Arh. hig. rada toksikol., **30** *(1979) suppl. pp. 49–54.*

INTRODUCING WHO PROGRAMME ON INTERNATIONALLY RECOMMENDED PERMISSIBLE LEVELS IN OCCUPATIONAL EXPOSURE TO HARMFUL AGENTS

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ABSTRACT

The differences existing between levels recommended in the USA and the USSR has resulted in doubts, and some confusion, with respect to the efficacy of those levels. WHO is starting a programme aiming at the recommendation of health based standards for occupational exposure. This is not another occupational health criteria programme but it consists of examination of the reasoning for the presently recommended standards in the different countries, the identification of what constitutes an adverse health effect in accordance with most recent epidemiological and experimental evidence and a judgement accounting for some of the imortant variables encountered in occupational exposure. Certain priority substances are selected in accordance with the criteria of magnitude of use and exposure, severity of toxic effects, availability of adequate data on harmful effects and diversity of levels recommended in the USA and the USSR. The paper presents the necessity and objectives of this programme and methods followed in its implementation.

IMPORTANCE AND PRESENT STATE OF LIMITS OF EXPOSURE

One of the objectives of occupational health is the prevention of health impairment and occupational diseases. The setting up of permissible levels is one of the means of achieving this goal. A major disagreement has existed between values of permissible concentrations recommended in the USA and the USSR. In 1968, the Joint ILO/WHO Committee on Occupational Health[3] was able to find a very limited number of substances where there had been close recommendations with respect to permissible levels. This number amounted to 24 out of more than 600 substances, for which permissible levels have been decided by the two major producers. The disagreement concerning permissible levels of exposure has not only resulted in weakening of protective measures in the highly industrialized countries, but it has also had a tendency to create confusion in developing countries which are unable to make their own recommendations with regard to safe occupational exposure to health hazards.

These differences resulted from the interaction of a number of factors, including the definition of what constitutes an adverse health effect. However,

the basic objectives in establishing permissible levels are now very similar in both countries. In the USA the goal is to ensure that "no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience"[2], while in the USSR it is to achieve the safe level that "in the case of daily exposure at work for eight hours throughout the entire working life will not cause any disease or disorders from a normal state of health detectable by current methods of investigation, either during the work itself or in the long term"[1].

In the USA proposed permissible levels are based solely on health considerations. In practice, however, in the standard-setting process, technological and economic factors are taken into consideration. Recommendations based solely on preventing adverse health effects then serve as goals for the development of improved control technology and later revision of official standards. In the USSR it is also recognized that technological and economic factors may affect exposure situations, but official levels are still based solely on health considerations.

It is anticipated that future official standards originating from the USA, the USSR and other parts of the world may be more in agreement, and international organizations such as WHO and ILO will be more able to make international recommendations based on a broad consensus among health scientists.

In their evaluation of the state of health in their countries, health planners are guided by the status of medical science and by national cultural values. Official standards are therefore the result of several criteria that may not be explicitly stated. Authorities in different countries make decisions on the basis of these criteria according to their own concept of health, and according to their interpretation of priorities and the need for applying permissible levels. National authorities also may consider the costs and economic factors involved and the resource demands of other health programmes.

At the international level there can be no mechanism for incorporating social, cultural, economic and priority factors into decision-making. However, WHO can develop health-based recommendations for international consideration, leaving to national health authorities the responsibility of determining how best to implement them. Important activities such as the exchange of information on basic data and the improvement and standardization of test procedures allow nations to share a common pool of biological information to promote the setting of similar permissible levels and ultimately similar official standards in various countries. In addition, the further refinement of analytical techniques would facilitate decision-making.

Epidemiological findings may indicate factors requiring special attention in setting permissible levels, e.g., variations in the vulnerability of the working population, the effect of work exertion, and the effect of exposure to a number of contaminants. In developing countries, where the nutritional status is often poor and the general level of health may be affected by endemic diseases, the increased vulnerability of the working population to chemical exposures is of special concern. Genetic differences in individuals or ethnic groups may also increase

vulnerability to certain substances. Permissible levels should be revised as necessary to take account of the reproductive vulnerability of young men and women exposed to toxic chemicals.

APPLICATION OF PERMISSIBLE LEVELS IN DEVELOPING COUNTRIES

The existing differences in recommended permissible levels have been associated with uncertainties in the choice of values to be implemented at the operational level in many developing countries and may sometimes have been instrumental in delaying the protection of workers exposed to harmful agents. This situation will no doubt be ameliorated with the introduction of internationally recommended values accounting for differences in the working and health conditions and for priority exposures.

Despite the overwhelming health problems at present receiving attention in developing countries, a complete public health programme should cover the complex health problems that workers may encounter. The working populations in these countries, in addition to being an important sector on which economic development depends, are affected by the general diseases prevailing in the community as well as by many uncontrolled hazardous agents at work. Where it is not feasible to replace toxic substances by harmless ones, to enclose dangerous processes, and to automate and mechanize manual processes, permissible levels are essential for the protection of workers' health. They should also be available in the planning stages of new industrial operations, in order to prevent future health impairment or costly redesign of operations.

It must be recognized, however, that conditions in the developing countries sometimes impose constraints on the application of permissible levels and may even influence the authorities with regard to the adoption of those levels.

CRITERIA FOR SELECTION OF PRIORITY SUBSTANCES FOR INTERNATIONALLY RECOMMENDED PERMISSIBLE LEVELS

The long term programme of WHO, in the field of permissible levels for occupational exposure, started in the last years of the past decade and continued to explore methods used in different parts of the world in establishing those levels. The Expert Committee of the World Health Organization which was organized in August 1976, by WHO, with the participation of ILO, found a broad area of agreement on methods used in establishing health based permissible levels. The Committee therefore recommended that WHO, in collaboration with ILO, undertake the task of producing recommendations for standards while accounting for priorities in workers exposure in different parts of the world. The WHO Executive Board in its Resolution EB60.R2, May 1977, requested the Director-General to implement, as soon as possible, the proposed programme to develop internationally recommended health based permissible levels.

In view of the fact that there are so many toxic substances to which workers are exposed, a decision will have to be made on priority agents or substances for which permissible levels should be recommended.

The criteria for decision on priority substances include:

1. Distribution, use and number of workers exposed throughout the world (ideally, the incidence of occupational diseases resulting from exposure to a particular toxic agent would be best, but such data are very difficult to come by);
2. Potential for serious (disabling) morbidity and/or mortality to develop as a result of occupational exposure;
3. Availability of experimental and epidemiological information on which to base permissible levels (this would include information on the early detection of disease, availability of health criteria, and monitoring and control information), and
4. Significant variance in permissible levels developed in the USA and USSR.

In accordance with these criteria, WHO has convened a consultation to decide on a list of priority substances for which there is an urgent need to establish internationally recommended permissible levels. These substances will be dealt with in groups and would include such agents as heavy metals, solvents, pesticides and dusts. Once a decision has been reached on particular agents as a priority, WHO will compile documentation describing the hazards associated with those agents. Documentation will come from various institutions in countries throughout the world and represent their views.

Application of the above criteria has resulted in the choice of the following substances:

Priority heavy metals: cadmium, manganese, mercury and lead

Priority solvents: trichloroethylene, carbon tetrachloride, toluene, xylene and carbon disulfide

Priority pesticides: malathion, carbaryl and DDT

Priority dusts: silica, cotton dust and selected vegetable dusts.

DATA REQUIRED FOR DOCUMENTATION

Account should be given to the fact that various institutions are already producing criteria documents on different toxic substances, both for occupational and general environmental exposures. Thus, much appropriate information is available for development of permissible exposure levels (PEL's)*. The content of the documentation requisite to development of PEL's will mainly be the following:

1. Up-take effect – response relationship in experimental studies on animals;
2. Up-take effect – response relationship in human exposures in epidemiological studies;
3. Early biological and physiopathological changes at different low levels of exposure for a prolonged period of time;

*Now referred to by WHO as Exposure Limits

4. The levels at which no health impairment would be expected in healthy humans;
5. A safety margin accounting for background of health or ill-health, individual susceptibility and combined exposure.

RELATIONSHIP TO OTHER WHO PROGRAMMES

A significant amount of input from various WHO programmes is expected. WHO's work on the Early Detection of Health Impairment in Occupational Exposure to Harmful Agents will produce background information on dose response relationships. The programme of research on Health Effects in Occupational Exposure to Combined Physical and Chemical Hazards will, in many cases, be the basis for decisions on safety margins.

Environmental health criteria documents produced by WHO contain a considerable amount of the information required for establishing permissible levels, although there are different priorities for substances selected for the environmental health criteria programme and for those of the WHO Programme on Internationally Recommended Permissible Levels.

MAIN CONSTRAINTS IN DEVELOPING INTERNATIONALLY RECOMMENDED PERMISSIBLE LEVELS

There are a number of constraints which mainly involve shortage of scientific information and several gaps in knowledge with respect to up--take/effect/response relationship. The most important ones which have been recognized by the WHO Expert Committee in 1976 include the shortage of satisfactory information on precise relationships between concentrations of chemicals in air, duration of exposure and actual uptake by the workers. The methodology in evaluation and sampling chemical and physical agents in the work environment vary from one part of the world to another which presents a difficulty in comparability of results. Such variables as effects of combined exposure to physical and chemical hazards and the exposure of vulnerable groups of workers who may be affected by nutritional deficiency, parasitic diseases or alcoholism, will have to be accounted for to meet the needs in developing and industrialized countries. It may be found however, that the substances which are commonly used by workers in different parts of the world are usually those substances on which a good deal of information is at present available. To over--ride the problem of combined exposure to various agents and that of vulnerable groups and until such a time that more information is available to identify more precisely a safety margin account should be given to broaden, in so far as practicable, the safety factor. At the same time, WHO is attempting, through its system of collaborating centres for occupational health in different parts of the world, to harmonize methodology of analysis with a view to eventual comparability.

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