Committee on Sick House Syndrome: Indoor Air Pollution
Progress Report No. 4
- Summary on the discussions at the 8th and 9th meetings -

22 January 2002

1. Guideline values of individual Volatile Organic Compounds (VOCs)

Scientific discussions leading to the establishment of guideline values for indoor air concentration of *acetaldehyde* and *fenobucarb* are summarized. The guideline values of all the chemicals determined so far at this committee are also tabled. The objectives and anticipated effects of providing the guideline values together with the criteria for selecting chemicals are described as well.

1.1 Outline of guideline values for indoor air concentrations

It is possible that all indoor air chemicals will have some impact on human health. Therefore, public health assessment has been made for the establishment of guideline concerning individual indoor chemicals in order to reduce unnecessary human exposure to them.

The guideline values for indoor air concentration mean that, given the current available scientific knowledge, no adverse health effects would be caused in humans with the lifetime exposure of the chemical at the level of no more than the value. The intention is that the lower a measured value is than the guideline value, the more desirable, not that it is acceptable if a measured value is not more than the guideline value.

Lots of residents are reported to experience allergic, toxic and multiple adverse health effects due to indoor air pollution by chemicals. The term ‘Sick House Syndrome’ is used to describe the conditions in which their complaints vary considerably and where the cause of the symptoms and the mechanism of action are still not completely known.

Therefore, further research and investigations are needed to demonstrate that the symptoms were caused by the exposure of any chemical that gained the guideline value. However, even before it is demonstrated, it is recommended that building materials, design and construction, housing and ways of living should be improved so as to meet the guideline. It is considered that the establishment and proper application of the guideline values will be effective to promote the improvement of residential environment and eventually, to prevent many people from health hazards due to indoor air pollution.

The guideline values may be revised in the future, as necessary, depending on further available knowledge and/or progress in international assessment works based on scientific knowledge.

All indoor environments should be subject to application of the guideline unless there are particular chemical sources.

All stakeholders including general public, constructors and related industry, and building management should have a correct understanding for the guideline values: they never indicate that, under any circumstances, a chemical subject to the guideline be harmful to human health. Scientific discussions leading to the establishment of guideline values should contribute to how chemicals will be used so safely and properly as not to cause health hazards and how chemicals will provide a maximum performance of the efficacy.

The selection of chemicals subject to the development of the guideline value follows the six criteria, which were described in the Progress Report No.1, June 2000, under the subheading "Priorities for setting up guideline values". Works on individual chemicals without still included in the guideline will be put forward consistently in accordance with these criteria.

As for a chemical with multiple exposure sources, it is important to consider the feasibility of total exposure assessment taking account of all the exposure sources in the environment. The establishment of the guideline value for the exposure to the chemical from indoor air will surely contribute to the promotion of efforts to mitigate the total exposure of the chemical.

1.2 Guideline values for indoor air concentration of individual chemicals

The guideline values for indoor air concentration of these chemicals have been provided based mainly on chronic toxicity via a long-term exposure, except that of formaldehyde has been given as a 30-minute average value based on toxicity via a short-term exposure. However, the advisable value of Total Volatile Organic Compounds (TVOC) has been gained not based on toxicological information, but as low as reasonably achievable from the results of investigations on indoor VOC concentration in our country. Therefore, the TVOC advisable value is used as an indicator for indoor air quality, independently of individual VOC guideline values.

The details of the assessment on chemicals newly added to the guideline are given separately, available only in Japanese.

Table 1. Chemicals newly added to the guideline

VOCs*	Toxicity endpoint	Guideline value for indoor air concentration**
Acetaldehyde 1), 2)	Effects on nasal olfactory epithelium in rats exposed by inhalation	48 μg/m^3 (0.03 ppm)
Fenobucarb 3), 5)	Effects on choline esterase, etc. in rat orally exposed	33 μg/m^3 (3.8 ppb)

Table 2. Chemicals so far included in the guideline

VOCs*	Toxicity endpoint	Guideline value for indoor air concentration**
Formaldehyde	Nose, throat irritation in humans exposed by inhalation	100 μg/m^3 (0.08 ppm)
Toluene 1), 2)	Effects on central nervous system (CNS) behavior functions and development and reproduction in humans exposed by inhalation	260 μg/m^3 (0.07 ppm)
Xylene 1), 2)	Altered development of central nervous system in offspring whose mother rat exposed by inhalation during its pregnancy period	870 μg/m^3 (0.20 ppm)
p-Dichlorobenzene 1), 2)	Liver/kidney effects in beagles dogs orally exposed	240 μg/m^3 (0.04 ppm)
Ethylbenzene 1), 2), 3)	Liver/kidney effects in mice and rats exposed by inhalation	3800 μg/m^3 (0.88 ppm)
Styrene 1), 2)	Brain/kidney effects in rats exposed by inhalation	220 μg/m^3 (0.05 ppm)
Chlorpyrifos 4), 5)	Altered development of CNS and morphological effects on brain in offspring whose mother rat orally exposed	1 μg/m^3 (0.07 ppb) For children: 0.1 μg/m^3 (0.007 ppb)
Di-n-butyl phthalate 1), 3), 5)	Abnormal genitals in offspring whose mother rat orally exposed	220 μg/m^3 (0.02 ppm)
Tetradecane 2), 6)	Effects on liver in rat orally exposed to C_8-C_{16} hydrocarbon mixture	330 μg/m^3 (0.04 ppm)
Di-(2-ethylhexyl) phthalate 3), 5)	Histopathological effects on testicle in rat orally exposed	120 μg/m^3 (7.6 ppb)
Diazinon 4), 5)	Effects on blood plasma and erythrocyte choline esterase in rat exposed by inhalation	0.29 μg/m^3 (0.02 ppb)

Total Volatile Organic Compounds (TVOC) 1), 3)	Gained as low as reasonably achievable from investigations on indoor air in our country.	Advisable value: 400 μg/m^3

Table 3. Chemical for further investigations

VOCs*	Toxicity endpoint	Interim guideline value for indoor air concentration**
Nonanal 2), 6)	Toxicological effects in rat orally exposed to C_8-C_{12} hydrocarbon mixture	41 μg/m^3 (7.0 ppb) (Interim value because of data gap)

* Numbers indicate the following criteria used for selection: 1) chemicals for which guidelines have been given by foreign governments or international organizations; 2) chemicals for which investigations demonstrated that the indoor air concentration has been found high because of apparent indoor chemical emission sources; 3) Chemicals for which public comments have particularly claimed; 4) Chemicals for which foreign governments have provided a new regulation and the like; 5) Chemicals to be selected so as to comprehend indoor chemical sources; and 6) Chemicals to be selected so as to comprehend chemical structural categories.
** At 25 degree Celsius

2. Sampling and analytical methods

About *acetaldehyde*, the revised sampling and analytical methods of indoor air chemicals, which are provided in the Progress Report No.3, 24 July 2001, should be followed.

About *fenobucarb*, refer to the interim sampling and analytical methods of *chlorpyrifos* in the Progress Report No.3.

The details of the sampling and analytical methods of these chemicals are given separately, available only in Japanese.

3. Revision to Manual for Analysis of Indoor Air Chemicals and Guide for Preparation of Manual for Consulting

Information on the two chemicals newly included in the guideline was added to the Manual for Analysis of Indoor Air Chemicals and the Guide for Preparation of Manual for Consulting, which had been published in the Progress Report No.3, 24 July 2001, respectively. The details of the addition are given separately, available only in Japanese.

Both the Manual and the Guide will be revised every year to include information on chemicals newly added to the guideline and scientific knowledge newly made available.

Appendix

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