequent side effects are dizziness, increased excitability, insomnia, loss of appetite, mouth dryness, nausea. These preparations are contraindicated in children.

PHARMACEUTICAL CARE IN RHINITIS SYMPTOMATIC TREATMENT

- In skin irritation of the lower external part of the nostrils vaseline oil or baby cream should be topically applied.
- In case of rhinitis it is recommended to ventilate the room, to use air humidifiers to facilitate breathing.
- Before applying any medicines for rhinitis treatment the patient shall properly clean the nasal cavity.
- Preparations for topical application (drops, sprays) should not be used more frequently than every 3-4 hours, to avoid overdose. Excessive use can lead to nose tissues damage.
- The use of decongestants should not exceed 2 weeks.
- The use of vasoconstricting preparations should not exceed 5-7 days.
- Pseudoephedrine and phenylpropanolamine containing preparations can induce anxiety, insomnia, tremor. There is a risk of stroke, disturbances of brain blood flow (even in young patients), heart arrhythmias, urinary retention in patients with prostate hyperthrophy (pseudoephedrine).
- Consumption of alcohol and driving are contraindicated when Chlophenamine and Pheniramine are used.
- Phenylpropanolamine cannot be used if the patient is treated with indometacin.
- Sympathomimetics can cause blood pressure increase. This has to be taken into account before prescription in patients with hypertension and hyperthyroidism.
- Sympathomimetics can increase the intraocular pressure. This has to be taken into account before prescription in patients with glaucoma.

- Sympathomimetics can increase the action and the side effects of antidepressants, monoamine oxidase inhibitors, psychostimulants. Blood pressure increase is one of the symptoms of this interaction. Thereby simultaneous administration of preparations containing sympathomimetics and preparations of antidepressants, monoamine oxidase inhibitors, psychostimulants is contraindicated.
- Sympathomimetics can decrease the effect of antihypertensive preparations and β -blockers and induce a blood pressure increase. In case of simultaneous administration with β -blockers arrhythmia may occur.
- Vasoconstricting preparations of sympathomimetics should not be administered simultaneously with other medicines showing sedative properties (decrease of the effect), other vasoconstricting preparations (enhancing of action and side effects), and also any other preparations intended for intranasal cavity introduction.
- Pheniramine and chlorphenamine are contraindicated in patients with prostate hypertrophy (because it may lead to urinary retention), and in patients with glaucoma (because it may lead to increase of intraocular pressure).
- Anti-histamine components can cause drowsiness, fatigue. So they should be used in the evening (especially oral dosage forms).
- Anti-histamine components should not be administered by drivers because they impair attention and coordination.
- Preparations containing anti-histamine components of first and second generation should not be used concomitantly with alcohol, sedatives, sleeping pills, tranquilizers, neuroleptics, narcotic analgesics.
- Steroids can be prescribed only by a doctor.
- Steroids use can induce dryness of the nasopharynx mucosa and irritation as well as bad smell and taste, nose bleeding.
- In long term use of steroids inhibition of the adrenal cortex function is possible.
- In prolonged use of steroids candidiasis of the mouth cavity and/or the nasopharynx mucosa may occur.
- Pregnant and lactating women, children under the age of 4 should avoid using steroid preparations.
- Antibacterial and steroidal preparations for topical application should not be used without a doctor's consultation.
- If the rhinitis in ARVI is not associated with fever then medicines of choice are preparations for intranasal application and complex preparations that do not contain any analgesics.
- In small children having rhinitis hypotonic (0,65%) salt solutions in warm water are recommended as first line therapy.
- In children the concentration of vasoconstrictors must draw special attention. Preparations for adults should not be administered in children.
- Oil solutions preparations for rhinitis treatment in children must not be used because the introduction of oil into the lungs may cause pneumonia.

- Increasing of nasal sputum discharge may indicate medication rhinitis development. If this situation occurs it is recommended to stop the medicine administration and proceed to nose wash.

COUGH

Cough is a complex reflective action and defensive reaction in case of mucosa, sputum accumulation in the airways, foreign body introduction and allows to clear the airways.

Cough is classified into three types based on the duration: acute, subacute, and chronic cough. Acute cough is defined as cough lasting for less than 3 weeks, subacute cough lasts 3–8 weeks, and chronic cough persists for more than 8 weeks.

Cough may be dry (non-productive) with no sputum discharge or wet (productive) with sputum discharge. In most cases a dry cough indicates a non-infectious cough, while a wet cough is more commonly seen in patients with an infectious cough. Respiratory infectious disease should be considered in patients with a large amount of sputum production or purulent sputum. Dry excruciating cough should be suppressed with the help of medicines. In productive cough preparations facilitating sputum evacuation but not suppressing cough reflex should be used.

On the first stage of pharmaceutical care it is recommended to try to determine the cause and to detect presence (or absence) of **threatening** symptoms.

Most frequent causes of dry cough:

- heavy smokers' cough.
- laryngitis (larynx and vocal cords mucosa inflammation). Dry, loud (**whooping**) cough, sore throat.
- tracheitis (trachea mucosa inflammation). Dry painful cough with metallic undertone and lean sputum.
- acute bronchitis (tracheobronchial tree mucosa inflammation) in the early stage of the process. Deep, painful cough, often associated with other ARVI symptoms.
- pleurisy (pleura inflammation). Dry cough associated with severe pain on the side of the lesion.
- asthma, which is a chronic recurrent inflammatory respiratory system disease connected to immunopathological mechanisms. During the exacerbation start there is spastic cough associated to a wheezing sound when the patient is breathing, dyspnea.
- foreign body in the airways. Stertorous breathing, dyspnea, pallor, cyanosis, aspiration (food ingestion), choking, cough during meal intake (more often in children and elderly);
- pertussis (acute infectious disease, transmitted by airborne droplets from the respiratory mucous membranes of infected individuals and characterized by

spasmodic cough attacks), at the peak (before convalescence) of the disease there are prolonged inhalation or breathing and paroxysmal cough). Pertussis is mostly observed in children.

- false croup (laryngeal edema). Paroxysmal *whooping* cough in children.
- lung emphysema (increased airiness of the lungs due to alveoli overstretching or destruction). Dry *short* cough associated to dyspnea. Lung emphysema is most often observed in elderly patients.
- lung tumors. Dry persistent cough associated to dyspnea, unexplained fatigue, weight loss, hoarseness are possible.

In laryngitis, tracheitis, early stages of acute bronchitis, in case of inhalation of irritating fumes (if the general condition of the patient is not disturbed) self treatment is possible. If any of the above conditions is suspected doctor's consultation is required. Suspicion of false croup or the presence of a foreign body in the airways requires emergency medical care.

Most frequent causes of productive cough

- acute respiratory diseases (cold). Mucous, mucous purulent sputum associated to other signs of a cold (fever, rhinitis, sore throat).
- mucus flowing from nasopharynx to larynx. Mostly the cough occurs at nighttime
- pertussis. There is a paroxysmal excruciating cough with prolonged inhalation and a discharge of a small amount of light sputum. It mostly occurs in children.
- pneumonia is an infectious inflammatory lung disease with bronchial tree involvement and a mandatory presence of intra alveolar exudation. There is a cough with mucous purulent sputum discharge associated to fatigue, sweating, fever. Pain in the chest and/or ague can occur. Ague is a fever such as from malaria that is marked by paroxysms of chills, fever, and sweating at recurring regular intervals. Hence, ague can refer to both chills and fevers.
- chronic bronchitis, which is a diffuse, slowly progressing bronchial tree disease. There is a persistent cough with purulent mucous or purulent sputum discharge. Exacerbations are common several times a year.
- asthma in exacerbation period. There is dyspnea with prolonged exhalation, wheezing breath, *glass-like* sputum.
- bronchiectatic disease (suppurative (purulent) process in irreversibly changed and functionally defective bronchi). There is an abundant discharge of mucous purulent or purulent sputum in the mornings.
- lung tuberculosis. There is an abundant sputum, possibly with blood streaks, sweating, weight loss, prolonged subfebrile temperature.
- lung tumors. There is a persistent cough associated to unexplained fatigue, weight loss, hoarseness, blood streaks in the sputum are possible.

When complaints of productive cough are reported self treatment is possible in acute respiratory diseases, bronchitis (mild conditions). In all the other cases a doctor's consultation is required.

****Threatening* symptoms*** suggesting a serious respiratory system disease:

- persistent cough lasting over a week (especially when the cough gets worse as days go by).
- cough associated to long-lasting (weeks) fever 37,5 - 38°C.
- cough associated to high (over 38 - 39°C) fever during 3 days or longer.
- cough associated to dyspnea, pain in the chest.
- cough associated to green sputum discharge.
- cough associated to sputum with blood streaks discharge.
- cough with asthma-like attacks.
- cough associated to fatigue, weight loss.
- abundant sweating (especially at night time), ague.
- sudden paroxysmal cough.
- severe cough during an hour without being able to stop it.
- abundant sputum discharge.
- voice change.

In presence of threatening symptoms a doctor's consultation is required.

If no **threatening** symptom has been described by the patient to the pharmacist then the choice of the pharmacological group for symptomatic cough treatment in the patient is made.

Symptomatic treatment of patients with cough complaints:

- dry cough: central and peripheral antitussive preparations.
- wet cough: expectorants and mucolytic preparations.

OTC-drugs for symptomatic dry cough treatment and conditions of their rational use

There is a wide range of OTC-drugs for dry cough symptomatic treatment. Most of them are complex and contain several active ingredients. Some ingredients as mono preparations are only for sale under prescription while they are one of the components of the OTC-drugs.

Active ingredients in composition of dry cough symptomatic treatment preparations

| Active ingredient | Trade name | Pharmacological characteristics |
|-------------------|-------------------------|--|
| Dextromethorphan | Actifed New, Nortussine | Synthetic codeine analogue, it is not inferior to codeine in |

| | | |
|---|---|---|
| Chlorpheniramine + dextromethorphan + phenylephrine | Mono, Bronchosedal Dextromethorphan Alka-Seltzer Plus Cold and Cough Gencontuss Robitussin Cough & Allergy | antitussive activity. Its abilities to depress the respiratory center, cause constipation and addiction are much lower than in codeine. It is contraindicated in pregnant women and in children under the age of 2. It is not compatible with alcohol, analgesics, sleeping and psychotropic (increased central nervous system depression, breathing depression) preparations, amiodarone (increased toxicity). |
| Dextromethorphan + paracetamol + pseudoephedrine | Daytime Cold and Flu relief Theraflu | Combination with paracetamol showing additional antipyretic and analgesic effects, and addition of sympathomimetics and/or H ₁ -histamine blockers provides symptomatic treatment of concomitant rhinitis. |
| Dextromethorphan + Guaifenesine | Creo-terpin | |
| Central antitussive preparations (non-narcotic) | | |
| Butamirate cytrate | Sinecod | It belongs to a new class of cough suppressants acting centrally through the receptors in the brainstem. In addition, |

| | | |
|--|------------------------------------|---|
| Butamirate dihydrogen cytrate+guaifenesin | Stoptussin | it has a very beneficial effect because it reduces the resistance in the airways by inhibiting bronchospasm and also providing anti-inflammatory effect. It has a moderate expectorant and anti-inflammatory effect, reduces airways resistance, improves respiratory function indicators. It should be administered before a meal. Rare cases nausea, diarrhea, dizziness have been reported. It is contraindicated during the first trimester of pregnancy, in lactating women. Syrup should be prescribed in children over the age of 3, pills in children over the age of 12. |
| Glaucine hydrochloride | Not sold as mono preparation | Depresses the cough center but has no impact on the respiratory center and intestinal motility, does not cause addiction. It provides antihypertensive and antispasmodic effects. Blood pressure decrease and dizziness are reported as side effects. It can be administered before going to bed for night cough prevention. It should be taken after a meal. It is not recommended in patients with hypotension. |
| Glaucine hydrobromide+ephedrine | Broncholytin | |
| Glaucine hydrobromide+pseudoephedrine | Broncholytin Neo | |
| Oxeladin | Oxeladin | Synthetic antitussive medication, selectively affects cough center. Oxeladin is a cough suppressant. It is a highly potent and effective drug used to treat all types of cough of various etiologies. It is not related to opium or its derivatives, so treatment with |

| | | |
|--|--------------------------------|---|
| | | oxeladin is free of risk of dependence or addiction. Nausea, vomiting, drowsiness are sometimes reported. |
| Peripheral antitussive preparation (non-narcotic) | | |
| Prenoxdiasine | Libexin | Synthetic antitussive preparation of complex action. Slightly depresses cough center, not affecting respiratory center. Provides topical anesthetic effect. Its direct antispasmodic effect reduces the excitability of peripheral receptors, prevents bronchospasm. Tablets should be swallowed without chewing (otherwise mouth mucosa numbness, loss of sensitivity are possible). Prescription in pregnant women must be done with caution. |
| Levodropropizine | Levotuss Salvituss Danka | Antitussive preparation with predominance of peripheral action, reduces airways receptors sensitivity. Dosage forms are drops, syrup. Interval between medicine administration must be 6 hours or more. The duration of the treatment cannot exceed 7 days. In patients with kidney failure and in children under the age of 2 prescription of this preparation must be done with caution. During the treatment it is recommended to refrain from any occupations requiring increased attention, focus and high speed of psychomotor reactions. |

PHARMACEUTICAL CARE IN ANTITUSSIVE PREPARATIONS ADMINISTRATION

- Patients are recommended to refrain from smoking, including passive tobacco fume inhalation, to ventilate the rooms more often, to use air humidifiers.
- Antitussive preparations should not be prescribed in case of increased bronchial secretion, abundant sputum discharge.
- Antitussive medicines should not be combined with mucolytic and expectorant preparations.
- Codeine, dextromethorphan and butamirate containing antitussive preparations are not recommended in children under the age of 2, in pregnant and lactating women.
- Codeine, dextromethorphan, butamirate containing antitussive preparations in large doses administration or in case of prolonged administration may lead to central nervous system and breathing depression.
- Oxeladin, butamirate and especially dextromethorphan can cause lethargy, drowsiness, dizziness. These preparations are not recommended in drivers and in patients whose occupations require increased attention, focus and high speed of psychomotor reactions.
- Oxeladin, butamirate, dextromethorphan and especially codeine preparations are not compatible with alcohol due to the high risk of central nervous system and breathing depression.
- High doses of butamirate containing preparations can cause vomiting, diarrhea, hypotension, and in severe cases severe central nervous system depression.
- Administration of glaucine hydrochloride containing preparations in children may lead to blood pressure decrease.
- Prenoxdiasine containing preparations should be swallowed without chewing to prevent pharynx and mouth cavity mucosa numbness and loss of sensitivity. Mouth and pharynx dryness are reported side effects.
- Prenoxdiasine containing preparations are not recommended in patients with low blood pressure.
- Prenoxdiasine administration is recommended in children over the age of 6.

OTC-medicines used in wet cough treatment and conditions of their rational use

In cough associated to sputum discharge (wet or productive cough) medicines that promote discharge of liquid sputum are used. These are expectorants. Mucolytics are medications taken to soften mucus in the respiratory tract, so that it can be coughed up more easily. They work by making the mucus less viscous (thick and sticky). These preparations exhibit the ability to break disulfide bonds of polysaccharides in bronchial sputum.

Active ingredients in composition of wet cough symptomatic treatment preparations (expectorants)

| Reflective expectorant | Pharmacological characteristics |
|---|---|
| <i>Terpin hydrate</i> Terpine Gonnon (syrup) | Stimulates gastric receptors, increases cough reflex efficacy |
| <i>Guaifenesin</i> Mucinex (tablets), Tussin DM (syrup) | Stimulates gastric receptors, increases cough reflex efficacy, improves vibrations of cilia of bronchi ciliated epithelium. Reduces sputum viscosity, facilitates its discharge. It should not be administered in patients with gastric diseases. |
| <i>Liquorice root</i> Sold in paramedical stores to prepare home-made decoctions | Possesses expectorant, anti-inflammatory, anti-allergic effects, enhances non-specific organism resistance |
| <i>Marshmallow root</i> Broncho Stop (syrup) | It possesses expectorant, anti-inflammatory effects. It reduces sputum viscosity, facilitates its discharge. Marshmallow root appears to act as an enzyme to loosen mucus and inhibit bacteria. |
| Medicinal herbs essential oils | |
| <i>Eucalyptus leaves (decoction)</i> <i>Thyme herb (decoction)</i> <i>Elecampane root (tincture)</i> | Possess expectorant, anti-inflammatory, light antiseptic effects. They decrease sputum viscosity and facilitate its discharge. |

| | |
|---|---|
| <i>Ivy leaves</i> Bronchipret, Prospan, Hedelix Cough drops, Hedelix Cough syrup, Hedelix Effervescent tablets | |
| Prospan cough syrup Prospan Acute Effervescent Cough tablets | Original standardized dry ivy leaves extract (5-7,5:1), provides secretolytic, mucolytic, mucokinetic and bronchodilator effects. Syrup can be used in infants. |
| Complex preparations | |
| Bronchipret | Preparation contains standardized herbal components (thyme herb extract, primrose root extract) and possesses secretolytic, bronchodilator, anti-inflammatory and low antimicrobial effects. It is administered in respiratory tract diseases that are associated to cough and sputum formation, including acute and chronic bronchitis. It exists in three dosage forms: oral drops, syrup and coated tablets. It can be administered in patients with diabetes. |
| Resorptive (direct) expectorants | |
| Sodium iodide Potassium iodide Sodium bicarbonate Ammonium chloride | Are excreted in the bronchi, increase bronchial secretion, liquefy bronchial secretion |
| Stodal (homeopathic syrup) | Possesses complex anti-inflammatory effect, helps recovering the ciliated epithelium function, provides antispasmodic effect on the musculature of the bronchi. |

PHARMACEUTICAL CARE IN EXPECTORANT PREPARATION ADMINISTRATION

- Patients are recommended to refrain from smoking, including passive tobacco fume inhalation, to ventilate the rooms more often, to use air humidifiers.
- Expectorants must not be combined with preparations depressing the cough reflex (codeine, oxeladin, glaucine) and with H₁-histamine blockers that thicken the sputum (dimedrol, pipolphen).

- Medicines leading to dehydration such as diuretics and laxatives should not be prescribed.
- Reflective expectorants (terpin hydrate, marshmallow) can cause vomiting in case of overdose, are contraindicated in gastric diseases (gastritis, ulcer).
- Expectorants should be taken with large amount of alkaline drink. It is recommended to intake 1,5-2 L of liquid additionally to the physiological norm to compensate physiological losses (if there are no contraindications like swellings, chronic kidney failure).
- Expectorants are not recommended in immobilized (bed) patients.
- The clinical effect of expectorants appears on the 6th -7th day of treatment.
- In the first 2-3 days of expectorants administration cough and sputum discharge may increase: these manifestations testify the preparation efficacy.
- In case of overdose or prolonged use of iodine containing preparations (potassium iodide, sodium iodide) iodism manifestations may occur: rhinitis, hives (nettle-rash), angioedema (Quincke's edema), hyperthyroidism symptoms (tachycardia, tremor, increased excitability, insomnia, diarrhea in patients over the age of 40).
- Iodides containing preparations (potassium iodide, sodium iodide) are contraindicated in pregnant women, acute inflammatory diseases, thyroid gland diseases.
- In acute inflammatory diseases herbal expectorants are preferable.
- Herbal decoctions and infusions have not only an expectorant effect but also promote the regeneration of the bronchi mucosa because they contain microelements, vitamins and biogenic stimulators in their composition.

Mucolytic preparations

Mucolytic preparations break down mucopolysaccharides, polypeptides, mucoproteins molecules that are components of bronchi secretions. They decrease the adhesive properties of the sputum (its capability to adhere to the bronchi wall). Mucolytic preparations, especially of ambroxol, increase lung surfactant synthesis, which is a surface active substance of protein-lipid-mucopolysaccharide nature. The surfactant is synthesized by alveoli cells and prevents their adhesion. Surfactant synthesis is disturbed in many bronchopulmonary diseases. Surfactant synthesis increase indirectly increases mucociliary transport activity. All the mucolytic medicines possess mild anti-inflammatory effect.

Active ingredients in composition of moist cough symptomatic treatment preparations (mucolytics)

| Active ingredient | Pharmacological characteristics |
|--------------------------|-------------------------------------|
| Direct mucolytics | |
| | <i>Non-enzyme mucolytics</i> |
| | |

| | |
|---|---|
| <i>Acetylcysteine</i> N-Acetyl Cysteine: Lysomucil Mucomyst Acys-5 | Cysteine derivative with a free thiol group. It breaks the sputum mucopolysaccharides disulfide bonds, stimulates the mucus-synthesizing cells function, increases the glutathione synthesis that determines detoxification and antioxidant properties. Possesses expectorant, secretomotor, mucolytic, antitussive effects, stimulates surfactant synthesis. Thiolytic's action does not depend on the initial secretion state so it may make it excessively liquid. It is contraindicated in liquid sputum, *wet lungs*. It should be used with caution in patients with severe broncho-obstruction and neuromuscular pathology. It penetrates the placental barrier and accumulates in amniotic fluid. |
| | <i>Enzyme mucolytics</i> |
| <i>Chymotrypsin</i> | Proteolytic enzyme, obtained from cattle pancreas. It predominantly hydrolyses bonds created by tyrosine, phenylalanine and other aromatic amino acids residues, cleaves peptide bonds in protein molecules and its decay products. It shows an anti-inflammatory effect since inflammation mediators are proteins or high molecular peptides (bradykinin, serotonin, necrosis products). It lyses necrotic tissues without affecting viable cells, due to presence of specific enzymes in them. It is not widely used except in case of purulent necrotic process since there is a high risk of bleeding and perialveolar walls destruction. |
| Indirect mucolytics | |
| | <i>Secretolytics</i> |
| <i>Bromhexine</i> Broncholyte Elixir Bisolvon Robitussin Chesty/Forte | The mucolytic effect is caused by depolymerization of mucoprotein and mucopolysaccharide polymer molecules. The preparation possesses mucolytic (secretolytic), secretomotor and independent antitussive, expectorant effects. It stimulates endogenous surfactant synthesis, improves rheological properties of bronchopulmonary secretion, promotes its movement (flowing) along the epithelium and its excretion from the airways. It is a prodrug. Bromhexine dose should be adjusted in liver failure. |
| | <i>Mucoregulators</i> |
| <i>Carbocysteine</i> Availnex | Activates sialyltransferases, goblet cells enzymes, normalizes sputum acid and neutral glycoproteins |

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| | equilibrium, increases the frequency of epithelium cilia movements, regulates secretion formation by glandular cells. The mucoregulatory effect leads to the regeneration of the mucous membrane, mucous membrane structure renewal improvement, reduces goblet cells hyperplasia. It activates IgA secretion, increases the number of sulfhydryl groups, possesses anti-inflammatory properties due to inflammation mediators decrease. Does not promote bronchospasm. Secretion viscosity and elasticity normalization is maintained 8-13 days after the end of 4-days treatment course. It promotes antibiotics penetration into bronchial secretion |
| | <i>Surfactant synthesis stimulants</i> |
| <i>Ambroxol hydrochloride</i> Relent Mucosolvan | Active bromhexine metabolite. The mucolytic effect is the consequence of the depolymerization of mucoprotein and mucopolysaccharide fibers. It has secretolytic, secretomotor, antitussive effects. It has a more powerful effect with lower adverse effects compared to bromhexine. It increases surfactant synthesis, changes the chemistry of sputum mucopolysaccharides, decreases secretions adhesion to airways walls, enhances the effect of antibiotics. Sputum liquefaction is not associated to its volume increase. It stimulates ciliary activity, facilitates mucus excretion, reduces cough, promotes pain relief and discomfort in the nasal cavity, ear and trachea area associated with it. It can be recommended during the second and third trimesters of pregnancy. |
| <i>Others</i> | |
| <i>Erdosteine</i> Erdotin | The efficacy is the result of active metabolites action, thiol groups which cleave disulfide bonds of glycoproteins fibers. It accelerates the respiratory tract purification the secretion, improves the secretory function of the epithelium, increases efficacy of mucociliary transport. It acts antagonistically on free radicals and prevents α 1-antitrypsin decrease in smokers. The effect occurs on the third or fourth day of treatment. It increases amoxicillin concentration in bronchial secretion. It is contraindicated in case of liver diseases, in children under the age of 2. |

PHARMACEUTICAL CARE IN MUCOLYTIC PREPARATIONS

- Bromhexine and ambroxol can increase liver transaminases activity.
- Bromhexine and ambroxol are not compatible with alkaline solutions, with preparations containing codeine with cholinolytics.
- Ambroxol enhances antibiotics penetration into bronchial secretions and bronchi mucosa.
- The medicine of choice in pregnant women (except 1st trimester) is ambroxol.
- Bromhexine is not prescribed in children under the age of 3, in patients with liver pathology.
- Acetylcysteine treatment should be started with low doses (100-200mg) since high doses effect may be unpredictable and lead to excessive hypersecretion (*drowning *).
- Acetylcysteine can cause lung bleedings, disturb liver and kidney functions, in patients with asthma it can provoke bronchospasm.
- Acetylcysteine is contraindicated during the first trimester of pregnancy. It can be administered under the supervision of a doctor.
- If oral acetylcysteine is used then antibiotics should be administered after 2 hours interval.
- Acetylcysteine potentiates both the vasodilator and antiplatelet effects of nitroglycerin.
- Carbocysteine is not recommended in patients with erosive and ulcerative lesions of the gastro-intestinal tract.
- The combination of erdosteine and amoxicillin or clarithromycin is a safe medication which is clinically superior to that of the antibiotic alone.

Algorithm of pharmaceutical care in cough

