

## Tight or Sick Building Syndrome

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### ABSTRACT

Modern buildings are designed with the usual heating, air-conditioning and ventilation equipment. In most of these buildings, air is continuously recirculated and, as a result, workers suffer from tight or sick building syndrome. This syndrome is discussed with reference to symptoms of air contamination, ventilation system standards and research needs. The most common symptoms of tight building syndrome are eye, nose and throat irritation, headache, fatigue, sneezing, difficulty in wearing contact lenses, chest tightness, nausea, dizziness and dermatitis.

Symptoms experienced by 50 doctors and 50 paramedical personnel working in an air-conditioned intensive care unit and operating theatres of the Government Rajaji Hospital, Madurai in India were studied by means of a questionnaire survey. In the present study, respiratory and ocular symptoms were observed more in those working in operating theatres and were believed to be due to excessive use of formaldehyde used for sterilization. Various suggestions were made to prevent sick building syndrome. Moreover, the physicians treating sick individuals should be aware of the symptoms caused by indoor air pollutants as sufferers invariably require a change of environment rather than drugs.

### INTRODUCTION

Since the early 1970s, indoor air quality problems have become more common in newly constructed or remodelled buildings [1, 2]. The

symptoms and signs experienced by those working in such buildings are grouped under the terms "tight building syndrome, sick building syndrome, closed building problem or new building syndrome" [3]. The possible reasons are attributed to the design of the new building, which has been constructed with a "recirculating air-conditioning system (cooling and heating) and unopenable windows". Moreover, the permeation that occurs from construction materials tends to remain in such buildings longer and at higher concentrations than in older or less airtight buildings. The purpose of the present study is to find out the symptoms experienced by medical and paramedical personnel working in an air-conditioned building.

### MATERIAL AND METHODS

In the Government Rajaji Hospital, Madurai, 50 doctors and 50 paramedical personnel working in an air-conditioned intensive care unit and operating theatres were informed about the nature of the study and asked to mention the symptoms experienced in the questionnaire provided to them on a weekly basis for four weeks. The data were collected and analysed.

### RESULTS AND DISCUSSION

The details of symptoms experienced by the staff are given in Table 1. The mean number of symptoms was four. Apart from these, various other symptoms [3] experienced by individual

TABLE 1

Symptoms of staff\* working in an air-conditioned hospital building\*\*

Central nervous system	
Headache	23
Fatigue	44
Irritability	13
Gastrointestinal system	
Nausea	7
Dys taste	9
General	
Noticeable odour	32
Eye irritation	19
Eye congestion	14
Respiratory system	
Sneezing	17
Nasal congestion	14
Nasal discharge	10
Wheezing	5
Chest tightness	3
Sore throat	3
Chest congestion	2
Cardiovascular system	
Nil	—
Genitourinary system	
Nil	—

\* Subjects: doctors 50, paramedical 50.

\*\* In operating theatre and intensive care unit.

occupants employed in the building are shown in Table 2. Frequently observed symptoms were irritation of eyes, headache, fatigue, drowsiness and running nose. One or more symptoms were observed in more than 50% of the staff. The factors causing the symptoms were identified with difficulty, as the levels of identifiable air pollutants inside the building are far below the known or expected effect levels, even though the concentrations of the pollutants are often higher than outdoor concentrations. The various chemicals identified indoors in such buildings are formaldehyde, volatile organics (toluene and others), light hydrocarbons, anions, metals, nitrogen dioxide, nitric oxide and diisocyanates [3].

In the present study, respiratory and ocular symptoms were observed more in those working in operating theatres, and symptoms were believed to be due to excess use of formaldehyde used in the operating theatres for the purpose of sterilization. Hence it is suggested that the person in charge of an operating theatre must take effective steps to control the formaldehyde level, as it will definitely

TABLE 2

Symptoms observed in tight building syndrome

Central nervous system	
Headache	
Fatigue	
Drowsiness	
Dizziness	
Sleeplessness	
Disorientation	
Irritability	
More emotional	
Depression	
Gastrointestinal system	
Nausea	
Unusual taste	
Tongue/lip numbness	
Digestive tract irregularities	
Abdominal pain	
Genitourinary system	
Bladder infection/dysuria	
Unusual vaginal discharge	
Menstrual irregularities	
Respiratory system	
Sore throat	
Nasal/sinus congestion	
Sneezing	
Chest tightness	
Chest congestion	
Nosebleed	
Cardiovascular system	
Chest pain	
Rapid heart beat	
General	
Noticeable odour	
Eye irritation	
Contact lens problems	
Visual disturbances	
Back pain	
Joint aches	
Skin irritation	
Ear problems	

improve the efficiency of staff working in the theatre environment. Even though formaldehyde was considered to some extent in the present study, the other etiological factors [4, 5] causing the problems have to be identified.

Inside the air-conditioned buildings, some of the occupants/employees may smoke due to ineffective controls on them. This adds to the agony of the other occupants who are non-smokers. Even if separate smoking areas are provided in the adjacent areas, it is possible that tobacco smoke enters the recirculated air. Unfortunately many people believe that

designating a smoking area provides protection to a non-smoker, but this is not so [6]. The problem is that unless adequate fresh air is introduced into the system, there is a build-up of the products of tobacco smoke in the recirculated air. Sweden requires that fresh air, 30% by volume, is introduced every hour into buildings, but the best approach is to determine the desired air quality [7] and then to provide appropriate ventilation so as to keep the air pollution to a minimum.

Knowing causes of sick building syndrome to be inadequate air circulation, recirculation of air and smoking inside the buildings, it is suggested that the technology must be modified in an economical manner to alter the heating, ventilation and air-conditioning (HVAC) of the buildings, which will help to reduce the symptoms of the inhabitants/employees. Smoking inside the building should be strictly prohibited and discouraged. The other suggestions are removal of the air inside the room, replacement with outside air and openable windows. Efforts should be taken to create an awareness among medical and paramedical personnel, and the public. Ser-

vices of expert consultants may be obtained to identify the causes of sick building syndrome and steps taken to rectify them. More than that, the physicians treating affected individuals should be aware of the possibilities of symptoms due to indoor air pollutants as patients invariably require a change of environment and most do not require drugs.

#### REFERENCES

- 1 J. B. Hicks, Tight building syndrome: When work makes you sick, *Occup. Health Saf.*, 54 (1984-85) 51-56.
- 2 J. D. Spengler and K. Sexton, Indoor air pollution: A public health perspective, *Science*, 221 (1983) 9-17.
- 3 M. D. Whorton, S. R. Larson, N. J. Gordon and R. W. Morgan, Investigation and work-up of tight building syndrome, *J. Occup. Med.*, 29 (1987) 142-147.
- 4 National Research Council, *Indoor Pollutants*, National Academy Press, Washington, DC, 1981.
- 5 R. Van der Lende, Health aspects related to indoor air pollution, *Int. J. Epidemiol.*, 9 (3) (1980) 195-197.
- 6 L. C. Kossuth, Smoking areas are ineffective in sick buildings, *J. Am. Med. Assoc.*, 255 (1986) 3244-3245.
- 7 J. L. Repace and A. H. Lowry, An indoor air quality standard for ambient tobacco smoke based on carcinogenic risk, *NY State J. Med.*, 85 (1985) 381-383.