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Examining building-related symptoms in clinical practice

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Evaluating relationships between indoor-climate factors and building-related symptoms is difficult due to the nonspecificity of symptoms and the complexity of exposures, both physical and psychosocial in character. At the group level, these problems can be handled efficiently by occupational health personnel using a stringent strategy and involving multiprofessional teams. However, at the individual level, the difficulties are even greater, mainly due to the differences in sensitivity and vulnerability among people and a lack of knowledge about which medical and psychosocial mechanisms are involved. Over the last few decades, some new clinical instruments and methods have been introduced to register subtle objective effects, and they will also, hopefully, increase the possibilities for making better evidence-based assessments in the future at the individual level. There is an urgent need for more basic research about the medical and neuropsychological mechanisms involved.

Key terms objective measures; occupational health care; questionnaire; sick building syndrome; strategy.

There are frequent complaints about the indoor climate in nonindustrial buildings, and workers or tenants often relate nonspecific symptoms to the indoor environment, sometimes summarized in the concept sick building syndrome or building-related symptoms. The symptoms involved are irritative symptoms of the eyes, skin, and upper airways, as well as symptoms such as fatigue and headache. The clinical evaluation of a relation between indoor-climate factors and these nonspecific symptoms is difficult due to complex mixtures of low-level exposures to chemical and biological agents in addition to different psychosocial factors. It is, of course, even more difficult to relate the symptoms to the building or its equipment because of the impact of activities in the buildings.

Epidemiologic studies have shown many statistical correlations between specific indoor-air exposures and symptoms, but the findings sprawl, and there are few (if any!) established relationships between specific exposures and symptoms. A relationship between moisture-damaged indoor environments and building-related symptoms are often reported, but the causal agents can only be speculated about (1). Clinical studies show objectively registered health effects, but the control of the exposures is usually poor (2–3). Controlled climate-chamber studies of low-level exposures to chemicals, biological agents, or particles show no well-defined health effects, although some effects are found that indicate possible inflammations of the mucous membranes in the eyes and nose (4–5). Symptoms are, by definition, subjective, and the perception is influenced by various attentional and attributional psychological processes in addition to differences in personality characteristics such as a tendency towards somatization or negative affectivity (6). This phenomenon explains, in part, why men and women have different symptom prevalences in many studies (6–7). Classical conditioning and sensitization mechanisms further complicate the picture (8).

The difficulties increase tremendously when the relation between environmental factors and symptoms are evaluated on an individual basis because of additional interfering personal differences in vulnerability and sensitivity. Nevertheless, these questions have to be dealt with, in particular by occupational health services or by occupational medicine institutions. In this presentation, I focus on the reported nonspecific symptoms from the perspective of occupational health services. Asbestos, lung cancer from radon, allergic alveolitis, humidifier fever, rhinitis, or asthmatic diseases are related to occupational environmental exposures, but I have not included them in my presentation.

Strategy

Basically, there are two different situations that need to be handled. In the first, the company staff or members

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from trade unions contact occupational health services asking for help because workers are reporting symptoms that they relate to the indoor environment (the group level). In the second situation, individual employees are seeking medical care because of symptoms that they relate to the indoor climate.

Group level

In this situation, the focus is on the environment. A stepwise strategy originally described in a document of the World Health Organization in the beginning of the 1980s has been shown to be efficient (9). The basic step aims at finding the basic problems and determining the extent of the problems. In most situations, an experienced occupational hygienist can make the first step by carrying out a walk-through investigation with use of his or her senses (sight, hearing and smell), checking drawings of the building and its history (ie, whether there has been moisture damage earlier), as well as some basic measurements (ie, the temperature of the indoor air, especially the temperature of the inlet air). Accompanying persons from the workplace can give further information about where and when the indoor air has deteriorated further (Monday morning, during the afternoon, when many people are together in meeting rooms, etc) or if other problems are common. When no obvious problems are noted or when there is reason to believe that the problems are more complicated, it is preferable, at the earliest, to involve a team of specialists covering medical and psychosocial questions, persons representing the company, and representatives of the workers.

In the next step, information is gathered with regard to how all the personnel perceive the environment, preferably by using standardized self-administered questionnaires. This standardization makes it possible to carry out comparisons with other occupational groups or reference groups with similar work situations, the impact of factors related more to the work situation than to the building itself thus being minimized. By using the graphic technique shown later in this presentation when the results of the questionnaire survey are presented, it is easy to explain and discuss the necessary completion of investigations with all persons involved. In the next step, necessary technical or biological measurements are planned and performed on the basis of the results from earlier steps. The personnel often put pressure on the employer to initiate general health check-ups. This process can be acceptable, at least from psychosocial point of view, but it seldom gives any essential clues with which to solve the basic problems. However, meeting the most affected workers can provide valuable information.

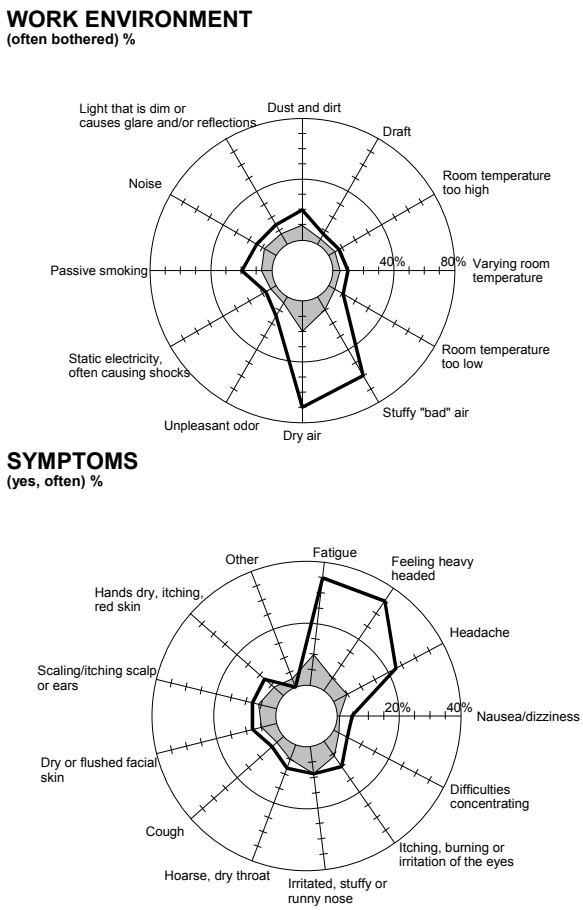

Figure 1. Complaints about stuffy "bad" air, dry air, and an increased frequency of general symptoms point to ventilation problems.

Graphic technique

When standardized MM questionnaires are used, the results are presented in graphs, as seen in figures 1 and 2 [10; supplementary information about the MM questionnaires is available at www.orebroll.se/amm)]. In the graphs, both the prevalence of "often" disturbing environmental factors and symptoms are presented together with reference values for environments without indoor-climate problems (shadowed area in the graphs). The same technique can be used when results are followed-up after intervention measures have been taken.

Individual level

When a person seeks occupational health services because of presumed building-related symptoms, a careful

registration of the medical and occupational history is essential, as is a detailed description of how the person perceives the specific environment. The symptom perception must be discussed in detail. It is important to discuss the type of symptoms, when they occur, if they change when the person(s) leave the workplace, and if other co-workers have similar symptoms in the same environment and whether any actions have already been taken. A general clinical investigation and appropriate basic tests (rhinoscopy, spirometry, methacholine provocation test, etc) are performed when necessary. It is essential to exclude specific diseases causing the symptoms, such as allergic diseases, and it is, therefore, often wise to make some basic allergy tests such as a radioallergosorbent test or a skin prick test, although they seldom point to causes related to the indoor climate. When there is a suspicion of building-related Legionnaires' disease, an X-ray and blood samples should be taken to exclude or verify this diagnosis. Provocation with the same mold species that are found indoors in nonindustrial buildings with moisture problems sometimes gives a positive outcome. The establishment of a correct diagnosis is essential to help the patients and to provide the appropriate interventions in the workplace.

Over the last few decades, an arsenal of objective methods has been developed to assess the environmental impact on mucous membranes in the nose (rhinomanometry, acoustic rhinometry, rhinostereometry or proteins in nasal lavage fluid) and eyes (break-up time, the number of inflammatory cells, etc) (11–12). Different provocation tests have been developed, such as the nasal histamine provocation test and the capsaicin inhalation test, for identifying sensory hyperreactivity (12–13). All of these techniques can be used in research and at the group level. However, none of them is specific enough to be of crucial value in individual cases.

Normally, none of the tests or provocations verify a relationship between specific environmental factors and perceived health problems or specific diagnoses, basically because of the lack of knowledge about the medical mechanisms and the significance of personal factors. Subsequently, the focus must be more on the environment, the very best assessment must be made about the possible relationship between the indoor environment and symptoms, and the results must be reported.

Concluding remarks

A huge amount of experience with practical cases from workplaces and domestic areas with indoor-climate problems shows that these problems can be handled efficiently by occupational health personnel at the group level by using a stringent strategy and involving multiprofessional teams while focusing on both the physical and psychosocial environment. However, the possibilities of establishing a true relation between the symptoms reported by individual workers and indoor environmental factors are limited, basically because the exposures are complex, the mechanisms behind the symptoms are seldom known, and available objective medical tests are not specific enough to be useful in individual cases. There is an urgent need for more basic research about the medical and neuropsychological mechanisms involved. One promising attempt has been made recently to describe the mechanisms behind eye symptoms in office environments (14).

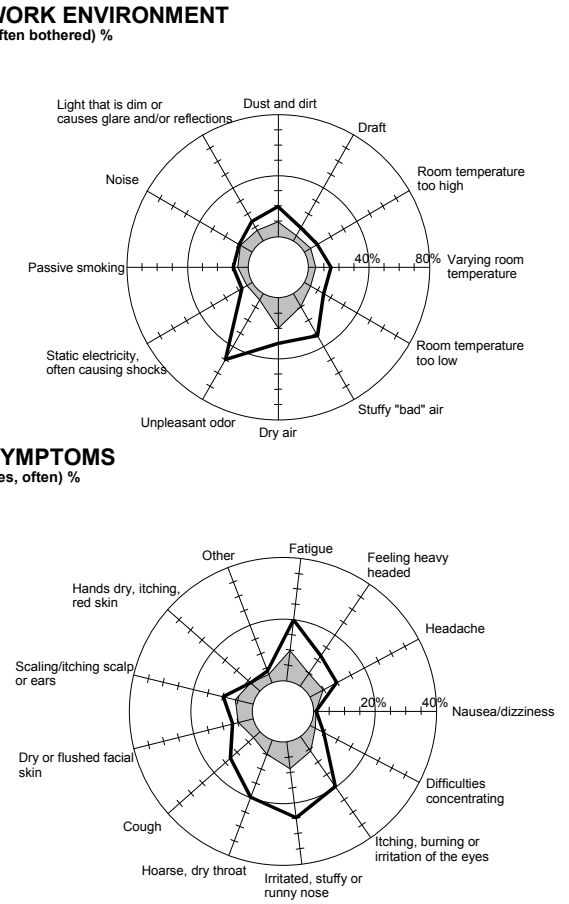

Figure 2. Complaints about an unpleasant smell, stuffy "bad" air, and an increased frequency of symptoms from the mucous membranes point to pollution in the indoor air. It is not possible to determine whether gases or particles are involved, but in such situations it is advisable to search for moisture problems.

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