

DIOXINS IN HUMANS: RELEVANCE OF FOOD ORIGINATING FROM HOT SPOTS IN VIETNAM, AUSTRALIA AND EUROPE

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Abstract

The human exposure to Dioxins (PCDDs/PCDFs) and dioxinlike PCBs via dietary intake of contaminated food, especially of contaminated fish, is demonstrated for countries like Vietnam, Australia and for Europe. Concentrations measured in food and in humans are reported. Values in humans can exceed background contamination of comparable groups by more than a factor of 100.

Introduction

Agent Orange, a phenoxyherbicide mixture of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2,4-dichlorophenoxyacetic acid (2,4-D) was sprayed for reasons of defoliation in large amounts on about 10 % of southern Vietnam during the Vietnam war between 1962-1971. 2,4,5-T was contaminated with the highly toxic and persistent 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in the low ppm-range (mg/kg). In samples collected between 1970 and 1973 Baughman et al. (1973) documented elevated levels of TCDD from Agent Orange in milk samples from southern Vietnamese woman as well as in fish and shrimp samples from sprayed areas in this region. Studies have documented the intake of 2,3,7,8-TCDD from Agent Orange in Vietnamese individuals by Schechter et al. (1990, 1992, 1995).

Recently a transfer of dioxins to humans by the consumption of contaminated fish originating from the Sydney harbour area has been reported by Symons et al. (2006).

This paper gives an overview on recent findings for Dioxins and related components in humans and in food and in some environmental compartments.

Results and Discussion

Countries and areas representing local reservoirs of high dioxin contamination (“hot spots”)

Exposure of humans and of food in areas of so called “hot spots” is still matter of concern. In such areas a long standing continuous exposure of humans is possible. Recently some specific dioxins reservoirs have been reported by Dwernychuk et al. (2002) and by Schechter et al. (2001, 2002, 2003, 2004).

We focused on three different areas in the southern part of Vietnam: *Bien Hoa*, north of Ho Chi Minh City, a former US air base, *Binh My*, an area where heavy fighting was happening during the Vietnam war, and *Can Tho* in *Tra Noc District*, south of Ho Chi Ming City, a former air base with Agent Orange storage as well. Here, only on the results for Bin Hoa is focussed on.

From Bien Hoa, 43 blood samples were analysed and 36 samples showed TCDD values above 20 pg/g lipid. The highest concentration found was 413 pg/g lipid. This person is known to have high fish consumption. Four individual and one pooled control samples from northern Vietnam (Hanoi) show values between 1.2 and 2.3 pg TCDD/g lipid. The detailed results are given by Schechter et al. (2002) and Dai et al. (2001).

Due to the situation that food is the major source for Dioxins and PCBs food samples in addition to the blood samples from the Bien Hoa area were analysed. The results for the food samples collected “in and around” the nearby Bien Hung lake frequently showed very high values for TCDD while values for samples from Bien Hung market and Bien Hoa market did not show such elevated values. Comparison data for food from Vietnam were published by Schechter et al. (2002) at between 0.001 and 0.05 pg TCDD/g wet weight.

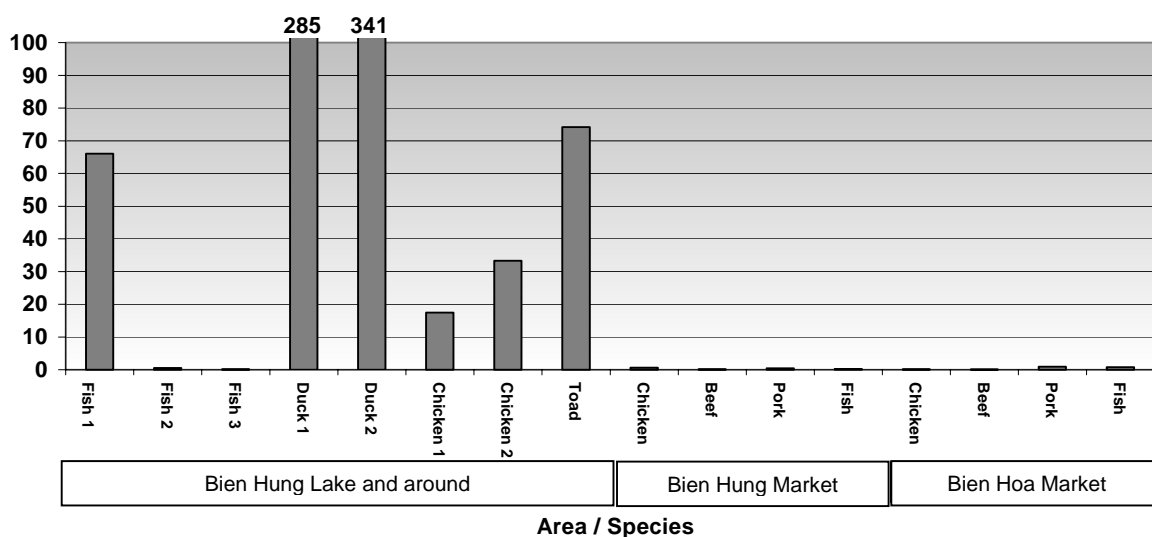


Figure 1: Dioxins in Vietnamese Food. Values in pg TEQ/g, wet weight (Schechter et al., 2003).

The so called “Sydney harbour contamination” was discovered as a hot spot by the analysis of sediment samples and fish samples originating from Port Jackson.

In close proximity to where the sediments had been collected a number of industries were located along the Rhodes peninsula bordering Homebush bay which manufactured a range of chemicals from 1928 to 1986 including xanthates, aniline, nitrobenzene, phenol, chlorophenol, chlorobenzene, 2,4,5-T and 2,4-D herbicides, chlorine, DDT, bisphenol-A and phenol-formaldehyde. Industrial practices during this time lead to contamination of the sediments of Homebush Bay with a number of these chemicals with subsequent studies have found levels of dioxins ranging from 31.5 to 4,352.5 pg WHO-TEQ g-1 dm with a mean of 711.5 pg WHO-TEQ g-1 dm (Birch et al., 2006).

As shown in Figure 2, 40 fish samples were analyzed from the harbour area of Sydney (Port Jackson). The area of Homebush bay was found to show highest concentrations in fish at TEQ values up to 141 pg/g fresh weight. For comparison, the European limit value for fish is set at 4 pg TEQ/g fresh weight.

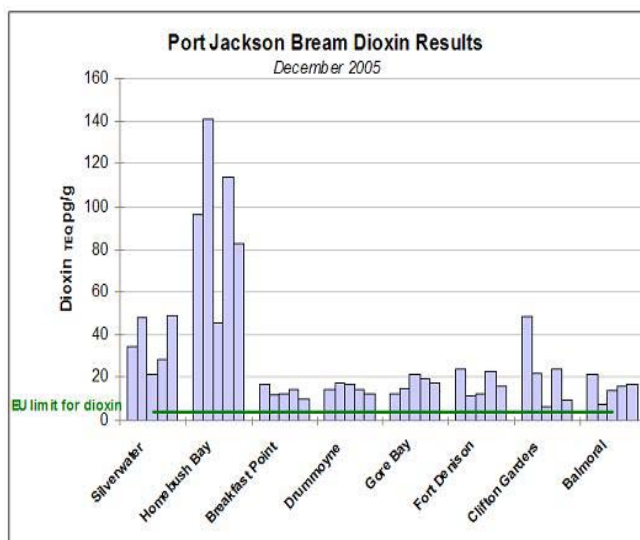


Figure 2: Dioxins in Fish Samples/Sydney Harbor Area, values on fresh weight basis (New South Wales Food Authority, 2006).

With the exception of one sample, all samples showed dominating values for 2,3,7,8 TCDD. These elevated levels for TCDD can be seen in combination with the production of 2,4,5-T / 2,4,5- Trichlorophenol.

Fisherman and their families that had consumed fish caught within these areas for a considerable time were contacted by investigative teams from two media organizations with regards to their willingness to provide blood samples for analysis of Dioxins. The results of the investigation of blood serum levels of Dioxins and dioxinlike PCBs from two families (family A and B) are discussed and compared with levels found in the general Australian population.

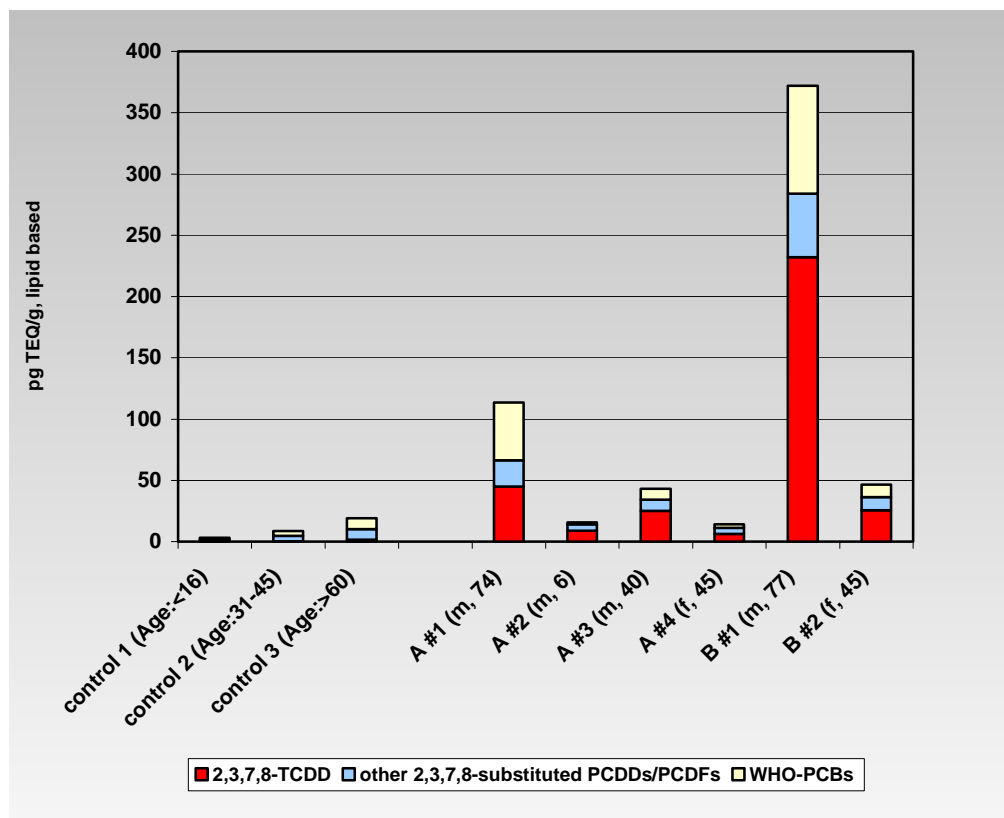


Figure 3: Comparison of TCDD Distribution in Australian Fish Eaters and Controls (Symons et al., 2006), age and gender are given in brackets.

The results for the determination of Dioxins and dioxinlike PCBs of the fishermen and their families are provided in Figure 3. When comparing the results for the six individuals with actual human background data for Australia, it is striking that all samples show elevated levels for 2,3,7,8-TCDD.

Observation for a correlation of consumption of contaminated fish and shellfish and Dioxin concentration in blood or milk are reported for a number of European countries as well: Sweden (Svensson et al., 1991), Norway (Johansen et al., 1996) and Finland (Kiviranta et al., 2002).

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