Liver retention of thirteen individual PCB congeners in rat

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Abstract

In order to study the kinetic behaviour of individual chlorinated biphenyls (CBs) at atoxic levels, a single oral dose of a CB mixture was given to male Sprague-Dawley rats in two experiments. The congener mixture of the first experiment consisted of CB 105, 118, 138, 153, 156, 157, 170 and 180, and each congener was given at a dose of 0.03 μmole. After exposure the rats were killed in groups of six at different time points from 6 hours after exposure until 135 days. In the second experiment rats were exposed to a mixture of CB 28, 52, 77, 87 and 101. The dose was 0.1 μmole of each congener and the rats were followed until 96 hours. No toxic effects were observed in any of the experiments, neither on vitamin A level nor body or tissue weights. However, small and transient increases of monooxygenase-activities, measured as ethoxy- and pentoxyresorufin dealkylation, were noted in both experiments. The livers were analysed for mother substances by GC/MS.

In the first experiment we found that initial liver half-lives varied between 3.5 to 7.6 hours. During the first 2-3 days, 90 percent of the maximal recovered concentration was eliminated from the livers. The final half-lives were calculated to be from 80 to 490 days. In this first experiment we saw a pattern that a high number of chlorine substitutions gave a high concentration at the first time point (6h), and a longer initial half-life, but also a shorter time needed for the 90 percent elimination.

In the second experiment the studied time range was only long enough to calculate initial half-lives, which varied between 4.3 and 9.5 hours in the following order: CB28>77>52>87>101. However, a tendency for a bi-fasic elimination was observed for all congeners.

From the results we draw the conclusion that all examined CBs have a quick initial elimination rate from the liver, probably both depending on metabolism and redistribution, followed by a slower elimination rate. We also note that the congeners of the second experiment have a lower initial liver retention compared to the ones of the first experiment (0.9 - 4.8 % of the given dose compared to 7.8 - 17.4 %).