



EFFECT OF DRY SODIUM CHLORIDE AEROSOL ON THE RESPIRATORY TRACT OF TOBACCO SMOKERS

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BRIEF SUMMARY

To estimate the changes in the airway of tobacco smokers after inhalations of dry sodium chloride aerosol the group included 47 males was examined. They were employees of an instrument manufacturing plant of St. Petersburg. Men aged from 35 to 60, who have been smoking about 15-20 cigarettes a day not less than 15 years, having no chronic pulmonary diseases and are not exposed to occupational hazards were eligible for participation in the study. Test group (TG) (24 males) were given 20 procedures (10 min daily) of inhalations of dry sodium chloride aerosol, and placebo group (PG) was included 23 males.

88% of smokers of TG by the end of inhalation course reported easier and/or decreased cough, changes in the character of sputum, which became lighter and clearer. Improvement in the character of sputum was noted only 22% volunteers of PG ($p < 0,001$).

Cytobacteriologic study of brush biopates taken from pharyngeal mucosa was determined that the infection index (II - % of epitheliocytes with adhered cells of *S. pneumoniae*) and adhesion index (AI - the mean number of microbial cells per one epitheliocyte) decreased significantly in the TG ($p < 0,01$). The amount of SIgA in epithelial cells of the oropharyngeal mucosa (estimated by indirect method of fluorescent antibodies) increased significantly in the TG ($p < 0,05$). There were no significant changes at these indexes in the PG.

Conclusion. DSCA relieves the main clinical signs (character of cough and sputum), improves local defense mechanisms and strengthens resistance of mucous membranes of tobacco smokers owing to decreased colonization activity of pathogenic microorganisms and increased SIgA.

INTRODUCTION

It is generally accepted that persons (prs) with exogenous risk factors of COPD (tobacco smokers, prs are exposed to industrial pollutants) are required sanitation of respiratory tract to prevent development of lung diseases.

Considerable efforts have been directed at examining the action of dry sodium chloride aerosol (DSCA) on respiratory tract of the patients with COPD, asthma and the persons with risk factors of COPD. DSCA is characterized with physical properties, differing from those of the saline aerosols. DSCA demonstrated anti-inflammatory activity in the respiratory tract, mucoregulating action. It enhances drainage of the bronchi, activates alveolar macrophages, and improves biocenosis and local humoral immunity.

AIM OF RESEARCH

The aim was to study influence of DSCA on the respiratory tract of tobacco smokers.

STUDY DESIGN AND PROCEDURES

47 male were examined. They were selected after medical and lung function examination. They had the productive cough associated with smoking. Chronic respiratory pathologies had been diagnosed in none of them. The groups did not differ significantly by sex, age, smoking duration and intensity (table 1).

TG were given 20 procedures (10 min daily) using inhaler Haloneb (fig.1), producing DSCA with particles size of 1-5 μm and 0.5 mg/min density (total dose is approximately 5 mg per procedure). PG received inhalation with plain air using inhaler Haloneb, specially designed for the study. It was a single blind study with placebo.

Cytobacteriologic study of brush biopates taken from pharyngeal mucosa was carried out before and

after procedures in the both groups. Brush biopates were obtained from the antero-medial tonsillar surface, using an endoscope brush fixed on a holder. The degree of the adhesiveness of the strain by microorganisms was estimated by the adhesion index (AI). The AI was found as the mean number of microbial cells per one epitheliocyte; 50 epithelial cells participating in the adhesion process of epithelial cells were counted. The colonizational activity was estimated by the infection index (II), i.e. the percentage of epitheliocytes with adhered cells of pneumococcus per 50 counted cells.

Table 1 Characteristics of the Test (TG) and Placebo (PG) groups

Parameter, M±m	TG	PG	Significant difference
Number of the persons	24	23	
Age, years	49.9±1.2	49.5±1.5	p>0.05
Smoking time, years	(37-60)	(35-60)	p>0.05
	27.9±1.7	26.5±1.7	
Smoking intensity (packs/years)	(14-42) 27,0±2,0	(15-42) 27,9±2.3	p>0.05

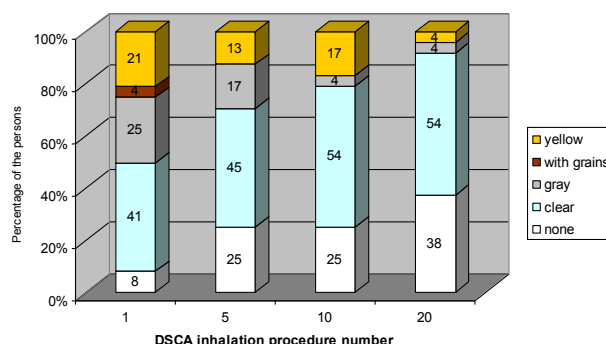
The amount of SIgA in epithelial cells of the oropharyngeal micosa was estimated by indirect method of fluorescent antibodies (RIF).

RESULTS

88% of smokers of TG by the end of inhalation course reported easier and/or decreased cough, changes in the character of sputum, which became lighter and clearer. Improvement in the character of sputum was noted only 22% volunteers of PG (p<0,001).

The character of sputum changed gradually in TG smokers during the course of DSCA inhalations. By the 5th procedure, the number of pts expectorating yellow sputum decreased, and by the 10th - there was decrease in the number of persons expectorating gray sputum (p<0.05). By the end of the course DSCA procedures expectorating of gray or yellow sputum was only in separate cases. The number of pts who stopped producing sputum increased significantly, while sputum turned light in the rest (p<0.01) (fig.2). There were no specific changes in the character of sputum in CG.

Fig. 2. Changes in the character of sputum during the course of the dry sodium chloride (DSCA) inhalations (n-24)



Cytobacteriologic study showed that the II and AI of epithelial cells for etiologically important microorganism *S. pneumoniae* decreased significantly in TG who were given DSCA (fig. 3). The II and AI also decreased significantly as regards another opportunistic microflora (*H. influenzae*, *S. aureus* etc.). These findings suggest decreased colonization activity of opportunistic microflora of the mucus. At the same time, the normal microflora (IA norm.) (*Neisseriae* spp., *S. viridans*, *S. salivarius* etc.) increased significantly, which indicates intensified natural colonization of the mucosa. This combination of the processes suggests increased resistance of the mucosa under influence of DSCA in TG. There were no significant changes in the character of sputum in CG (table 2).

Table 2.

Colonization activity of microflora of brush- samples from pharynx of the Test (TG) and Placebo (PG) groups of smokers before and after inhalations of dry sodium chloride aerosol (DSCA)

Index (M±SD)	Units of measure	TG		PG	
		Before DSCA	After DSCA	Before DSCA	After DSCA
II (<i>S. pneumoniae</i>)	%	28.1±24,9	7.8±9,7***	18.4±22,6	11.8±16,8
II (<i>H. influenzae</i> , <i>S. aureus</i> etc.)	“-“	20.8±31,9	2.4±5,6**	6.9±14,9	5.2±10,5
IA (<i>S. pneumoniae</i>)	Number of the microbes cells	45.4±33,0	13.9±16,3***	25.4±22,9	17.6±18,0
IA (<i>H. influenzae</i> , <i>S. aureus</i> etc.)	“-“	21.6±25,0	4.2±9,3**	9.8±19,5	7.8±17,6
IA norm.	“-“	6.9±7,9	23.0±17,8***	7.5±14,5	9.8±15,2

*Note: significant ($p < 0.05$) changes vs. initial values; ** significant ($p < 0.01$), *** $p < 0.001$ changes vs. initial values

The amount of SIgA increased significantly in the TG (before - $1,5 \pm 0,9$ and after - $2,1 \pm 0,5$, $p < 0,05$). There were no significant changes at these indexes in the PG (before - $1,6 \pm 0,9$ and after - $1,7 \pm 0,9$, $p > 0,05$).

CONCLUSION

Dry sodium chloride aerosol inhalations produce positive effect on the airways of tobacco smokers (versus placebo). DSCA relieves the main clinical signs of tobacco smokers (character of cough and sputum), improves local defense mechanisms and strengthens resistance of mucous membranes of tobacco smokers owing to decreased colonization activity of pathogenic microorganisms and increased SIgA.

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