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THE EXPOSURE TO THE CARCINOGEN DUST IN TIMBER INDUSTRY

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Summary
Previous studies of worker exposure to wood dust in the workplace, both in our country and other countries were determined by the mass concentrations of respirable particles and total dust. Based on previous studies, the results show that more than half of the work places exposures are greater than the prescribed limit. This paperwill note which tree species cause tumour of the nasal cavity, other disorders, allergies, and asthmas, etc.

Key words: wood dust, Inhalable fraction

1. INTRODUCTION

Working with sprockets saws, workers have to work felling and processing, with a load of noise and vibration, further burdened by adverse effects of exhaust gases and particulate mineral oil and wood dust from the working atmosphere. Due to long exposure to wood dust, at low concentrations, the chemical composition of wood materials can have very strong biological effect on human health. Besides the occurrence of allergies and asthma, due to harmful substances from pine, spruce and oak the biggest problem is the risk of developing adenocarcinoma of the nose and sinuses caused by exposure to wood dust, beech and oak. The emergence of developing adenocarcinoma of the nasal cavity in the wood industry workers is very significant in relation to the occurrence of other malignancies of the total human population, which is very rare and is only 0.25%.It is not entirely sure that the chemical composition of wood substance has carcinogenic effect, but given the importance of the content of tannin, tannin acids, aldehydes and its oxidation products, as a result of mechanical processing at high heat generated chemically altered charred wood particles. To assess the harmfulness of wood dust it is significant the one that reserves in the ambient air particulate matter consisting of up to 100 μm aerodynamic diameter before the sedimentation. Professional exposure to organic dust is still present in many workplaces. The term organic dust refers to a mixture aerosol particles of plant, animal and microbial origin. It can cause or worsen a

variety of inflammatory disorders of the respiratory system, the irritating symptoms of upper and lower respiratory tract to asthma, chronic obstructive lung disease, byssinosis, hypersensitivity pneumonitis and organic dust toxic syndrome.

2. WOOD DUST

Dust is a solid dispersion consisting of aerosol particle size of <1 to 100 um. Most of the wood particles mean aerodynamic diameter greater than 5 mm (135). The airways are observed separate areas which differ according to the method of removal of inhaled particles, and particle residence time at the site of deposition.

The air is purified entering the body when going through the input part of the respiratory system.Coarse particles are stopped by the nasal hairs or deposited on the mucous membranes of the nose, pharynx and throat after which it can be mechanically removedby sneezing, wiping noses or swallowing. Smaller particles penetrate deeper into the respiratory system. Previous studies have shown that the disposal of particles in the respiratory system can be displayed as a function of particle aerodynamic diameter.

International Organization for Standardization (ISO) has introduced five fractions of particles as a function of the probability of penetration in certain parts of the respiratory system:

1. Inhalable fraction - mass of particles that enter the respiratory system when appropriate.
2. Extrathoracic fraction - mass of inhalable particles do not penetrate deeper than the larynx (aerodynamic equivalent diameter of particles> 10μm).
3. Thoracic fraction - mass of inhalable particles that penetrate deeper than the larynx.
4. Tracheobronchial fraction - mass of inhalable particles that penetrate deeper into the larynx, they penetrate deeper than the terminal bronchioles (aerodynamic equivalent diameter of the particle 3-15μm).
5. Respirable fraction - mass of inhalable particles that penetrate the alveolar spaces (aerodynamic equivalent diameter of particles <0.2 - 10μm).

Wood dust has irritating and allergenic properties. One example is the allergicallyplicatic acid that is released during the processing of red cedar (Thuja plicata). Exposure to high concentrations of allergens is associated with an increased prevalence of asthma among workers.

It is assumed that the mechanisms that lead to the development of asthma in exposed workers are not only allergic nature.Although he found the increase of specific IgE antibodies to plicatic acid in exposed workers with a positive correlation between the concentration of these antibodies and the incidence of bronchial hyper-responsiveness (BHR), increased prevalence of BHR was found in neatopic workers. Seems to be allergenic and irritant properties owned and catechol from oak (Quercussp) and sesquiterpenes from beech (Fagussp), which is associated with an increased incidence of BHR in exposed workers.

3. EFFECTS OF EXPOSURE TO ORIGANIC DUST IN THE WORKING ENVIRNMENT IN TIMBER INDUSTRY

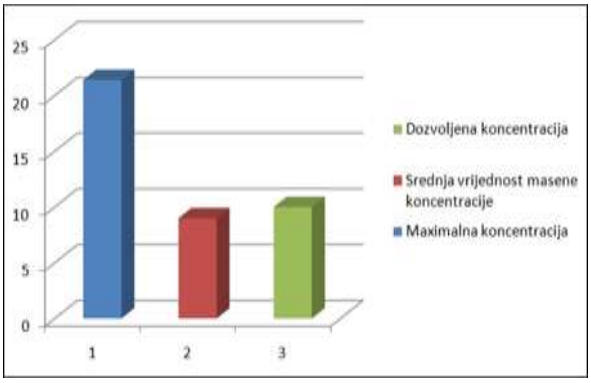
Wood industry, as well as many jobs in other industries, such as textiles and food processing, agriculture, livestock farms and forestry; involve significant exposure to organic dust. Organic dust can be defined as a mixture of particles aerosol plant, animal and microbial origin. Workers in the timber industry, for example, are exposed to wood dust and volatile substances that are released when wood processing (e.g. terpenes, catechol, and plicatic abietic acid), bacteria and spores of various types of moulds and their decomposing products, including endotoxin and beta glucan, pesticides which wood is treated to protect against parasites, and metals which are released from the surface of the cutting machines.

PICTURE 1- bend saw blade-blade of unalloyed or low-alloy steel

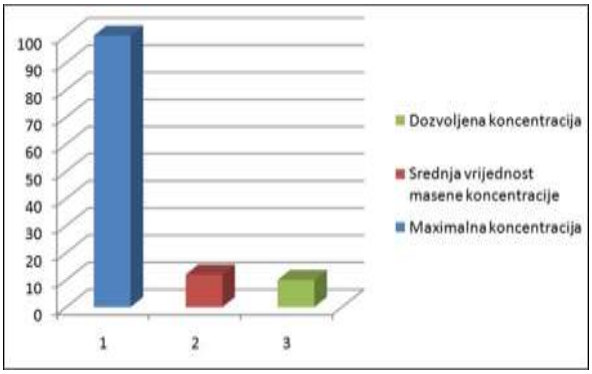
In the following example, there are the results of investigations of wood dust in the factory flooring. When we sampled and determinate dust we used recommendations company Casella CEL and their website http://airsamplingsolutions.com/ used. In the process of sanding wooden floors in the operation of the company frees up a considerable amount of dust. Workers are exposed to constant during their full-time job to petty respirable dust and they avoid wearing personal protective equipment, which they are secured by.

PICTURE 2-Personal protective means are used for protection from respirable dust

To determine the amount of the presence of dust in the workplace dust measurements were performed on two occasions. The measurement is carried out using the direct method of reading instrument MicroDust 880. The first measurement was made on the first day for 10 minutes. Concentration reached a maximum of up to 21.4 mg/m3. The average (mean) value of the mass concentration of total dust was 9.00 mg/m3 which does not exceed the maximum allowable concentration of wood dust is 10.00 mg/m3. Another measure in the same job operation was repeated the next day. Measurement is made by direct indication of mean mass concentration of total dust for 30 minutes and when it has reached a maximum concentration of 100.00 mg/m3, whereas the mean value of the mass concentration of total dust was 12.00 mg/m3, which amounts to more than the maximum allowable concentration of 10.00 mg/m3.



PICTURE 3- Measuring the presence of dust for the first time in about 10 minutes



PICTURE 4-Measuring the presence of dust, the second time for 30 minutes

The results showed that, depending on the duration of the measurements in one case we get the value of which, according to our current standard of the permitted MRL, and in the second case the measurement time extended to 30 minutes,mean for the average concentration of dust has exceeded the limit. Besides the extension of the time of sampling, the maximum concentration of 100 mg/m3, which is significantly higher than the value of 20 mg/m3, recommended by the British Standard MDHS14 / 3 for short-term exposure limits (STEL) for cellulosic total dust inhalation.

As recommended by the British Standards MDHS14 / 3 short-term exposures limit (STEL), which is defined as a 15-minute TWA (weighted average value of the observed time interval) exposure that should not be exceeded during a workday even if the 8-hour reference TWA is within limits. Exposure to the STEL should not be longer than 15 minutes and should not be repeated more than 4 times a day.You should pass at least 60 minutes between successive exposures at the STEL.So from these previous considerations, one can clearly see that the value of 10.00 mg/m3, prescribed by JUS.Z.B0.001/1991 for MRLs for wood dust remains very poor in the context of the considerations above, especially for the workers' safetythat are endangered in the work process where mentioned dust is present.

4. HEALTH EFFECTS OF OCCUPATIONAL EXPOSURE TO RESPIRATORY HAZARDS IN TIMBER INDUSTRY

Exposure to organic wood dust can cause acute and chronic respiratory disorders, irritative symptoms of upper and lower respiratory tract to asthma, COPD, hypersensitivity pneumonitis and organic dust toxic syndrome (4, 5, 134). Wood dust, primarily from hard wood species (e.g. Oak and beech) can have carcinogenic effects, and is associated with the development of cancer of the nasal cavity and sinuses.

Asthma is a disease characterized by varying disturbances in the flow of air through the airways and / or hyper-reactivity of the airways accompanied by inflammation. Occupational asthma refers to cases of asthma caused by the inhalation hazard in the workplace (4). Occupational asthma may be allergic and irritating, distinguishing between two forms of irritating asthma. The first is reactive airways dysfunction syndrome (RADS) which occurs suddenly after a short exposure (usually accidental) high concentrations of gases, vapours, fumes or dust that act as respiratory irritants, and to the people who had never suffered from asthma. Another form of professional irritating asthma is induced by prolonged exposure to irritating astmogenic substances in concentrations much lower than those that cause RADS. Allergens liable for the development of allergic asthma are numerous, and their chemical compositions are usually proteins. The molecular weight can be divided into high molecular weight (> 5000 Daltons, e.g. dust mites, latex, mould, coffee, flour) and low molecular weight (<5,000 Daltons, e.g. diizocyanate, acid anhydrides, metals, penicillin. The low molecular weight allergens include and abietic and plicatic acids that are released when processing wood.

Chronic obstructive pulmonary disease is characterized by restricted air flow through the airway that is not fully reversible (4). Flow limitation is usually progressive and associated with (probably genetically based) excessive inflammatory response in the airways and lung parenchyma caused by inhalation of noxious gases or particles. Chronic obstruction of the airway is caused by the pathological changes in the small airways (obstructive bronchiolitis) and deterioration of lung parenchyma (emphysema). This disease is one of the leading public health problems, and by the predictions of the World Health Organization will become the third cause of death and the fifth leading cause of work disability in the world by 2020. Costs of treating COPD triple exceed the costs of treating asthma (158). In developed countries the most common cause of the origin and development of COPD is cigarette smoking, but also air pollution, diet

deficient in protein, as well as occupational exposure respiratory hazards, including wood dust.

Byssinosis is also included in the group of professional lung diseases caused by inhaling dust with biologically active vegetable origin as it is cotton, hemp and linen.At the beginning of the disease is manifested by coughing, chest tightness and shortness of breath on the first working day of the week after a week of rest, and over time these symptoms persist throughout the work week and the disease goes into COPD.

Hypersensitivity pneumonitis (extrinsic allergic alveolitis) is accompanied by an inflammatory reaction in alveoli and terminal bronchiole after previous sensitization and repeated inhalation of organic dust (farmer's lung, pigeon breeder's disease).

5. CONCLUSION

It has already been pointed out that the determination of the concentration and duration of exposure to respirable dust of most concern in the professional pathology. The methods of work, analysis of working atmosphere, the whole methodology and procedure for the analysis should be determinated. Personal sampling dust with the constant analysis of the results should be a central part of the safety and health at work for each extraction of minerals or the treatment processes where dust occurs.
When selecting maximum risk workers important factors are the following:

- Closeness to sources of contaminants (pollutants),
-The frequency of closeness to sources of contaminants,
- Number of sources of contaminants,
- Workers' complaints and diseases.

Suspicious and potential health hazards can be assessed by sampling the greatest dangers workers - persons who is considered to have the greatest potential for exposure. A worker can be exposed to high risk, due to the work area (location) or procedures of work (tasks). Work area can have more than one maximum risk if work activities or operations are not uniformed or if there are several different sources of exposure.

6. RESOURCES

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