Dietary Exposure to PCBs and Dioxins in Children

(See Patandin et al., p. 45)

Dioxins and polychlorinated biphenyls (PCBs) are persistent environmental contaminants that bioaccumulate up the food chain (*1–3*). Human exposure is largely via microcontamination of animal products in the diet (*4–7*). Lactational transfer is a major route of exposure to the nursing infant (*8,9*); approximately 10–12% of total lifetime exposure can occur via nursing (*10*). A nursing infant may receive as much as 50 times the daily exposure of an adult (*7,11*). However, several studies have demonstrated that the benefits of nursing outweigh any potential risk from contaminants transferred in the milk (*11–13*).

This paper by Patandin et al. is part of a large ongoing investigation looking at exposure and health effects in children whose mothers are from the general population in The Netherlands. Approximately 400 mother–infant pairs were included in the cohort. Previous studies have measured the levels of both total and congener-specific PCBs, congener-specific polychlorinated dibenzo-*p*-dioxins and dibenzofurans, and total dioxin toxic equivalency (TEQ) in maternal plasma, cord blood, and milk. Developmental effects on neurobehavioral, hormonal, and immunological end points were examined at 2 weeks, 3 months, and 18 months. A decrease in neuro-optimality and circulating thyroxine levels were observed in the infants. There were also changes in lymphocyte subsets. These were relatively subtle changes, and the clinical importance is not clear.

In this paper, which deals with the exposure issues, Patandin et al. examine not only exposure via lactation and its impact on the blood levels in the children at 3.5 years of age but the relative contribution of different foods that the children eat during their preschool years. This dietary exposure, assessed via a food questionnaire, was compared to that estimated from older children and young adults. Because of their dietary patterns, young children consume three times more TEQ on a daily basis than do adults. As observed in other studies, nursing infants consume a daily TEQ intake that is 50 times higher than adults. While meat and dairy products each contribute approximately one-third of the daily TEQ in adults, in young children dairy products contribute approximately half of the total daily TEQ. Meat products account for less than 20% and processed foods approximately 20% of the daily TEQ in young children.

This paper thus supports other studies (*8,9*) which have reported that lactational transfer represents a major source of PCBs and dioxins to the developing infant. While the level of exposure decreases after weaning, the young child is still more highly exposed on a daily basis than the adult. The mean daily TEQ for infants was approximately 110–120 pg TEQ/kg/day during the first 6 months of life for a nursing infant. Exposure dropped to ~6–7 pg TEQ/kg/day for ages 1–5 years, and continued to drop until adulthood. The current daily TEQ intake per kilogram body weight in The Netherlands is approximately 2–3 pg TEQ/kg/day. This is within the range of the tolerable daily intake (TDI) recently set by the World Health Organization (WHO) in May of 1998 (1–4 pg/kg body weight) (*14*).

Further studies on this cohort by these investigators are anticipated. It is important to determine whether the relatively subtle neurological, hormonal, and immunological effects noted in infants persist in the children as they grow up. While exposure during lactation is quantitatively highly significant, it is important to note that the effects observed in the children correlated with their prenatal, rather than their lactational, exposure. These children and their mothers all come from among the general population, with no known "excess" exposure to PCBs and dioxins. Yet, children whose mothers are at the "high end" of the background population, in terms of TEQ and total PCBs, appear to function less well than children whose mothers are at the "low end" of the population. These results, which are in general agreement with those involving other populations in the United States and Japan (*15–20*) support the recent WHO recommendation to continue to reduce exposure to these ubiquitous pollutants.

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