

**INVESTIGATIONS ON THE ABSORPTION AVAILABILITY OF PCDD/PCDF
FROM INDUSTRIAL SOIL**

Model experiments on absorption assessment after oral ingestion.

Rotard, W., Christmann, W., Knoth, W., Mailahn, W.

Institut für Wasser-, Boden- und Lufthygiene des Bundesgesundheitsamtes
Corrensplatz 1, D 1000 Berlin 33

From 1938 until 1945, in Marsberg/Germany copper was produced from a low copper ore with a bitumen content of 10% using a combined roasting-leaching-process, in which the ore was primarily roasted at temperatures around 600 °C after addition of certain amounts of sodium chloride. The soluble copper salts formed in the roasting step were then leached out. The remaining slags were stored on a dump hill alongside the plant. From these slags, called "Kieselrot"(red slag), approximately 400000 tons have been sold for use as surface layer on sports arenas, playgrounds or minor roads.

Thus, more than 1100 sports arenas, playgrounds etc. have been found to be covered with such Kieselrot layers. In more than half of the cases, PCDD/PCDF contents of this Kieselrot generally are between 1000 and 10000 ng I-TEq/kg d.s. (dry substance). The total amount of PCDD/PCDF for an individual arena or playground varies, according to extension and depth of the surface layer, between 1 and 100 g I-TEq.

Dust from these areas may be blown to the near vicinity, thus leading to a considerable contamination of soil and plants. Through the food chain this may contribute to a considerable extent to the average daily intake of people living in this area. Also, the direct respiratory and/or oral intake of soil dust may be possible during sports or playing activities on these grounds. Especially, intake by hand to mouth contact in the case of playing children may play an important role. In risk assessment therefore, availability of PCDD/PCDF in the digestive tract, that means desorption/extraction from the ingested particles and absorption by intestinal membranes, is of special importance.

In our experiments, where we tried to imitate intestinal conditions, we treated "Kieselrot" with a mixture of synthetic saliva - gastric juice - duodenal juice - bile to find out whether and to what degree transfer of PCDD/PCDF from the Kieselrot-particles into the aqueous phase takes place, thus facilitating absorption. The digestive juices are a complex mixture of various substances such as enzymes, electrolytes etc. which may vary according to food intake. For our model mixture only the main constituents and those who are considered important in the transfer process were used.

The Kieselrot-sample used in our experiments contained a total PCDD/PCDF amount of 6048 µg/kg d.s. resp. 63 µg I-TEq/kg d.s.. The sample fraction (4%) of a particle size ≤ 20 µm shows a PCDD/PCDF content of 34700 µg/kg d.s. resp. 292 µg I-TEq/kg d.s.. The fraction of particle size > 20 µm (96%) shows a PCDD/PCDF content of 5684 µg/kg d.s. resp. 56 µg I-TEq/kg d.s.. The PCDD/PCDF content of the fine dust fraction (≤ 20 µm) was five times higher than that of the fraction of higher particle size. For the fine dust fraction as well as for the total sample the profiles of chlorhomologues and of congeners are similar.

The rate of transfer from the Kieselrot into the model digestive juice is about 1% with regard to I-TEq. and PCDD/PCDF, and varies between 0,3 and 3% for different 2,3,7,8-substituted congeners. Therefore, the absorption availability for PCDD/PCDF of ingested Kieselrot is estimated to be about 1% in our model.

