

Perinatal exposure to dioxin-like compounds: Workshop report

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Perinatal exposure to xenobiotics can occur via the placenta to the developing fetus and via breast milk to the infant. For nursing infants, the breast milk is the major source of non-volatile chlorinated compounds, and the amounts received by the infant can be quite significant. For example, the intake (pg/kg/wk) of dioxin-like compounds can be up to 100-fold greater for nursing infants than for the general population, and exceeds the tolerable weekly intake values (TWI) for these compounds. The fetus and infant may be particularly susceptible to the effects of such chemicals because many tissue and organ systems are in active stages of development. Investigation of these effects is important if we are to provide effective perinatal medical care which protects the health of the mother and nursing infant.

In a variety of research centers throughout the world, studies have been undertaken or are underway to determine the effects in infants of perinatal exposure to dioxin-like compounds. Such exposures, whether transplacental or lactational, are suspect as causes of adverse health effects in newborns. Recently, for example, published studies in the Netherlands and the US have demonstrated that levels of lipophilic persistent organochlorine residues (PCBs and dioxins) in human breast milk are associated with adverse health effects in the newborn. These effects include altered thyroid hormone/receptor function¹, neurodevelopmental² and cognitive deficits³, and reduced birth weights and head sizes⁴. At higher levels, dioxin-like compounds produce pleiotropic effects in animals and humans^{5,6}, including dermal toxicity, thymus atrophy, immunotoxicity, reproductive toxicity, neurotoxicity, porphyria, weight loss, tumor promotion and induction of cytochrome P-450 dependent mono-oxygenases.

During June, 1993, a group of scientists gathered in Berkeley, CA, to discuss ongoing and completed studies on the effects of perinatal exposures to dioxin-like compounds. The Workshop was organized by the Hazardous Materials Laboratory of California Department of Toxic Substances Control and co-sponsored by the California Environmental Protection Agency, the California Public Health Foundation, the USEPA/Environmental Toxicology Division and the National Institute of Environmental Health Sciences.

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The objectives of the Workshop were:

- o to review the current status of research in the field, through presentations by researchers of completed, ongoing or planned studies;
- o to provide a multidisciplinary forum to share insights on the different health effects of dioxin-like exposures, and to evaluate current applications of biomarkers in perinatal studies;
- o to strengthen future research by establishing new contacts between research groups, encouraging new collaboration, and setting priorities for the future.

The Workshop was organized into sessions to discuss studies on perinatal exposures to dioxin-like compounds and the related reproductive effects, endocrinological effects, neurotoxicological effects, immunological effects, biomarkers of effects and risk assessment.

The Workshop summarized:

Measurements that are used in different disciplines, describing the epidemiologic and laboratory characteristics of each. The epidemiologic characterization included: relevance of endpoint to human health; suitability; ease of application; and special needs for field studies; validation and/or field testing; range of values in the normal population; sensitivity/specificity of measure; responsiveness (magnitude of response to given dose) and statistical power or sample size required to show significant increase over background. The laboratory characteristics included: complexity of laboratory method (experimental or standard protocol); sensitivity/specificity; complications in producing, delivering and preparing sample and cost per measure or sample.

A summary of the key issues in the Workshop will be presented.

References

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