These paragraphs are quoted from the introduction of the booklet *Safety Audits* published last year by the Chemical Industries Association. Although the publication is specifically oriented towards the chemical industry, the principles of the safety audit can be applied in any industry that has already dealt adequately with the primary principles of accident prevention. It does not dispense with the need for well-motivated safety-conscious managers and supervisors. The technique is quite unsuitable for those industries with the philosophy that safety is the responsibility solely of the safety officer and indeed unless the faults revealed by the audit are remedied the whole operation becomes pointless.

The booklet includes examples of how the technique may be applied in organizations and workplaces of differing size. It emphasizes the need for involvement of top management, for making and keeping deadlines both in presenting the audit report and in implementing its recommendations, and for subsequent monitoring.

This publication will be of interest to all doctors who care about the safety and well-being of workpeople. Some may even realize that the principles can be applied to industrial hygiene as well as to physical safety.

**ALEXANDER MUNN**


This 54-page booklet reports on the twentieth meeting of the WHO Expert Committee on Pesticides in October 1972. Those who are professionally interested in pesticide toxicology and safety measures have probably seen it already, for the reports of this particular international committee of experts fill a gap left by the multiplicity of local views expressed at a multiplicity of local conferences or symposia. This value will be increasingly seen, as the committee has now widened its scope to include safety aspects of pesticide usage in agriculture, a welcome release from its previous confinement to pesticides used in disease vector control. Agricultural usage takes up only a few pages of this particular report, and it is sincerely hoped that this will expand in future issues as data are accumulated.

The report starts with a general summary of the matters discussed, leading into sections on insecticides, molluscicides, and rodenticides in public health. Finally, there are sections on safety problems met in other types of usage, and on progress in the diagnosis and treatment of insecticide poisoning.

The committee first faced up to the technical and ethical problems raised by the suspicions of some years ago that DDT may present tumorigenic risks, as judged by animal studies. Certainly some subsequent experiments had shown some liver cell tumours and some malignancies in mice, but the committee did not find these provided an adequate basis for withdrawal of DDT where its continued use could be life-saving; in a nutshell, the known benefits outweighed the possible risks to man indicated by animal studies. The DDT saga continues with further information on tissue storage in relation to intake rates (with the view expressed that enough data now exist on human population levels of DDT in tissues), and on morbidity surveys planned on groups of pesticide workers in the USA, Brazil, and India whose exposure to DDT has been lengthy and relatively severe. As yet, these surveys are basically negative from the medical viewpoint.

Obviously, WHO must be and is interested in retaining DDT on the 'active list' until better materials come along. But are they coming along? The WHO scheme for testing new insecticides started in 1962: more than 1600 new candidate insecticides have now been tested for activity and safety and only three have as yet been accepted for operational use against malaria. The annual input of new compounds from the laboratories of industry and Governments has fallen progressively, and one can fully understand WHO's anxiety to retain that which is good at its job, and safe by any rational standards.

Several case histories are given of efficient insecticides tested through the scheme under the nearly-realistic conditions of village trials in several tropical countries. The most promising insecticides continue to be mainly organophosphates and carbamates, and praise be that the measurement of blood cholinesterase inhibition as an index of overexposure remains as useful now as when it came into widespread use almost 20 years ago.

In recent years, the common or garden louse in many locations has joined the DDT-resistant insect lists, and some strains are now even malathion-resistant as well. A few new insecticides are showing promise, but being organophosphates or carbamates in nature, may also be expected to succumb to cross-resistance after a few years of intensive use. It sounds as though the warmer areas of the world will soon be itching for new chemical families of insecticides, for which the demands continue to limit the supply.

An interesting survey is made of the so-called ULV (ultra low volume) technique of applying concentrated insecticide sprays: 1 litre or less of 90% active chemical applied per hectare of terrain, usually as droplets of 20 μm diameter or below, using low-volatility chemicals. Broadly, the committee expresses no active anxieties about such methods of insecticide application, as quantitative estimates of personal contamination and possible exposure are very reassuring. It is best that treated rooms should be unoccupied, is the deadpan suggestion. As could be expected, the risks in such operations are apt to be most serious in those handling the containers of highly concentrated chemical, when filling up aircraft spray tanks or ground equipment.

The disinsection of aircraft by DDT is now being steadily changed to the use of natural pyrethrum or synthetic pyrethroids, and a clean bill of health is given to these chemicals, as medical travellers will no doubt be unsurprised to hear. The slightly petulant arguments of recent years about the safety of dichlorvos for disinsection are brushed aside by a concise factual survey, which concludes that if the then current inhalation carcinogenicity tests proved negative (as is believed to be the case), dichlorvos could safely be used for vector control aircraft. A brief look is directed at other control methods such as biological agents as parasites, chemosterilants, development retardants, bacillary or virus preparations. The point is made that these methods may be closer to nature, but are not necessarily safer than
orthodox chemical insecticides, so each must be judged on its identified merits and test results.

For the increasing problem of schistosomiasis, mollusc control is the best tool available in practice, and effective molluscicides slowly released into water then remaining active for a few days seem the best approach. Niclosamide and Frescon seem to present insignificant risks in practice, but organotin compounds are looked upon with some doubts. Safety in drinking water supplies is the main usage requirement for new aquatic molluscicides.

Increasing resistance of rats and mice to the anticoagulant rodenticides is now a fact of life, but the committee warns against using acute rodent poisons carelessly. Red squill, norbormide, and zinc phosphate are thought to need 'ordinary care' (regrettably not defined). Acute rodenticides requiring maximal precautions (in handling, placing, disposal, and preventing access) include sodium fluoroacetate, fluoroacetamide, and strychnine. The committee regarded arsenic trioxide, white phosphorus, ANTU, and Gophacide (an organophosphate chemical) as too hazardous in use, and advise against them.

The agricultural pesticide safety programme of WHO is geared to that of FAO and ILO, and in later years joint meetings are envisaged. The committee deduced that about 500 000 cases of accidental pesticide poisoning occur globally in a year, with an estimated 1% mortality. However, the real facts are scanty and ill-reported so WHO inevitably appeals for better national data in years to come. A new information function was afoot, in the provision of WHO/FAO technical and toxicological data sheets on new chemicals, as a guide for developing countries' regulatory officials and doctors. As yet, these data sheets have not emerged but have a considerable potential for good—and not just in developing countries. The committee has now become involved in the controversial 10-year-old problem of how to achieve a sound and usable system for classifying pesticides according to risk of poisoning accidents, and recommends a system which regards liquids as more hazardous than solids; supplements rat LD50 by other cogent toxicity data; uses three risk categories (by a logarithmic progression of LD50s) which can also be applied to other chemicals; and ends with the much echoed hope that agreement on a tentative classification will be reached and internationally applied. Eighteen months later we are still not in that happy position, unfortunately.

On medical arrangements for pesticide intoxication emphasis is placed on official supervision and control of imports and distribution, the supply of information on toxicity and hazards of products, field methods for quick diagnosis when possible, and on analytical services for confirmatory tests.

It also emphasizes the needs for instruction in safe use, education of the rural population, specialist tuition courses for users, and the value of specialized consultants to guide new national efforts; all very good advice, and no doubt progressively being assimilated into regional plans.

It was felt that international or other transport of pesticides or treated grain must inevitably cause further occasional outbreaks of mass intoxication. The recommendation was made that WHO should be able then to assemble an emergency squad of specially knowledgeable scientists to help immediately on the spot, first for the diagnosis, control, and treatment of the emergency, then on the scientific aspects of the outbreak. Again, this is wise counsel, and the need will undoubtedly arise again somewhere, sometime soon. The current lack of doctors and scientists competently trained in pesticide toxicology was also pointed out, and increased training and tuition is urged to ease the problem.

The committee then discussed protection against chemical contamination risks in the tropics, emphasizing dermal absorption hazards, the need for an improved airpermeable but particle-resistant fabric, and pointed out the value of almost any type of clothing in protecting against dermal exposure.

Diagnosis of cholinesterase depression by blood tests presents some difficulties and potential errors with available techniques, especially from carbamate insecticides. Further research and development on methods was advocated to WHO. Organochlorine levels in blood and tissues present even greater difficulties unless undertaken in a highly sophisticated laboratory, and the committee could only urge inter-laboratory harmonization of techniques.

On therapy of pesticide poisoning, the annex adds little new to our present limited knowledge, and concentrates on organophosphate and carbamate poisoning treatment, wherein the advice is practical and sound.

This is a rather short booklet, and a rather long review: but the WHO Expert Committee does a very valuable job when it meets, and at least this reader and reviewer thus expresses his many years' gratitude to them.

E. F. Edson

Notice

Institution of Electronic and Radio Engineers

A Conference on Environmental Sensors and Applications is being organized by the Institution of Electronic and Radio Engineers with the association of the Institution of Electrical Engineers, the Institute of Physics, and the Institute of Electrical and Electronics Engineers. It will be held at the Royal Society, London on 18 and 19 November 1974.

Further details may be obtained from the Information Officer, Institution of Electronic and Radio Engineers, 8-9 Bedford Square, London WC1B 3RG.

Errata

In the paper by Cramér, Goyen, Jagenhorg, and Wilson entitled 'Renal ultrastructure, renal function, and parameters of lead toxicity in workers with different periods of lead exposure' on p. 113 of the April issue—8-penicillamine should read d-penicillamine throughout. In Table 2 the heading of the third column should read 'Renal clearance (ml/min/1.73m2).