Non-ortho and mono-ortho substituted PCB congeners in polecats in The Netherlands

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Non-ortho and mono-ortho substituted polychlorinated biphenyls (PCB) are considered the most toxic of all 209 PCB congeners[1,2]. These congeners may have comparable effects as dioxins and furans. The relative abundancy of the non-ortho congeners may exceed that of dioxins and furans[3]. Non-ortho and mono-ortho substituted PCBs are assumed to have serious effects on the reproduction of piscivoreous birds and mammals, such as seals, cetaceans and mustelids [4,5].

In this study the relative importance of non-ortho and mono-ortho substituted PCB congeners was investigated in polecat (*Mustela putorius* L.), a mustelid with a mainly terrestrial diet. This is one of the first surveys on the occurence of non-ortho and mono-ortho substituted PCBs in toppredators of terrestrial food chains.

Non-ortho (IUPAC nr. 77, 81, 126, 169) mono-ortho (IUPAC nr. 105, 114, 118, 156, 157, 167, 189) and 13 di-ortho substituted congeners were determined in liver, kidney, muscle, anal gland secrete and fat of 7 polecats, according to the method of Leonards et al.[6]. The animals were road victims, collected in the period 1990-1991 from various locations in The Netherlands. In summary, ^{13}C labeled non-ortho PCBs were added before soxhlet extraction with dichloromethane/pentane. H_2SO_4 clean-up was performed for the non-ortho PCB measurement, followed by a KOH silica gel clean-up. The extracts were fractionated on alumina and silica gel columns. Seperation of the non-ortho PCBs from the other PCBs was performed with a cosmosil PYE 5 HPLC column, according to the method of Haglund et al.[7]. Mono-ortho PCBs were measured with GC-ECD, and non-ortho PCBs with GC-MSD. Recoveries were determined as 95±10% (n=36) for the mono-ortho substituted congeners and 73±14% (n=36) for the non-ortho congeners.

Total PCB concentrations (sum of 30 PCB congeners) ranged from 0.6 to 60 mg/kg wet weight (2-370 mg/kg lipid weight), the same range as found in the last otters in the Netherlands[8]. Juvenile polecats had much higher concentrations than adult animals. Mono-ortho PCB concentrations ranged from 10 to 600 µg/kg wet weight, non-ortho PCB concentrations ranged from 0.02 to 8 µg/kg wet weight. Non-ortho PCB 81 was not detected in any of the samples. Converting the concentrations to 2,3,7,8-TCDD AHH-equivalents according to Tanabe[3], shows that 97-99% of the equivalents may be attributed to PCB 77, 105

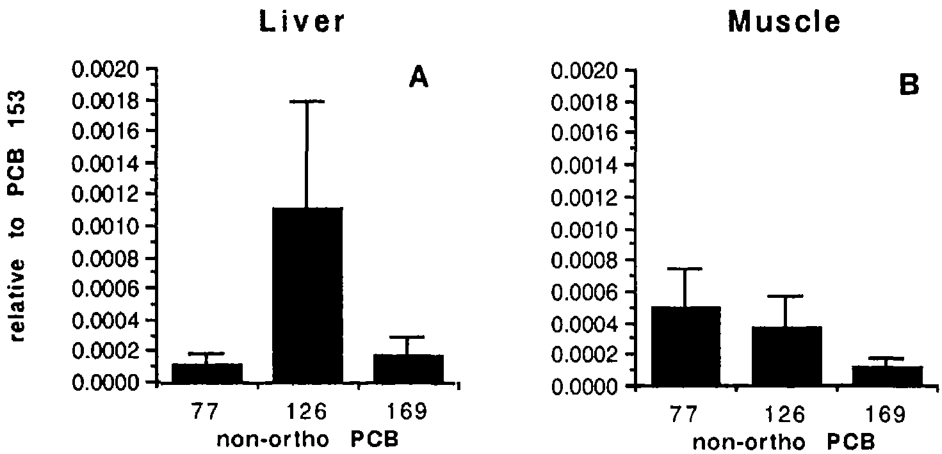

Fig. 1. Mean relative concentration and standard deviation of non-ortho substituted PCBs in liver (A) and muscle (B) of polecats (n=7) from the The Netherlands. PCB numbers are IUPAC numbers according to Ballschmiter and Zell[13].

126 and 156. PCB 126 accounts for 70-96% of the activity. This is in agreement with Smith et al.[9].

The TCDD equivalent concentration ranged from 0.003 to 2 μg/kg wet weight. The same range (0.03-1.2 μg/kg TCDD equivalents) was found in dolphins and whales from the Pacific[10].

Fig. 1 shows the patterns of non-ortho substituted PCB congeners in polecat liver and muscle. More or less organ and tissue specific non-ortho PCB patterns were observed in all animals. Stomach contents were investigated. Polecats from woodland foraged mainly on terrestrial organisms (small rodents); in animals from wetland habitats amphibians were the most dominant food items. This implies that the non-ortho PCB pattern seems to be primarily determined by metabolic processes rather than diet related factors. The relative reduced fraction of PCB 77 in polecat liver in comparison with muscle may be attributed to metabolic activity. This is in line with Brouwer[11] who reported that higher mammals can metabolize PCB 77 and to a lesser extent also PCB 126[12].

In conclusion, the present results indicate that non-ortho and mono-ortho substituted PCB may occur in terrestrial mammals in the same order of magnitude as in marine mammals. PCB 77 is probably metabolized in polecat liver.

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