

Health officials have examined a total of 730 pregnant women formerly resident in the contaminated area. The difficulties in securing legal abortions have added considerable impetus to the

campaign for abortion law reform; the Italian parliament is to consider several bills advocating changes.

In view of the known toxicity of TCDD and the knowledge that it is a

constant by-product of the trichlorophenol manufacturing process, many scientists are now beginning to question the need for the continuation of trichlorophenol production. One of the two

The possible alternatives

THE available alternatives to 2,4,5-T are 'Amcide', 'Glyphosate' and 'Krenite'; all three are effective brushwood killers. Amcide has been available in the UK since the early 1960s; Glyphosate is a more recent addition, and Krenite is at present only on sale in the US and West Germany.

These alternatives, when compared with 2,4,5-T, have some definite advantages. Amcide, made by Nissan in Japan, has an LD₅₀ value for rats of 3,900 mg kg⁻¹; Glyphosate, made by Monsanto, has an LD₅₀ value of 4,900 mg kg⁻¹. These toxicity ratings are well below that for 2,4,5-T (LD₅₀ value 300 mg kg⁻¹). Krenite, made by Dupont, has an LD₅₀ value of 24,000 mg kg⁻¹, a toxicity rating one eightieth of that for 2,4,5-T.

The reaction to produce Amcide presents none of the potential hazards associated with trichlorophenol manufacture in terms of toxic by-products. Information has not been made available for Glyphosate or Krenite production. However, in the case of Krenite the US Environmental Protection Agency (EPA) considers its manufacture to conform to accepted safety standards, and in view of its comparatively low toxicity has declared it as safe for use even on land adjacent to domestic water supply reservoirs and streams.

The disadvantages associated with the three alternatives are primarily those of cost. Amcide and Glyphosate are more expensive than 2,4,5-T when the concentrations of herbicide necessary to effect the same plant kill ratio are considered; Glyphosate is nearly five times as costly. Some potential buyers of Krenite consider that it, too, may be expensive when it is introduced on the UK market. The only other problem of any consequence relates to Amcide. In contrast to 2,4,5-T which is absorbed through leaves following spraying, Amcide must be applied to cut surfaces on plants. Its method of application is therefore considerably more labour intensive.

Hexachlorophene, the other major product derived from trichlorophenol, is a general poison effective in the control of gram-positive bacteria. In the cosmetics industry hexachlorophene is used as a preservative. For medical purposes hexachlorophene is used in the control of staphylococcal organisms. The bactericide has four

main uses: treatment of acne and impetigo, cleansing of intact skin around burns or wounds, pre-surgical washing, and cleansing of new-born infants, particularly the umbilical cord.

Its use, however, has been much reduced, and the industry is reported as being able to dispense with it altogether. Chlorhexidine—a bactericide now cleared for sale in the US—is used surgically in the UK as a skin cleanser, wound steriliser and for pre-surgical washing. On the question of the cleansing of the newly-born infant, however, there is a difference of opinion as to which of the two bactericides is the most effective.

Maternity clinics and nurseries are particularly open to bacterial cross-infection by the staphylococcal organisms. One of the most common is *S. aureus*. In the 1940s this organism was responsible for frequent epidemics in nurseries, with a consequent increase in infant mortality. When hexachlorophene was first marketed by Givaudan in the late 1940s it proved to be effective both in the routine containment of *S. aureus* and in controlling the organism in the case of an epidemic. As a result of its efficiency, hexachlorophene rapidly replaced the bactericide 'Triple Dye' in use at that time, to become the most widely used anti-bacterial agent in nurseries.

Two events in 1971 and 1972, however, caused users to reconsider their judgment. The first was a report by the EPA showing hexachlorophene to cause oedema and hindlimb paralysis in experiments on mice. The second was the death in France of 35 infants following the use of talcum powder containing 6% hexachlorophene. The neurological damage which led to the death of the children was caused by a twenty-fold increase of hexachlorophene concentration in the talc, the result of a manufacturing error.

Many maternity units in the UK have since reduced the amount of hexachlorophene used for infant washes. Currently less than half use hexachlorophene at all. Others rely on alcohol, used either alone or with chlorhexidine. Consultants at one cross-infection laboratory now recommend nurseries to avoid the use of hexachlorophene altogether for routine washes. The reasoning behind

this recommendation lies in the evolution of *S. aureus* itself, which has evolved through several forms since the 1940s and is now active as a complex of *S. aureus*.

The present generation of the bacterium is not causing serious epidemics in British hospitals which are fatal to children. Indeed the risk associated with hexachlorophene use is considered to present a greater threat than that represented by the staphylococcus itself. A further consideration is the fact that many British maternity units use a concentration of hexachlorophene to control *S. aureus* which is too low to kill the bacterium.

In the routine control of *S. aureus* chlorhexidine is as effective as hexachlorophene, and has the added advantage of an LD₅₀ value ten times higher. Chlorhexidine is also reported to be just as efficient in controlling local epidemics of the present milder strain of the bacterium. It has not been tested, however, with more lethal strains of the staphylococcus, whereas hexachlorophene has been shown to control dangerous epidemics of *S. aureus* in the past. Some bacteriologists anticipate that chlorhexidine will prove to be equally effective, but are reluctant to recommend it unequivocally as an alternative until this has been demonstrated conclusively.

Although the principal purpose behind trichlorophenol production is the synthesis of 2,4,5-T and hexachlorophene, the chlorinated phenol is still used to some extent as a slime control agent in the paper-making industry. It has never been as popular as pentachlorophenol, used for the same purpose, and what use it has had has been much reduced, due mainly to the criticisms of the unrestricted industrial use of polychlorinated biphenyls (PCBs) such as DDT, advanced by the environmental lobby.

In common with many industries which discharge effluent directly into rivers, the paper manufacturers have been particularly sensitive to the charge that their plant operating procedures are damaging to the environment. Because of the known risks associated with extensive PCB use, paper manufacturers in the UK have considerably reduced their use of all chlorinated phenol derivatives. Agents now preferred for the prevention of fungal growth include methylene bis thiocyanate together with some organobromine and organosulphur products.