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Chemical risk assessment and international cooperation

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Summary. - The scope and the main activities as regards the assessment of the risk from chemical exposure are described. During the United Nations Conference of Environment and Development (UNCED) member states recommended that attempts be made to develop a "common framework to risk assessment" and to improve risk assessment methodology. Within agenda 21, chapter 19, the International Programme on Chemical Safety (IPCS) was given the responsibility to undertake this work while taking full account of ongoing activities within other international and multinational or non-governmental groups to complete the task in a timely and cost-effective manner.

Key words: toxicology, hazardous substances.

Riassunto *(Valutazione del rischio chimico e cooperazione internazionale).* - Sono descritti lo scopo e le principali attività riguardanti la valutazione del rischio da esposizione alle sostanze chimiche. La United Nations Conference of Environment and Development (UNCED, Conferenza delle Nazioni Unite sull'Ambiente e lo Sviluppo) ha raccomandato ai paesi membri lo sviluppo di una base comune per la valutazione del rischio e il miglioramento dei metodi di valutazione. Secondo l'agenda 21, capo 19, l'International Programme on Chemical Safety (IPCS) ha la responsabilità di portare avanti questa opera tenendo conto delle attività già in corso intraprese da altri organismi internazionali, multinazionali o non governativi, per il raggiungimento tempestivo e vantaggioso dell'obiettivo.

Parole chiave: tossicologia, sostanze chimiche pericolose.

Introduction

Within agenda 21, chapter 19, of the United Nations Conference of Environment and Development (UNCED) - "Environmentally sound management of toxic chemicals" - member states recommended that attempts be made to develop a "common framework to risk assessment" and to improve risk assessment methodology. The International Programme on Chemical Safety (IPCS) was given the responsibility to undertake this work while taking full account of ongoing activities within other international and multinational or non-governmental groups in order to complete the task in a timely and cost-effective manner. During the past few years, recommendations for the harmonization of methodology for the risk assessment for human health and the environment have also emanated from meetings concerned with specific classes of chemicals, e.g. the Special Sessions on Pesticides of the Organization for Economic Co-operation and Development (OECD, 1992 and 1993) [1] and the Joint FAO/WHO/GATT Conference on Food Standards, Chemicals in Food and Food Trade (1991) [2].

The present situation

Assessment of risk from chemical exposure is conducted to ensure that neither man (as a consumer, worker, or member of the public at large) nor the environment are exposed to unacceptable levels of chemicals arising from their production, use and disposal. At the national and international levels, risk assessments are performed through a variety of different mechanisms before chemicals can be placed on the market (e.g. industrial chemicals) or authorizations for use are granted (e.g. pharmaceuticals, pesticides, food additives). Risk assessments are also conducted to determine whether existing legislation in many countries also requires that employers assess the risks of chemicals to their workers. Finally, the disposal of chemicals has resulted in legislation requiring the assessment of the risks to the health and the environment taking into account not only the inherent properties of the chemicals, but also potential exposure in the specific site [3, 4].

The risk assessment process is defined by IPCS as four interrelated components and the various activities associated with risk assessment can be understood in the context of this nomenclature. These components consist of:

a) hazard identification, i.e. utilization of all available data (epidemiological, clinical, experimental, *in vitro* and structure-activing relationships) to establish that a chemical has the apparent capacity to cause an adverse effect;

b) dose-response assessment, i.e. assessment of the relationship between dose, or level of exposure, and the incidence and/or severity of an effect. It is recognized that this step includes appropriate extrapolations beyond the range of the observed dose-response in a study or group of studies;

c) exposure assessment, i.e. estimation of the incidence and severity of the adverse effects that are liable to occur in a population or ecosystem due to actual or predicted exposure [5-9].

In this context, IPCS will establish work groups to address the first two steps in the risk assessment process, hazard identification and dose-response assessment for certain toxicological end-points. Although the importance of exposure assessment and risk characterization is recognized, it is noted that the other activities are either planned or underway in these areas within the framework of the UNCED agenda 21. Under the auspices of OECD, for example, various activities are ongoing concerning the harmonization of exposure assessment methodology. In the European Union, guidance documents related to risk assessment are being developed. Other IPCS activities

Table 1. - Priority criteria in the selection of chemicals for risk assessment

End-point	Human health impact	Availability of documents on risk assessment	Probability of short-term success	Current or planned global harmonization activity in other IPCS-related form	Agreement on data requirement or study protocols
Development, reproduction toxicity	Yes	Yes - many	High	No - IPCS document is "on hold"	Yes - although reproduction protocols may change
Genotoxicity	Yes	Yes - many	High	No	Yes
Carcinotoxicity	Yes	Yes - many	High probability of increasing understanding, but low probability of complete harmonization	No	Yes
Neurotoxicity	Yes	Minimal (some draft documents)	High (for a staged approach)	No	Limited - some agreement on protocol, less on staging
Immunotoxicity	Yes	Minimal except for sensitization. On-going activities	Low for some aspect, but high for some others	No	Limited (varies with aspects)
Genetic system toxicity	Yes	Yes	High - for identification of differences	No	Yes
Dosimetry	Not directly	Some	High - for identification of differences	No	No

are examining risk characterization, e.g. the work related to the preparation of the EHC "principles for the assessment of risk to human health associated with chemical exposures". In recognition of these ongoing efforts, the establishment of work groups is not considered necessary for exposure assessment and risk characterization.

All end-points of toxicity are important, but because of resource limitations, a pragmatic approach to setting priorities must be used. Those end-points of toxicity meeting the criteria below are given the highest priority:

a) there is a potential public health impact;

b) guidance assessment documents by national and international organizations are available;

c) there is a probability of success in a reasonable time-frame;

d) it is not being dealt with under other agenda 21 activities; and

e) agreement has been reached on data requirements and study protocols.

The need for harmonization based upon the degree of divergence of methodologies is also considered in ranking end-points after the application of the criteria described above.

A matrix given in Table 1 summarizes the results of the application of the above criteria. As shown, agreement exists on data requirements and study protocols for most end-points, but is limited, however, on certain aspects of neurotoxicity and immunotoxicity. Assessment documents are available on many of the toxic end-points reviewed. Some categories, such as carcinogenicity, are very broad in scope, but they could be described only in a general way now, with the responsibility being placed on the working groups to address each in a logical way.

Conclusions

A key issue to properly face the problems outlined above is to identify priority areas for the harmonization of approaches to risk assessment. Harmonization is considered to include an understanding of the methods and practices used by various countries and organizations so as to develop confidence in and acceptance of assessments using different approaches and a willingness to work toward a convergence of methodology.

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