

MINISTRY OF PUBLIC HEALTH OF RUSSIAN FEDERATION

**HALOTHERAPY APPLICATION IN COMPLEX
TREATMENT AND REHABILITATION OF RESPIRATORY
DISEASES**

METHODICAL RECOMMENDATION №95/111

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INTRODUCTION

Nowadays powerful development of pharmacology and industrial production of medicines encouraged growth of treatment by medication. Simplicity of application, availability and rapid effect provided priority of pharmacotherapy. However, together with therapeutic effect, medicines can cause pathologic conditions that are connected with side effects. Many allergic conditions and autoimmunal processes are caused by medicines. Furthermore treatment by medication as a rule does not provide restore the own defense mechanisms of the body. This point of view makes physicians turn back to the experience of natural treatment factors and conduct investigations in order to find drug-free treatment methods.

Halotherapy ("halos" in Greek means a salt) is one of such methods. **Halotherapy is mode of treatment in a controlled air medium that simulates a natural salt cave microclimate.**

Treatment in natural salt cave (speleotherapy) has been known since long. The efficacy of speleotherapy is associated with unique cave microclimate. The natural dry sodium chloride aerosol is the major curative factor of the cave microclimate. It is formed by the convective diffusion from salt walls. Other factors such as comfortable temperature and humidity regime, the hypobacterial and allergen-free air environment saturated with aeroions enhance the therapeutic effect.

A suggestion that it is the air saturated with saline dust that causes the main curative effect in the speleotherapy of patients with respiratory diseases was first formulated by a Polish physician F.Bochkowsky in 1843. Salt mines are known to be used

for therapeutic purposes in other countries as well such as Austria (Solzbad-Salzeman), Rumania (Sieged), Poland (Wieliczka), Azerbaijan (Nakhichevan), Kirgizia (Chon-Tous), the Ukraine: Solotvino, (Carpathians); Artiomovsk (Donietsk region).

Speleotherapy has been recognized as highly effective drug-free treatment method. It is assumed that during treatment, the organism adapts to specific features of the microclimate and alters all its functional systems.

However adaptation of patients who came from different climate areas, travel and transport problems, limited number of beds keep back its wide spreading. So HT has been worked out.

HT is type of natural therapy, taking from speleotherapy main acting factor. That is aerodispersed environment saturated with dry sodium chloride aerosol. The complex of equipment for Halotherapy created at firm "AEROMED", named "Halocomplex", provides all necessary parameters of air medium.

EQUIPMENT OF HALOCHAMBER

Halo-chamber consists of two especially arranged and equipped rooms. The patients seat in the comfortable chairs placed in the main (theurapeutic) room. Its space is 20 - 40 m² at a rate of 6 m³ per a person. A special salt covering, which is a buffer capacity for air moisture and helps to maintenance the environment aseptic properties put upon the walls. Medical aerodispersed environment saturated with dry sodium chloride aerosol with the prevailed respirable fraction of particles is created in this room (table 1).

Table 1

Fractions of dry sodium chloride aerosol fractions in halo-chamber (according to data of optical devices

Size of particles, mkm	Fractions, %
1-2	35,4 ± 2.1
2-5	61,8 ± 3.3
5-10	2,8 ± 0.4
>10	0,003

Aerodispersed environment is generated by Halogenerator - a device for dry salt aerosoltherapy. Halogenerator (ASA.01.3) is situated in the interconnecting room (operator chamber) and brings the flow of cleaned dry saturated with highly dispersed particles of sodium chloride aerosol air into the therapeutic room.

The concentration of dry sodium chloride aerosol in the Halochamber is from 0,5 till 11 mg/m³. It is sustained in the certain ranges (modes):

0,5-1 mg/m³

1-3 mg/m³,

3-5 mg/m³,

8-11 mg/m³.

Rock salt is used for halotherapy. The recommended composition of rock salt is in table 2.

Table 2

Recommended composition of rock salt for halotherapy

Components	% (mass)
NaCl	> 97,70
Ca-ion	< 0,50
Mg-ion	< 0,10
SO ₄ -ion	< 1,2
K-ion	< 0,10
Fe ₂ O ₃	< 0,01
Na ₂ SO ₄	< 0,50
Insoluble residuum	< 0,45
Moisture of rock salt	< 0,25
pH of NaCl solution	6,5-8,0

Medical environment has stable humidity (relative air humidity – 40-60%) and stable air temperature (18-24⁰C). These parameters create comfortable conditions for patients and promote stable aerosol environment.

Stable hypoallergenic and hypobacterial environment is held in the therapeutic room. The assessment of the microbial contamination during a session of Halotherapy proveds that 1m³ contains from 90 to 130-200 saprophytic microorganisms (according to WHO standards on air sterility 1m³ should contain less than 300 microbial bodies).

Microflora content returns to its initial level in 10-20 min after the session is completed. Sanitary important microorganisms are not revealed.

The therapeutic sessions could be held either in the individual or in the group halochamber. Additional psychological effect during Halotherapy sessions could be achieved with the help of special audiovisual programs such as audio records and slides.

The device is meant for maintenance by an operator (trained staff). Staff gets all necessary instructions for device operation when the equipment is installed and all technical documentation is provided.

MECHANISMS OF ACTION

Therapeutic action is provided by air dispersed media saturated with dry sodium chloride aerosol at mass concentration varying from 0,5 to 11 mg/m³ and particle size of 1-5 mkm. Particle size is optimum for penetration in all sections of respiratory tract. Dry sodium chloride aerosol has a considerable level of negative charge of the particles (6-10 nK/m³). The inner surfaces of the airways have slight positive charge. Negative charged dry sodium chloride aerosol particles move in the lumen of respiratory tract and fall more intensively in comparison with neutral particles. Besides, negative charge augments aerosol stability. Thus, dry aerosol influence is much more effective as against moist one.

The use of dry aerosol permits to produce optimal temperature and humidity parameters in the chamber. That allows avoiding the development of respiratory tract mucus edema and bronchial spasm, reactions common in patients when moist aerosols are used. Furthermore, sodium chloride dose got by the patient within 1-hour Halotherapy session is less than the dose got while inhaling moist sodium chloride aerosol.

Positive effect of Halotherapy could be explained in the following way:

One of the pathogenetic mechanisms of the obstructive lung diseases is the mucociliary clearance disturbance. Sodium chloride aerosol improves flow characteristics of the airways content, normalizes mucociliary clearance. The presence of sodium chloride is necessary for normal functioning of bronchial ciliated epithelium, whereas sodium chloride contents in bronchial secretion of patients with chronic pulmonary pathology is decreased. The positive symptom dynamics is evident during the Halotherapy as a result of the aerosol influence. This is the improving of respiratory tract drainage function: sputum discharge alleviation, sputum viscosity reduction, cough alleviation, auscultatory picture in lungs changing.

Sodium chloride aerosol provides bacteriocidal and bacteriostatic impact on

respiratory tract microflora, stimulates alveolar macrophage reactivity, facilitating the increase of phagocytic elements and their activity. Cytobacteriologic researches of bronchial and nasopharyngeal content of patients with asthma, chronic obstructive bronchitis and cystic fibrosis demonstrate that Halotherapy promotes the reduction of neutrophils and pathogenic microorganisms and increases the quantity of alveolar macrophage. Its inhibitory effect on growth and vital capability of microorganisms is accompanied by loss of their pathogenic properties and by adaptation to changed conditions. This adaptation consists, due to the loss of fluid, in an enhancement of the hydrophobic properties facilitating attachment to epithelial cells. However, activation of the microbial adhesion does not occur due to an increase of the epithelial cell electrophysiological functional activity. Moreover, the colonizational resistance of the epithelial cells is enhanced under effect of the dry, highly dispersed sodium chloride aerosol. This indicates its favorable action on protective properties of respiratory tract cells and an activation of the non-specific body defense.

Superficial skin autoflora of most of patients normalizes after Halotherapy sessions. Halotherapy effects positively on humoral and cellular immunity of the patients with chronic lung diseases. The evidence of diminution of IgE content after the sessions of Halotherapy of the patients with asthma is especially important.

Halochamber maintains optimal temperature and humidity, provides hypoallergenic and hypobacterial air medium. Breaking of patient contact with pathogenic aerogenic factors has additional positive influence upon the organism.

MECHANISMS OF ACTION of Halotherapy are manifold:

- * mucolytic,
- * antibacteriologic,
- * antiinflammatory,
- * immunomodulating,
- * hyposensibilising.

INDICATIONS

Mode and duration of treatment should be prescribed after making a diagnosis and estimating the actual patient condition, according to the nosologic form, peculiarities of its course (Table 3).

Table 3

MODES AND DURATION OF TREATMENT IN HALOCHAMBER

Pathology manifestations	Modes (mg/m³)	Duration of treatment course (procedures)
1	2	3
Asthma intermittent, mild	1-3	12-14
Asthma moderate, severe at correct basic therapy	0,5-1	18-21
Acute bronchitis with lasting stage	1-3	12-14
Recurrent bronchitis	3-5	12-14
Chronic simple bronchitis	3-5	18-21
Chronic obstructive bronchitis at FEV1 > 60%	3-5	18-21
Chronic obstructive bronchitis at FEV1 < 60%	1-3	18-21
Pneumonia after acute stage	1-3	12-14
Bronchiectatic disease	8-11	20-25
Cystic fibrosis at correct basic therapy at FEV1 > 60%	8-11	20-25
Cystic fibrosis at correct basic therapy at FEV1 < 60%	3-5	20-25
Respiratory infections, influenza	1-3	5-7 procedures during acute diseases; 2 times a week for prevention
Vasomotor and allergic rhinitis, rhinosinusopathy	3-5	14-18
Chronic pharyngitis and tonsillitis	1-3	14-18
Adenoiditis	3-5	14-18
Chronic sinusitis	8-11	14-18
Acute sinusitis	3-5	3-5
Remains after pulmonary tuberculosis	1-3	14-18
Hay fever	1-3	12-14
Multi chemical sensitivity syndrome	1-3	12-14
Sick building syndrome	0,5-1	12-14
Smokers	8-11	12-14
Persons contacting with industrial and household pollutants	3-5	12-14
Skin pathology	8-11	8-25

Halotherapy improves draining bronchial function, thus this method should be prescribed for patients with clinical signs of dyscrinism (in chronic cases), complaining of:

- cough with viscous sputum discharging with difficulties;
- dry paroxysmal cough with distant rales;
- attacks of heavy asthma attacks with strong discharge of a small quantity of sputum;
- slight efficacy of expectorants.
- Dry rales (mostly with low tone) changing its localization while patient lungs auscultation

It's advisable to follow-up patients with chronic airways diseases and estimate the changes in his clinical course. It helps to prescribe additional treatment methods and to change the halotherapy duration in case of need.

Cough efficiency, sputum amount and its characteristics, number and intensity of respiratory dyspnea attacks, number of inhalers using (β -agonists etc.), auscultatory picture in lungs and general condition changes should be estimated to control Halotherapy results. The most effective way of control is the registration of lung function parameters in the middle (session 7-10) and at the end of the of Halotherapy course.

MAIN CONTRAINDICATIONS:

1. Acute stage of brochopulmonary diseases
2. Chronic obstructive pulmonary diseases with symptoms of the 3rd stage of chronic lung insufficiency
3. Intoxication
4. Cardiac insufficiency
5. Bleeding
6. Blood spitting
7. Hypertension in IIB stage
8. All internal diseases with decompensation

DESCRIPTION OF METHOD

Treatment course consists of everyday sessions (procedures) which is 60 minutes (for adults) long each and 30 minutes (for children). Patients form the groups according to the prescribed treating mode. Patients discharging purulent secretion and ones with

respiratory infections and influenza are recommended to pass the Halotherapy sessions after all other patients.

The operator registers all the patients before the session starts, the patients put upon their own clothes (that should be loose, light, preferably cotton) disposable dressing gown and shoes. Patients are prohibited to use cosmetics with smell. Special clothes are used by the patient during the whole session and at the end of treating are cleaned as usual.

It's not recommended to open halochamber door (it could be done only in emergency cases). Patients make themselves relax and comfortable in armchairs. Calm, medium deep breath through nose and mouth is recommended.

Patients with ENT pathology having no fistula functioning should use locally vasoconstrictive drugs, opening the natural fistulas. It will improve lung ventilation and provide aerosol penetration.

Several sessions of Halotherapy (5-6 on average) could be held during the day. It's recommended to ventilate the room for 20-30 min.

The patients with chronic lung diseases feel the improvement of their state, sleep normalization, disappear or diminution of expiratory after the 3-5th session. The quantity of discharging sputum increases, it becomes less viscous and discharges much easier, the breath obtains vesicular character and the quantity of dry rales reduces. The bronchial patency improvement (according to the respiratory function researches) appears usually at the 5-7th session and stays till the treatment is completed.

According to the fiber-optic bronchoscopy facts for the majority of patients were observed the endoscopic picture normalization in the bronchial tree: mucous membrane inflammatory changes disappear or diminish, bronchial secretion quantity and level of bronchi hyperactivity evidence are reduces.

Some patients with asthma of severe clinical course and with marked respiratory function disturbance could feel short-term deterioration of their condition after 5-7 sessions of Halotherapy. It lasts for 3-5 days and usually doesn't request Halotherapy cessation. It expresses clinically in sputum discharge difficulty, paroxysmal cough enhancement and asthma attacks become more frequent.

These clinical manifestations could be connected either with temporal worsening of bronchial drainage because of the mucous hypersecretion and lumen of large bronchus occlusion by clots of mucus, discharging from the small sizes bronchi or with viscosity qualities of bronchial content changing, which are connected with inspissated secretion coming-in. Increasing of biochemical indices activity level, changing in leukocyte blood

formula, worsening of bronchial obstruction could be observed in this period. These changes prove the local reaction of respiratory tract and changing of common organism reactivity in response to the applied medical factors.

It is recommended to add voluminous drink including slight mineral water during the treatment. Also could be prescribed thorax massage, punctate massage, drainage respiratory training, moist inhalations (including inhalations with medical herbs if there are no contraindications), fasting days, acupuncture, respiratory flatter. Non-drug means and methods are preferable for using while temporal worsening of condition. Although if it gives no effect additional drug therapy should be prescribed: expectorant drugs, β -agonists etc. Additional means are prescribed till the condition becomes stabilize, usually for 5-7 days.

Patient's general condition improves to the end of Halotherapy course: sleep becomes normal; malaise, weakness and general sweating disappears; nervous system becomes stabilize; asthmatic fits and expiratory dyspnea become less frequent and intensive. It allows to reduce the β -agonist inhalation dose. Cough stops or becomes less intensive; sputum quantity reduces, it becomes mucous and its discharge is easier; auscultatory picture in lungs improves or becomes normal; nasal breathing becomes easier. If corticosteroids, mostly inhalation, were prescribed for antiinflammatory treatment, its' dose could be reduced or corticosteroids therapy could be stopped during the Halotherapy if patient condition improves (only after physician's recommendations).

Clinical changes while halotherapy treating are low-grade or are not evident at patients with the initial and pre-clinical forms of bronchopulmonary pathology (smokers, persons contacting with industrial and household pollutants) and the dynamics of condition could be revealed only by the data of additional examine. Mucus hypersecretion, sometimes with grayish-black tint, as well as small quantity of low timbre dry rales in the chest lower part could be observed for the 4-7th day of treatment. Increasing of non-specific reactivity in a form of activation of macrophages phagocytic activity, neutrophils and indexes of cellular and humoral components of immune system is observed in this period. All these signs prove sanogenetic mechanism starting and airways cleaning. Changing of sputum and of bronchial lavage character, cough disappearance are observed at most of these patients.

Cough with small quantity of sputum and slight breathing discomfort could appear at patients predisposed to bronchospasmodic reaction (hay fever, multi chemical sensitivity

syndrome). Disorders of general state of health are not observed and additional therapy is not necessary for this contingent of patients.

The improvement of nasal breathing right up to the absolute refusal from the vasoconstrictors, reducing or disappearing of nasal secretion discharging, absence of sneezing attacks were observed at the patients with allergic and vasomotor rhinitis, purulent sinusitis after Halotherapy course. Significant enlargement of the common nasal passage and nasal cavity mucosa normalization were noticed at rhinoscopy. Significant diminishing or full disappearing of paranasal sinus edema were showed by X-raying in 100 % of cases. Nasal resistance (R_n) reducing was observed during its measurement. R_n reducing was observed even if the patients don't mark subjective improvement.

Halotherapy is prescribed for patients with purulent sinusitis after maxillary sinusitis puncture and purulent content evacuation. Control puncture proves that purulent content completely disappears after 2-3 Halotherapy sessions.

Patients with different forms of chronic pharyngitis feel disappearance of discomfort, scratching, lump in the throat feelings. Should be outlined that it's not advisable to continue Halotherapy if there is no subjective improvement after the 7-th session. Chronic tonsillitis Halotherapy isn't always effective for this pathology is often accompanied by commissural process and aerosol doesn't reach its target. Halotherapy can further tonsils clearance from its pathologic content if the commissures aren't expressed.

Liquidation of reactive inflammation in shorter terms than usual after Halotherapy was observed in the patients after endonasal and endolaryngeal operations. Bactericide and anti-edematous properties of aerosol improves healing process in this case.

Were observed itch and skin manifestation disappearing, sympathicotonia manifestation reducing in patients with exudative form of atopic dermatosis and psoriasis in stabilization phase. Condition improvement after Halotherapy was observed in patients with exudative form of atopic dermatosis in stabilization phase, complicated by secondary pyoderma (mostly streptococcal impetigo). It is expressed in brightness diminishing, skin manifestation and streptococcal impetigo practically full disappearing. Treating effect doesn't depend on the season in patients with stabilization phase of disease. Significant improvement and improvement are observed more rarely in patients with diffuse form of atopic dermatosis than in patients with exudative form. Significant condition improvement expresses in skin itch and lichenification complete disappearing.

Halotherapy is very effective in streptococcal impetigo both in case of complications of some skin pathology and in separate pathology (for example adolescent cases).

Halotherapy could be used either separately or in combination with other treatment methods. It is combined with vary drug therapy: β -agonists, anticholinergic drugs, antiinflammatory, desensitizing, sodium cromoglycate derivatives, glucocorticoids. Halotherapy effectiveness increases greatly if it is used in complex with drainage training, thorax massage, physical training.

To improve Halotherapy effectiveness it is desirable to combine it with other methods of non-specific prophylaxis (kinesiotherapy, massage, aeroionotherapy, aromatherapy, vitamine therapy, phytotherapy, supplements etc.).

Halotherapy is to be repeated 1-2 times a year.

SIDE EFFECTS

Slight skin itch, cases of skin irritation in a shape of small dotted skin rash are observed at some patients after halotherapy sessions. These cases disappear after 3-5 sessions as a rule. In case of throat tickle appearing it is recommended to gargle with boiled water. Conjunctivitis appearance is quite possible as a result of eye mucous tunic after halotherapy sessions. To stop inflammatory process it is recommended to instill eye drops (for contact lenses, for example) for 5-7 days, it is recommended to keep eyes closed during halotherapy session.