The Metabolism of Hexachlorobenzene (HCB) in Rats

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The metabolism of HCB has not yet been extensively cleared up in warm-blooded organisms. The World Health Organisation (WHO 1974) has pointed out to the still needed clearing up in the concerned metabolism. A paper concerned with the degradation of HCB in a culture of mould has already been published (ENGST et al. 1975 a). According to ALBRO et al. (1974), more than 72 per cent of HCB are to be absorbed in the intestine, according to PARKE et al. (1960), it are only 25 per cent within 5 days.

MEHENDALE et al. (1975) found pentachlorobenzene (PCB), pentachlorophenol (PCP), tetrachlorobenzene, and trichlorophenol as metabolites from HCB in the urine of rats. Some more compounds could be detected by autoradiography, but they were not identified.

In former papers, PCB, PCP, and gamma-2,3,4,5,6-pentachlorocyclohexene have been identified as metabolites of Lindane (ENGST et al. 1974; ENGST et al. 1975 a-c, 1976 a, b; KUJAWA et al. 1974, 1976; SEIDLER et al. 1975). PCB and PCP are substances which are also found in the metabolism of HCB. After feeding HCB to rats, we succeeded in detecting metabolites in organs and excreta.

Methods and Materials

Wistar rats (male, average weight 250 g) were fed 19 days pelleted standard diet and water (ad libitum). In

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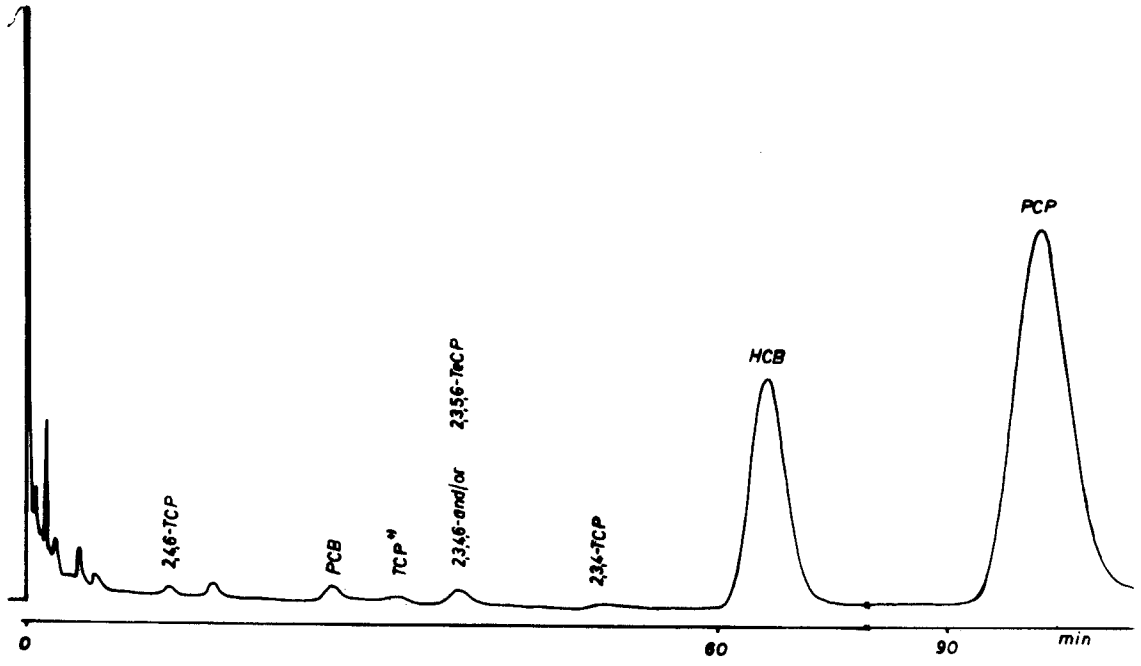

Fig. 1 Separation of n-hexane extract from urine on 7.5 per cent QF-1 at 90 °C

addition to that, they were applicated by gavage 8 mg HCB per kg body weight, dissolved in 1 ml sunflower oil.

On the 19th day the animals were killed by decapitation. Liver, kidneys, adrenals, heart, spleen, and intestinal fat were isolated and extracted three times with 25 ml n-hexane each per organ or per sample. Moreover, faeces and urine of the animals were analysed in the 2nd and 3rd week of application. The splitting and identification of beta-glucuronides and the identification by gas chromatography on 5 columns (QF-1, OV-17, OV-25, SE-30 and Epicote, XE-60) have been carried out as in the above mentioned papers.

Results and Discussion

In organs (especially in the spleen), only PCB and PCP could be identified, and that in small concentration, and HCB could be determined in the following amounts: fat tissue 82 p.p.m.; muscle 17 p.p.m.; liver total 125 /ug, kidneys total 21 /ug each, spleen total 9 /ug, heart total 1.5 /ug, and adrenals total 0.5 /ug each.

In urine, together with HCB and the main metabolite PCP, still 2,3,4,6-tetrachlorophenol and/or 2,3,5,6-tetrachlorophenol++) (TeCP), 2,4,6-trichlorophenol (TCP), and PCB were detectable in the free form (fig. 1). 2,3,4-TCP and other TCPs+) were present in traces. Small amounts of 2,4,6-TCP and 2,3,4,6-TeCP were present in the conjugated form as glucuronides.

In faeces only great amounts of HCB were identified together with little PCB.

+) TCP means here 2,3,5-TCP and/or 2,3,6-TCP and/or 2,4,6-TCP and/or 3,4,5-TCP

++) A separation by gas chromatography was impossible.

According to our hitherto existing results and with regard to our studies concerned with the degradation of PCB (ENGST et al. 1975 a, 1976 b), the degradation of HCB in rats happens slowly according to the following scheme (fig. 2):

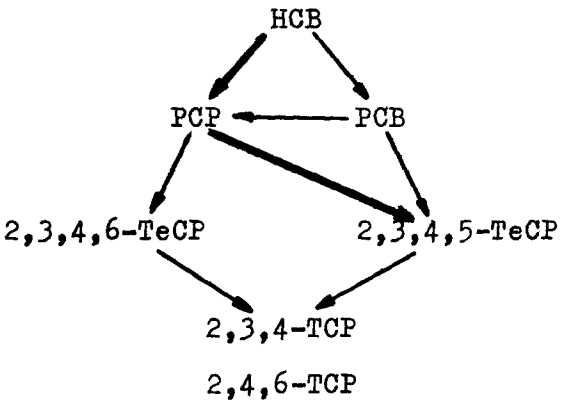

Fig. 2 Degradation scheme of HCB in rats

The degradation via PCB seems to be of subordinate importance because PCB and its main metabolite, the 2,3,4,5-TeCP, were detectable only in traces in these investigations.

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