

INTERACTION OF OFFICE POLLUTION WITH PULMONARY FUNCTION AND CELLULAR RESPONSES

D.Sprudza, Z.Martinsone, I.Remeze, M.Pilmane¹, M.Bake

Rīga Stradiņš University,

Laboratory of Hygiene and Occupational Diseases

¹Institute of Anatomy and Anthropology

16 Dzirciema str., Riga, Latvia, e-mail: Dagmara.Sprudza@rsu.lv



Introduction

The non-industrial indoor air quality could be significant risk for health. The office employees could be exposed to different indoor environmental risks: chemical compounds (coming from office equipment, cleaning materials etc.), microbiological agents, inadequate microclimate and deficient efficiency of ventilation system in the premises.

The aim of study – to determine effects of office equipment pollution on the organism in the animals studies using passive inhalation exposure method.

Materials and methods

The study was carried out under OECD guidelines for inhalation toxicity studies, European Convention for protection of animals and opinion of local Ethics Committee. Twenty-five Wistar rats weighing 182–185 grams were randomly divide into 2 experimental groups: 10 – control; 15 – exposure 28 days of passive inhalation of office equipment pollution. The study was carried out under natural conditions. At the end of the study was evaluated follows parameters: clinical analysis of blood, cell composition of bronhoalveolar lavage, oxydativ stress (SOD, GSH, LOOH) and inflammatoty markers (TNF- α factor, IL-1, C-reactive protein), indicators of immunity and histopathological examination of lungs and upper respiratory tract.

Results

From the third week the experimental group animal's weight gain was less than the control group (Fig. 1). The lung and upper respiratory tract lavage analysis showed epithelial cell changes; disappearance of macrophages, slight increasing of lymphocyte count (Table 1). At the end of study some inflammatory (TNF- α factor, C-reactive protein) indicators of experimental animals compared to the control group were statistically significantly increase (Fig. 2;3). The changes of the level SOD and GSH show to involved free radicals in oxidative stress process, at the same time exist the mobilization of the immune system. The histological data of lungs and upper respiratory tract confirm the inflammatory process (Fig. 4).

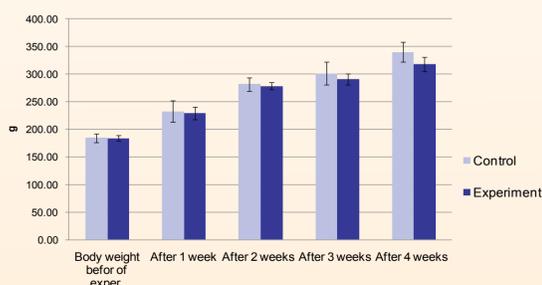


Figure 1. The body weight changes within 28 days of the experimental and control group

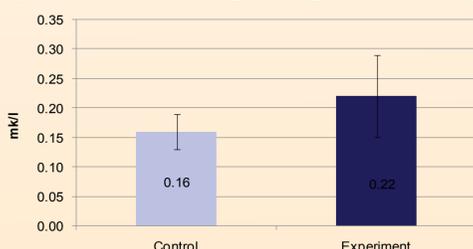


Figure 2. C-reactive protein changes in the blood of white rats after 28 days of exposure

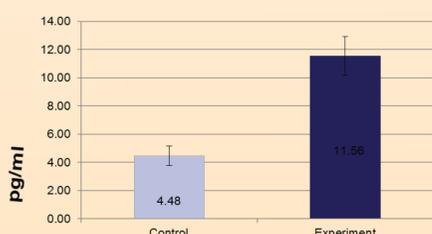


Figure 3. TNF- α changes in the blood of white rats after 28 days of exposure



Table 1. The lung and upper respiratory tract lavage analysis of white rats

Groups	Animals (n)	Total number of cells	Macrophages	Neutrophils	Lymphocytes	Epithelial cells
Upper respiratory tract						
Control	5	27,4±3,2	1,2±0,8	11,4,0±2,3	8,0±1,9	6,8±2,3
Experiment	10	65,0±22,0*	0	43,0±18,8*	14,0±5,3*	8,0±1,2
Lungs						
Control	5	118,4±43,9	1,6±1,2	45,4±15,1	66,2±25,6	5,2±1,8
Experiment	10	107,2±52,2	0,8±0	24,2±14,6*	74,2±48,5	8,0±4,2

* P<0,05, compared with the control groups

Trachea



Basal cells hiperplasia; mucos gland hipertrophy

Figure 4. Histological study of the trachea

Conclusions

The observed changes indicate to development of compensatory inflammatory process in organism caused by air pollution (volatile organic compounds and ultrafine particles) in the offices air.