

LEVELS OF CHLORINATED DIOXIN AND FURAN CONTAMINATION AT VARIOUS DEPTHS IN PENTACHLOROPHENOL TREATED WOOD.

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Introduction

We have found that a source of chlorinated dioxins and furans (PCDDs/PCDFs) in beef produced in the United States is through dermal contact, licking, or chewing pentachlorophenol (PCP) treated wood used in production facilities (1-3). We also found that wildlife (elk, Wapiti; *Cervus canadensis*) contained moderate levels of PCDD/PCDF in the same congener patterns found in PCP treated wood or paint used in winter feeding stations erected for these animals (4). In an effort to determine the extent of PCDD/PCDF contamination, we studied PCDD/PCDF contamination at various levels in PCP treated wood.

Materials and Methods

A sample of PCP treated wood (4.61 cm x 15.0 cm x 50.0 cm) was obtained from George F. Fries of the Agricultural Research Service, USDA, Beltsville, MD 20705, USA. The outside edges of the board were removed resulting in a 4.61 cm x 5.12 cm x 50.0 cm board with 4.61 cm between opposing weathered surfaces. Individual samples (1-2 g) were shaved from a 12 cm area, approximately 5-7 cm from each end, of a weather exposed surface and at the following depths beneath that surface: 1.9 mm, 4.2 mm, 6.2 mm, 9.2 mm, 12.1 mm, 16.2 mm, and 23.1 mm. At each level, approximately 50 mg of shavings from each of the two sampling areas were combined. Analysis for PCDDs/PCDFs followed the standard EPA 1613 method except that the PCDDs/PCDFs were extracted from the wood sample in the following manner: the wood was soaked in 50 ml of methylene chloride for five days, methylene chloride was removed and saved, the wood was then washed twice in 20 ml of methylene chloride, and the methylene chloride fractions were combined and assayed for PCDDs/PCDFs.

Results and Discussion

1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin (OCDD); 1,2,3,4,6,7,8-heptachlorodibenzo-*p*-dioxin (HpCDD); 1,2,3,4,6,7,8,9-octachlorodibenzofuran (OCDF); 1,2,3,4,6,7,8-heptachlorodibenzofuran (HpCDF); and 1,2,3,6,7,8-hexachlorodibenzo-*p*-dioxin (HxCDD) are the most abundant dioxin/furan congeners associated with technical pentachlorophenol, and their levels in the pentachlorophenol treated wood board are shown in Figure 1. OCDD level was the highest of the dioxin congeners with 17 ppm at the weathered surface. The level of OCDD dropped off to 7 ppm at 4.2 mm below the surface and remained relatively constant to the center of the board (7.1 ppm).

The next highest congener, HpCDD, was present at 10.4 ppm at the surface but dropped off rapidly at 4.2 mm below the surface to 2.4 ppm, and then slowly decreased to 1.6 ppm at the center. HpCDF and OCDF were present at the surface at similar levels (5.4 and 3.8 ppm, respectively). At 4.2 mm below the surface, these values leveled off to 1.0 and 1.6 ppm, then were detected at 0.4 and 1.6 ppm, respectively, at the center. HxCDD is a congener indicative of pentachlorophenol treated wood and was present at the surface at 0.8 ppm and gradually decreased to 0.07 ppm at the center of the board.

These data show that these congeners are present at high concentrations on the surface of the PCP treated wood, decrease to about half their levels at 4.2 mm under the surface, and remain relatively constant through the remaining interior of the wood. In terms of remediation of these dioxin congeners from the treated wood, a surface removal will lower but not prevent animal exposure.

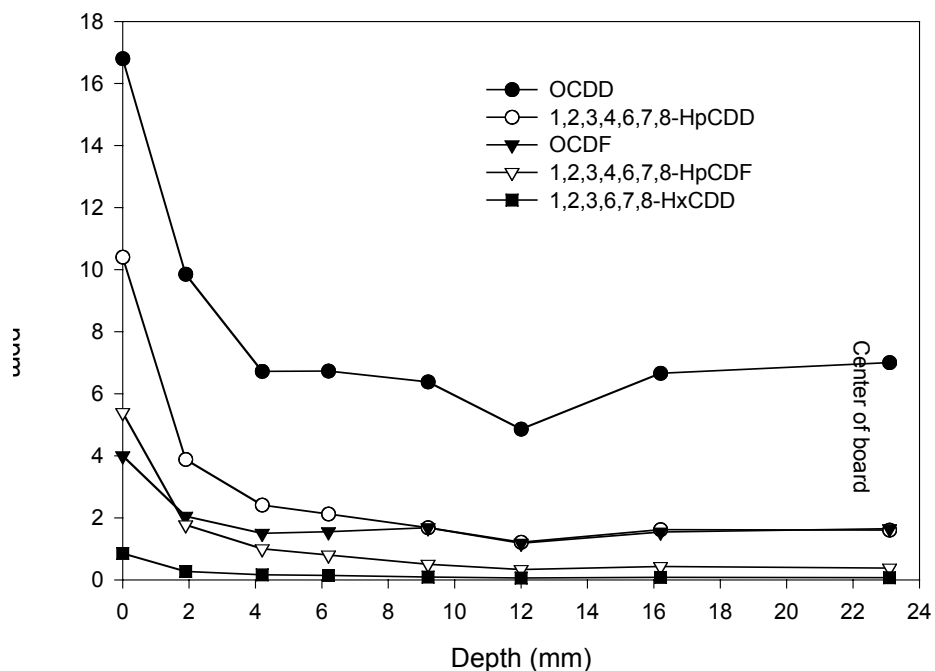


Figure 1. Concentration levels of 1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin (OCDD); 1,2,3,4,6,7,8-heptachlorodibenzo-*p*-dioxin (1,2,3,4,6,7,8-HpCDD); 1,2,3,4,6,7,8,9-octachlorodibenzofuran (OCDF); 1,2,3,4,6,7,8-heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF); and 1,2,3,6,7,8-hexachlorodibenzo-*p*-dioxin (1,2,3,6,7,8-HxCDD) from the surface to the center of pentachlorophenol treated wood.

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