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" SICK BUILDING SYNDROME " IN ACTUALITY

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Abstract. The study have been performed a new established factory near Timişoara. People working in offices presented different discomfort complaints in short time after starting the work. The working conditions are very modern. Tests for chemical hazard identification and microclimate measurements in different workplaces have been performed. The concentration of alveolar fraction of the dust was higher than that in the factory and exceeded the maximum allowable concentration. Other investigated airborne toxicants, such aromatic hydrocarbons, formaldehyde, carbon monoxide, ozone were found in normal limits. The relative humidity values were of 30-40% in offices. We performed an ergonomic evaluation of the occupational activity, clinical examination, laboratory tests, electrocardiogram and pulmonary function tests in two groups of workers. An adequate questionnaire was used. The group "O" with occupational exposure in offices consisted of 15 subjects with the average age 29.8±5.2 years. The control group "W" consisted of 22 workers with respiratory exposure to synthetic fibbers and the average age 35.4±8.5 years. Irritative and allergic symptoms in both groups were noted. In office personnel we found headache, fatigue, and for women, abdominal pain, nausea, headache, dizziness, behavioral changes, memory disturbances; these findings were statistically significant. The modifications of some laboratory and functional tests proofs for pre-existing complains, tobacco smoking and occupational exposure.
Key words: sick building syndrome, air pollution, health status

Rezumat Am întreprins un studiu la o fabrică nou înfiinţată lângă Timişoara. Personalul care lucrează în birouri acuza disconfort la scurt timp după începerea lucrului. Condiţiile de muncă sunt foarte moderne. Am efectuate teste de toxicitate şi măsurători de microclimat la diferite locuri de muncă. Concentraţia fracţiei alveolare de pulberi a fost mai mare decât cea din fabrică şi a depăşit concentaţia maxim admisă. Alte noxe chimice investigate, cum are fi hidrocarburi aromate, formaldehidă, oxid de carbon, ozon, au fost găsite în limite normale. În birouri, umiditatea relativă a fost de 30-40%. La două loturi de muncitori am efectuat evaluarea ergonomică a locurilor de muncă, examen clinic, teste de laborator, electrocardiograme şi probe funcţionale ventilatorii. S-a utilizat un chestionar adecvat. Lotul "O" cu expunere profesională în birouri a cuprins 15 persoane cu media de vârsta de 29,8± 5,2 ani. Lotul martor "W" a fost alcătuit din 22 de muncitori cu vârsta medie de 35,4±8,5 ani şi expunere respiratorie la fibre sintetice. La ambele loturi s-au observat simptome alergice. Personalul din birouri a prezentat dureri de cap, oboseală, iar femeile au acuzat dureri abdominale, greaţă, dureri de cap, ameţeli, modificări de comportament, tulburări de memorie; aceste modificări au semnificaţie statistică. Alterarea unor probe funcţionale şi de laborator dovedeşte existenţa unor suferinţe anterioare, fumat şi expunere profesională.
Cuvinte cheie: sindromul clădirilor bolnave, poluare atmosferică, stare de sănătate.

INTRODUCTION

We performed a study in a newly established factory near Timişoara. The reason for this research was that the people working in offices presented different complaints in short time after starting the work.

This study addresses relationships between indoor air quality (IAQ), occupants health and comfort, and the mitigation strategies. The major objectives are to relate direct measurements of IAQ to building related illness and the sick building syndrome and to increase the understanding of the relationships between occupants health, building system operation, and air quality.

Literature data

Indoor air pollution poses many challenges to the health professional. The individuals complaining of environmentally associated symptoms is apt to have been exposed to airborne substances originating not outdoors, but indoors.

An actual public health problem that occurs in persons with a good living standard, in modern offices or at home, is a sum of symptoms, known as the "sick building syndrome" (SBS).

Studies from the United States and Europe show that persons in industrialized nations spend more than 90 percent of their time indoors. For infants, the elderly, persons with chronic diseases, and most urban residents of any age, the proportion is probably higher. In addition, the concentrations of many pollutants indoors exceed that of outdoors. Therefore, the locations of highest concern are those involving prolonged, continuing exposure - that is, the home, school, and workplace [1].

The lung is the most common site of injuries induced by airborne pollutants. Acute effects, however, may also include non-respiratory signs and symptoms, which may depend upon toxicological characteristics of the substances and the host-related factors.

This paper addresses the indoor air pollution problems that may be caused by contaminants encountered in the daily living of persons, both in their homes and offices. Etiology can be difficult to establish because many signs and symptoms are nonspecific, making differential diagnosis a distinct challenge.

Multiple pollutants may be involved. The challenge is further compounded by the similar manifestations induced by many of the pollutants and by the similarity of those effects which may be associated with allergies, influenza, and the common cold. Many effects may also be associated, independently or in combination with, psychological stress, work pressures, and seasonal discomforts.

Because only few prominent aspects of indoor air pollution have notably been brought into public attention, individuals may volunteer suggestions of a connection between respiratory or

other symptoms and conditions in the home or, especially, the workplace.

Key signs/symptoms of the sick building syndrome are lethargy or fatigue, headache, dizziness, nausea, irritation of mucous membranes, sensitivity to odors [1, 9].

Diagnostic leads are [2]:

Are there problems temporally related to the time spent in a particular building or part of a building?

Do the symptoms resolve when the individual is not in the building?

Do symptoms recur seasonally (heating, cooling)?

Have co-workers, peers, noted similar complaints?

Remedial action: appropriate persons - employer, building owner or manager, building investigation specialist, medical epidemiologists and other public health officials-should undertake investigation and analysis of the building in question, particularly the design and operation of HVAC systems, and correct the contributing conditions. Persistence on the part of individual(s) and health care consultant(s) may be required to diagnose and remedial the building problems.

The term "sick building syndrome" (SBS), first employed in the 1970s, describes a situation in which reported symptoms among a population of building occupants can be temporally associated with their presence in that building. Typically, though not always, the structure is an office building [1,4,6,7].

Generally, a spectrum of specific and nonspecific complaints is involved. Typical complaints, in addition to the signs and symptoms already listed, may also include eye and/or nasopharyngeal irritation, rhinitis or nasal congestion, dry cough; dry or itchy skin, inability to concentrate, fatigue, and general malaise-complaints suggestive of a host of common ailments, some ubiquitous and easily communicable. The key factors are commonality of symptoms and absence of symptoms among building occupants when the individuals are not in the building. Most of complainants report relief soon after leaving the building [6].

Sick building syndrome should be suspected when substantial proportions of those spending extended times in a building (as in daily employment) report or experience acute on-site discomfort. If is important, however, to distinguish SBS from problems of building related illness [5]. The latter term is reserved for situations in which signs and symptoms of diagnosable illness are identified and can be attributed directly to specific airborne building contaminants. Legionnaires' Disease and hypersensitivity pneumo-nitis, for example, are building related illnesses.

There has been extensive speculation about the cause or causes of SBS. Poor design, maintenance, and/or operation of the structure's ventilation system may be at fault. The ventilation system itself can be a source of irritants. Interior redesign, such as the rearrangement of offices or installation of partitions, may also interfere with efficient functioning of such systems.

The following have been cited causes of or contributing factors to sick building syndrome: inadequate ventilation, chemical contaminants from indoor sources (such as adhesives, carpeting, upholstery, manufactured wood products, copy machines, pesticides, and cleaning agents, fragrances, environmental tobacco smoke, carbon monoxide, nitrogen dioxide, a.s.o.), chemical contaminants from outdoor sources, biological contaminants [8, 11].

The phenomenon appears with high frequency in new or recent renovated buildings / homes [3]. Another theory suggests that very low levels of specific pollutants, including some of the discussed, may be present and may act synergistically, or at least in combination, to cause adverse health effects [9]. Humidity may also be a factor: while high relative humility may contribute to biological pollution problems, an unusually low level -- below 20 or 30 percent -- may strenghten the effects of mucosal irritants and may even prove irritating itself. Other contributing elements may include poor lighting and adverse ergonomic conditions, temperature extremes, noise, and psychological stress that may have both individual and interpersonal impact.

The prevalence of the problem is unknown. A 1984 World Health Organization report suggested that as many as 30 percent of new and remodeled buildings worldwide may generate excessive complaints related to indoor air quality. In a nationwide, random sampling of U.S. office workers, 24 percent perceived air quality problems in their work environments, and 20 percent believed their work performance was hampered thereby [11].

When SBS is suspected, the personal physician or other health care provider may need to join forces with others (e.g., clinicians consulted by an individual's co-workers, as well as industrial hygienists and public health officials) to adequately investigate the problem and develop appropriate solutions.

MATERIAL AND METHOD

An ergonomic study of the working conditions in all of the workplaces of the "I" plant was performed. It comprised microclimate evaluation, noise, light, dust, chemicals and radon measurements, airborne micro-flora analyze, evaluation of the effort and organizing of the work, shifts, a.s.o.

Questionnaire regarding personal data, antecedents, working conditions and different symptoms and/or disorders was applied upon two groups of workers (a total of 37 people).

The questionnaire contained 104 items. Some of them had the role to put in evidence the impact of the indoor air quality [2, 11]:

When did the [symptom or complaint] begin?

Does the [symptom or complaint] exist all the time, or does it come and go? That is, is it associated with times of day, days of the week, or seasons of the year?

(If so) Are you usually in a particular place at those times?

Does the problem abate or cease, either immediately or gradually, when you leave that location ? Does it recur when you return?
What is your work? Have you recently changed employers or assignments, or has your employer recently changed location?
(If not) Has the place where you work been redecorated or re-furnished, or have you recently started working with new or different materials or equipment? (These may include pesticides, cleaning products, craft supplies, a.s.o.).
What is the smoking policy at your workplace? Are you exposed to environmental tobacco smoke at work, home a.s.o.?
Describe your work area.
Have you recently changed your place of residence?
(If not) Have you made any recent changes in or additions to, your home?
Have you, or has anyone else in your family, recently started a new hobby or other activity?
Have you recently acquired a new pet?
Does anyone else in your home have a similar problem? How about anyone with whom you work? (An affirmative reply may suggest either a common source or a communicable condition).
It was performed clinical examination, functional tests (ECG, spirometric tests) and laboratory analysis.
The results were processed by means of EPI 6 Info software.

RESULTS AND DISCUSSION

Work environmental conditions are very modern, in all the sections of the plant.
In the factory the entire activity is mechanized and automated. The occupational effort is low, sometimes medium, and the workers wear adequate individual protective equipment. The general artificial ventilation is efficient. There is a very good separation between the production section and office building.
In offices there is modern insulation, furniture, carpets, air conditioning, without humidifier. Smoking is not prohibited; modern substances for housekeeping, electric odor fragrances are used.
We performed tests for chemical hazard identification and microclimate measurements in different work places. According to these tests we observed that the concentration of alveolar fraction of the dust is higher than the maximum allowable concentration in the factory (synthetic fibers). Other investigated airborne toxicants, such aromatic hydrocarbons, dust, form-aldehyde, carbon monoxide, ozone were found in normal limits. The relative humidity values were of 30-40% in offices [10].
We performed an ergonomic evaluation of the occupational activity, an adequate questionnaire, clinical examination, laboratory tests, electro-cardiogram and pulmonary function tests in two groups of healthy workers. The group "O" with professional exposure in offices comprised 15 people with the average age of 29.8± 5.2 years. The control group "W" comprised 22 workers with respiratory exposure at synthetic fibbers and the average age of 35.4±8.5 years.

There is noted irritation of mucous membranes, allergic symptoms and sensitivity to odors in both groups. If these signs are acceptable for artificial fibbers exposed workers, they are not explicable for office employers. In office personnel we found headache, fatigue, and for women, abdominal pain, nausea, headache, dizziness, behavioral changes, memory disturbances; these findings were statistically significant.

The modifications of some laboratory and functional tests proofs for pre-existing sufferings such as spasmophylia (5), pharyngitis (6), musculoskeletal disorders (6), arterial hypertension (3) obesity (5), diabetes mellitus (1), anaemia (3) a.s.o. Tobacco smoking is accompanied by low pulmonary restrictive or obstructive function. The exposure to professional noxious agents and specifically work environment is another cause of health damages.

The health status of the workers requires the necessity of prophylactic medical examinations, performed by occupational and family physicians.

We recommended some improvements that may include variations in the fresh air exchange, increasing the ventilation rates, HVAC (heating, ventilating and air conditioning) system scheduling/ operation, humidity, nighttime purge, filtration, and cleaning, interdiction of tobacco smoke in the plant or providing a separately ventilated room, change of the cleaning materials, the cease of the usage of products that contain fragrances, education and communication. A psychosocial survey will account for job-related and personal cofactors, which may affect reporting results of the IAQ and symptom survey.

The study should help to identify and quantify effects of various indoor pollutants and potential mitigation strategies, and should help to improve protocols for building investigations.

The health status of workers requires the necessity of prophylactic medical examinations, performed by occupational physicians.

The conclusions of this modest study can be a starting point for other studies, in the problem of the “sick building syndrome”.

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