Aroclor - Environmental Contamination. November, 1969.

Recent publicity in the U.K. press regarding the finding of P.C.Bs in dead sea-birds has highlighted once again the fact that the chemicals are being found in wild-life, particularly in those species associated with a marine environment. The deaths of these particular sea-birds may, or may not, be connected with the presence of polychlorinated biphenyl and, on present evidence, responsible opinion is non-committal. The fact is that evidence has been built up pointing to significant levels of P.C.Bs. in sea birds, particularly predators, and other species of wild life in many areas of the world. A substantial and growing number of scientific papers and reports provides a fairly detailed account of this evidence, much of it dependent on relatively new, highly sophisticated analytical techniques(1 - 6).

Polychlorinated biphenyls (Aroclors) cover a series of compounds of varying chlorine content and, as normally available, consist of complex mixtures of isomers. This complexity makes analysis difficult and only in recent years has the development of suitable forms of gas/liquid chromatography (G.L.C.) made this possible; even now great care is necessary in the interpretation of the chromatograms, especially when quantitative information is sought. Claims relating to specific levels of P.C.Bs in birds and other animals are often open to dispute, particularly, if the claims refer to named products such as Aroclor 1254, Clophen 50 and etc.

Most published papers refer to the finding of higher polychlorinated biphenyls, particularly penta- and hexa-chlor-biphenyls, but there have been suggestions (5) that lower chlorinated compounds have been detected in cold blooded species; these have not been detected in the higher species of the food chain and it is speculated that metabolism results in degradation of these lower chlorinated compounds. Reference is often made in these papers to the similarity of chromatograms observed to those of commercially available chlorinated biphenyls such as Clophen 50 (Aroclor 1254) and Aroclor 1200. Polychlorinated terphenyls have also been observed in wild-life(2).

The occurrence of the highest concentrations of P.C.Bs in wildlife associated with a marine environment suggests that the origin of these substances is the sea. It has been established in tests on fish, that persistent organochlorine compounds, such as DDT, in water at a level of part in 10^9 can concentrate up to 1 part in 10^6 in the fish muscle. It seems probable that similar concentration could occur wi P.C.Bs. This level could be increased by a further factor of 10^2 when passing through a food chain to a predatory sea-bird. Considerations of this type suggest that it is plausible for P.C.Bs to be found in sea-birds at the 100 ppm level, originating from levels in the sea below 1 part in 10^9. Similar arguments could apply to insecticides and thus explain why relatively high levels of both P.C.Bs and insecticids residues are often found simultaneously. Another way of expressing this is that P.C.Bs and other persistent chemicals when present in the sea at levels around 1 part in 10^9 or less may present an environmental hazard.

To minimise this hazard it will be necessary, in future, to prevent the pollution of the atmosphere and the sea by the more persistent P.C.Bs and, where possible, to develop and use bio-degradable products. It may be that the lower chlorinated biphenyls, or at least some of their isomers, are bio-degradable; work is in progress at Ruabon to determine this. If this can be demonstrated, the

development of acceptable products of the Aroclor type may be possible and will be exploited. For persistent chlorinated biphenyls, efforts must be made to contain any waste product, not only at the manufacturing plant, but at customer plants and through to the end- product.

One of the most difficult facets of this problem is to establish at what level or levels these P.C.Bs present a toxic hazard. In many small mammals, tests have shown that at levels of 100 ppm, a serious toxic hazard is not apparent, but in certain forms of marine life very much lower levels appear to be toxic. Studies of toxic effects are at present in progress in many laboratories in the United States and Europe. The results of this work will in time become available and it will be possible to assess the toxicological aspect more objectively.

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