A Plan of the Comprehensive Study on Indoor Pollution and Its Health Effects by the Aichi Prefecture, Japan

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In order to study the level and nature of the indoor pollution and its possible health effect the Department of Public Health of the Aichi Prefecture in Japan is planning to conduct a comprehensive study on indoor pollution. An outline of this study is presented in this report. The study will consist of measurements of the indoor pollution and health surveys for a sample of 10 large buildings and 75 houses involving 2,000 persons for the former and 1,000 three-year-old children and their mothers for the latter. The major survey items on the indoor pollution are measurements of suspended particles, CO, CO₂, NO₂, formaldehyde, falling and floating bacteria and fungi, mutagenicity, types of air cleaners, air conditioners and ventilators, and the number of smokers etc. The major health survey items are a questionnaire survey on respiratory diseases, pulmonary function tests, chest X-ray test, and measurement of urine hydroxyproline concentration. This comprehensive study on indoor pollution will be conducted for 5 years beginning the fiscal year 1984.

(Key Words: indoor pollution, health effect, epidemiology)

TRENDS AND SOURCES OF INDOOR POLLUTION IN JAPAN

In recent years the ambient air pollution except nitrogen oxides pollution has been improved substantially in Japan (4) (Fig. 1). In contrast, the indoor pollution seems to have been getting worse in part due to the wider use of economic non-ventilated kerosine stoves at home and the spread of energy saving air-tight house structure along with the high rate of smoking at home and work palaces.

The ambient air quality has been monitored and controlled under the Air Quality Control Law. However, the indoor air quality has been neither monitored nor controlled systematically except for large buildings whose indoor air quality has been controlled by the Law for Maintenance of Sanitation in Building (2). The latter law was enacted in 1970 (revised in 1976) and is applicable to specially designated large buildings with a floor space of over 3,000 m² (e.g., department stores, other large stores, schools, offices, entertainment facilities, large condominium houses etc.). The indoor air quality standards determined by this law are as follows:

1) concentration of suspended particles ... less than 0.15 mg/m³
2) carbon monoxide (CO) concentration ... less than 10 ppm
3) carbon dioxide (CO₂) concentration ... less than 1,000 ppm
4) temperature ... between 17 and 28°C
5) relative humidity ... between 40 and 70%
6) speed of the air flow ... less than 0.5 meters/sec.

Although the level of indoor pollution in houses and smaller buildings has not been measured systematically in Japan, there are some indirect evidences which suggest worsening of the indoor pollution. Major causes of the indoor pollution at home in Japan may be wide use of economic non-ventilated kerosine stoves.
non-ventilated instant gas water boilers and gas cooking tables, and the high rate of smoking at home. The wider uses of room air conditioners and aluminum sash windows or doors seem to aggravate the indoor pollution by inhibiting ventilation of the indoor air. Trends in the availability of kerosine stoves, instant gas water boilers and room air conditioners at home and the percentage of adult smokers 20 years old and over are shown in Fig. 2. At present, over 90% of households have at least one kerosine stove (an average of 1.6 kerosine stoves per household in 1981) and about 75% of households have instant gas water boilers (1). Most of the kerosine stoves and instant gas water boilers are non-ventilated open type. Thus, they emit lot of pollutants directly into the room. The wider availability of room air conditioners may hinder ventilation of the indoor air by closing windows in hot seasons. Another important source of indoor pollution is smoking at home or workplaces. The percentage of male adult smokers in still very high (70% in 1982) although that of female adult smokers is relatively low (15% in 1982) (3).

A PLAN OF THE COMPREHENSIVE STUDY ON INDOOR POLLUTION AND ITS HEALTH EFFECT

For the purpose of studying the magnitude of indoor pollution and its possible health effects, the Department of Public Health of the Aichi Prefecture has decided to conduct a comprehensive study on indoor pollution. The protocol of this study is presented in this communication. The planned study will consist of measurements of the indoor pollution and health surveys for a sample of 10 large buildings and 75 houses involving 2,000 persons for the former and 1,000 three year old children and 1,000 mothers for the latter. The major survey items are shown in Table 1. This comprehensive study on indoor pollution will be conducted in five years beginning the fiscal year 1984. The protocol of this study may be modified depending on the change in funding.

It is expected that through this comprehensive study on indoor pollution the magnitude of the indoor pollution and its possible health effect will be clarified and the study results will be used to control indoor pollution of buildings and houses where the Law for Maintenance of Sanitation in Buildings is not applicable.

REFERENCES

A Plan of the Comprehensive Study on Indoor Pollution and Its Health Effects

Table 1  Survey items in the comprehensive study on the indoor pollution and its health effect planned by the Department of Public Health of the Aichi Prefecture, Japan

A. Survey items for studying the indoor pollution.
1. Survey items common to large buildings and houses:
   1) temperature, relative humidity and air flow
   2) concentration of suspended particles and percentage of tobacco smoke
   3) concentrations of CO and CO₂
   4) concentration of NO₂ (including personal exposure)
   5) numbers of falling and floating bacteria and fungi
   6) number of ticks in the housedust
   7) sources of indoor pollution; number of smokers etc
   8) chronological change in the indoor environment

2. Survey items for only large buildings:
   1) mutagenecity of suspended particles
   2) types of air cleaners, air conditioners, air ducts, ventilators and cooling towers and the situation of their maintenance
   3) intake rate of open air

3. Survey items for only houses:
   1) volume of the room air and the density of dwellers
   2) situation of ventilation

B. Survey items for studying the health effect of the indoor pollution.
1. Survey items common to large buildings and houses:
   1) a survey by using a standard questionnaire on respiratory disease
   2) a survey by using a special questionnaire on consciousness and sentitivity to indoor pollution
   3) measurement of urine hydroxyproline (HOP) concentration for whom the personal exposure to NO₂ is measured (10% sample of all study subjects)

2. Survey items for only large buildings:
   1) analyses of results of various health check up for the workers in the study buildings

3. Survey items for only houses:
   1) pulmonary function tests
   2) further examinations if necessary,
      - examination by physician
      - chest X-ray test
      - other tests
Fig. 1 Trends in the air pollution in Japan

Fig. 2 Trends in the major sources of indoor air pollution in Japan