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Reduced antibody responses to vaccinations in children exposed to polychlorinated biphenyls

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Background: Developmental exposure to polychlorinated biphenyls has been implicated as a possible cause of deficient immune function in children. A prospective study is now being carried out to assess whether prenatal and postnatal exposure to polychlorinated biphenyls (PCBs) impacts on antibody response to childhood immunizations.

Methodology: In two Faroese birth cohorts, where exposures mainly originate from pilot whale blubber and vary widely, prenatal PCB exposure was determined from maternal concentrations in pregnancy serum and milk. Following routine childhood vaccinations against tetanus and diphtheria, one group of 119 children were examined at 18 months and 129 children at 7 years. In addition, over 500 children were examined before and after the booster vaccination at 5 years. Child serum was analyzed for tetanus and diphtheria toxoid antibodies and for PCBs.

Results: The antibody response to diphtheria toxoid decreased significantly at age 18 months at higher serum PCB concentrations at the time of examination. The diphtheria response was much lower at age 7 years and was not associated with the exposure. However, the tetanus toxoid antibody response was affected mainly at age 7 years. The response at age 5 years was substantially affected by short-term changes. Structural equation analysis showed that the early postnatal exposure was the most important predictor of a decreased vaccination response.

Implications: Increased perinatal exposure to polychlorinated biphenyls may adversely impact on immune responses to childhood vaccinations.