

Topic: Language delay and exposure to dioxins and PCBs

Title: Maternal dietary exposure to dioxins and polychlorinated biphenyls (PCBs) is associated with language delay in 3year old Norwegian children.

Conclusion: Girls born to mothers who exceeded the tolerable weekly intake for dl-compounds or had a PCB-153 intake above the 97.5 percentile in early pregnancy may have increased risk of language delay at age 3 years

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Abstract: **BACKGROUND:** Prenatal exposure to dioxins and PCBs is potentially harmful to the developing fetus and may increase the risk of delayed or impaired neurodevelopment. Several studies have reported negative associations between prenatal exposure to these compounds and aspects of cognition related to language in early childhood. **OBJECTIVES:** The aim was to examine the association between maternal low level dietary exposure to dioxins and PCB during pregnancy and language development in 3year old children in a large group of mother-child pairs participating in the Norwegian Mother and Child Cohort Study (MoBa). **METHODS:** This study includes 44,092 children of women who were recruited to the Norwegian Mother and Child Cohort Study (MoBa) during the years 2002-2009. Maternal dietary exposure to dioxins and PCBs was estimated based on a validated food frequency questionnaire (FFQ) answered mid-pregnancy and a database of dioxin and PCB concentrations in Norwegian foods. Exposure to dioxins and dioxin-like PCBs (dl-compounds) was expressed in total toxic equivalents (TEQ), and PCB-153 was used as marker for non-dioxin-like PCBs (ndlPCBs). Children's language skills at age 3 were assessed by parental report including a Dale and Bishop grammar rating and questions about communication skills from the Ages and Stages Questionnaire (ASQ). Logistic regression models adjusted for confounders were used to examine the association between maternal dietary exposure to dl-compounds or PCB-153 and language development in children. **RESULTS:** The maternal dietary exposure to dl-compounds and PCB-153 was generally low, and 98% of women had intakes of dl-compounds  $\leq 14$ pg TEQ/kg bw/week, which is the tolerable weekly intake set by EU's Scientific Committee for Food (SCF). High maternal exposure ( $>14$ pg TEQ/kg bw/week of dl-compounds (median 2.6pg/kg bw/day, range 2-16) or  $>97.5$ -percentile intake of PCB-153 (median 11ng/kg bw/day, range 5-28) was associated with higher odds of incomplete grammar (in boys and girls, adjusted ORs 1.1 to 1.3) and severe language delay in girls, adjusted ORs 2.8 [95% CI 1.1, 7.1] for PCB-153 and 2.9 [95% CI 1.4, 5.9] for dl-compounds. Furthermore, high exposure to dl-compounds was associated with moderate language delay 1.4 [95% CI 1.0, 2.0] and lower communication score (ASQ), adjusted OR 1.4 [95% CI 1.1, 1.9] in girls. **CONCLUSIONS:** The main findings of this study were: 1) Girls born to mothers who exceeded the tolerable weekly

intake for dl-compounds or had a PCB-153 intake above the 97.5 percentile in early pregnancy may have increased risk of language delay at age 3 years. 2) Negative associations with maternal exposure to dl-compounds or PCB-153 were observed for both boys and girls having incomplete grammar, which is a subtle reduction in language skills. This interesting finding should not be considered as deviant at this age.