Structural requirements for accumulation of PCB methyl sulphones in mink treated with Clophen A50

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Technical PCB products comprise a large number of polychlorinated biphenyl congeners (CBs). It is well known that several of these CBs are biotransformed to methylsulphonyl-metabolites with similar lipophilic character as the parent compound. These methylsulphonyl-CBs ($MeSO_2$-CBs) are accumulated in adipose tissue of mammals and some of the $MeSO_2$-CBs also show specific retention to certain tissues in the animals. Thus, a number of $MeSO_2$-CBs have been detected in different species of seals from the Baltic, in otter and wild mink from the Swedish environment and in polar bear and beluga whale from Canada. The structures of some of the $MeSO_2$-CB have been determined.

In the present study the structural requirements of the parent CBs for the formation of the retained $MeSO_2$-CBs were investigated in mink (*Mustela vision*) exposed to PCB (Clophen A50). Both muscle and liver samples were analyzed and the $MeSO_2$-CBs determined were compared to synthesized reference $MeSO_2$-CBs.

Major unmetabolized CBs such as 2,4,5,2',4'-pentaCB (I-99), 2,4,5,2',3',4'-hexaCB (I-138), 2,4,5,2',4',5'-hexaCB (I-153) and 2,3,4,5,2',4',5'-heptaCB (I-180) were determined in high concentrations in the mink adipose tissue. All these CBs are substituted in the 2,4,5-positions of at least one of the phenyl rings and are all known to be heavily retained in biota. On the other hand CBs with free *meta-/para*-positions were readily metabolized. Thus, at least 30 $MeSO_2$-CBs were detected at concentration of µg/g extracted lipids in both muscle and liver samples from the minks. Most of the sulphone metabolites were 3- and 4-$MeSO_2$-CB isomers of CBs known to be rapidly metabolized, e.g. 2,4,2',5'-tetraCB (I-49), 2,3,6,4'-tetraCB (I-64), 2,5,3',4'-tetraCB (I-70), 2,4,5,2',5'-pentaCB (I-101), 2,3,4,2',5'-pentaCB (I-87), 2,3,6,3',4'-pentaCB (I-110), 2,3,6,2',4',5'-hexaCB (I-149), 2,3,4,2',3',6'-hexaCB (I-132) (cf. Figure 1). 3-$MeSO_2$-2,5,2',5'-tetraCB and 3-$MeSO_2$-2,5,6,2',5'-pentaCB were also found to be retained in the muscle of the minks treated with Clophen A50 but their isomeric 4-$MeSO_2$-CBs were not detected. It may be observed that both the

3- and 4-$MeSO_2$-2,5,6,2',4',5'-hexaCB isomers were identified in the muscle extracts while no $MeSO_2$-CB metabolite originating from 2,4,5,2',3'-pentaCB was detected in any of the samples. Furthermore, minks treated with a fraction of PCB containing mainly 1-ortho-CBs were shown to contain mainly 3- and 4-$MeSO_2$-2,5,3',4'-tetraCB. These results show that CBs with at least one phenyl ring with 2,5-dichloro- and 2,3,6-trichloro-substitution are strongly favored and may be considered a criterion for the formation of $MeSO_2$-CBs accumulated in mink muscle. These observations are in accordance with $MeSO_2$-CBs detected also in other mammals.

In liver a much more specific mechanism for accumulation of $MeSO_2$-CBs takes place. Only a few $MeSO_2$-CBs are retained in the liver at high concentrations. 3-$MeSO_2$-2,5,2',3',4'-pentaCB and 3-$MeSO_2$-2,5,6,2',3',4'-hexaCB were identified in liver samples of the minks dosed with PCB. The selective retention of $MeSO_2$-CBs in the liver indicates the presence of some specific binding site that has not been identified so far.

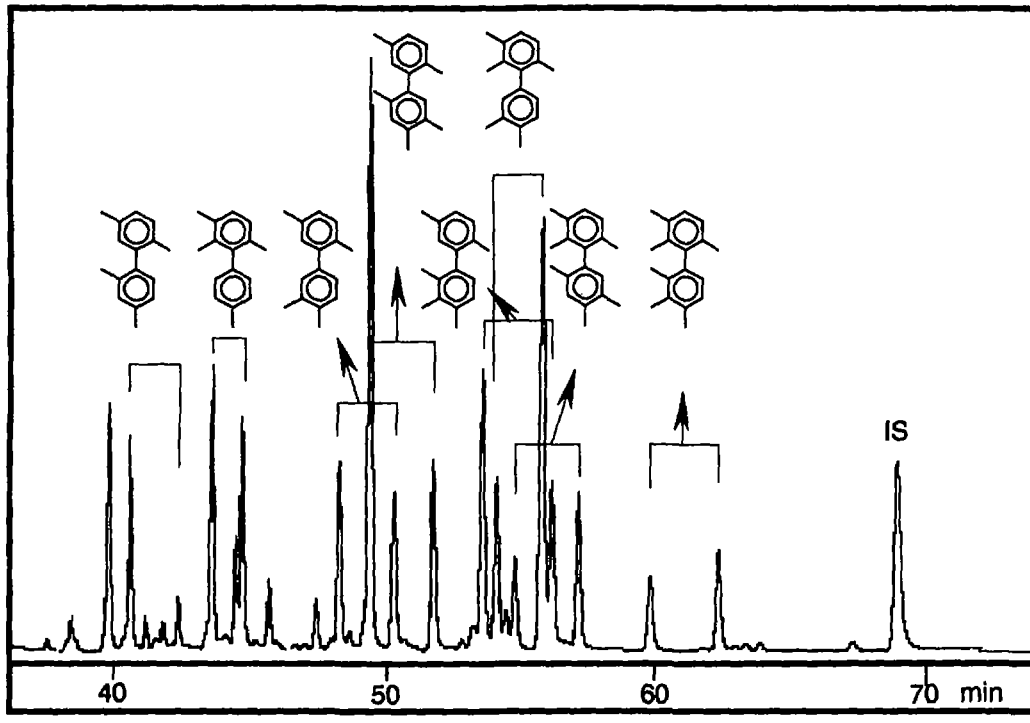

Figure 1. Gas chromatogram of $MeSO_2$-CBs in the muscle of the minks treated with Clophen A50. Pairs of peaks correspond to 3-$MeSO_2$- and 4-$MeSO_2$-CBs which are derived from the parent CB shown above, major components in Clophen A50.
IS = internal standard (3-$MeSO_2$-4-Me-5,2',3',4',5'-pentaCB)