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## Salmon in pregnancy study (SIPS): the effects of increased oily fish intake during pregnancy on cord blood mononuclear cell (CBMC) fatty acid composition and cytokine responses

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There has been an increase in the prevalence of allergic diseases in recent decades<sup>(1)</sup>. The events leading to T helper cell 2 (Th2)-driven allergic immune responses are not known, but changing environmental exposures in early life are implicated in the recent increase in allergic diseases<sup>(2)</sup>. Dietary effects are likely to be more significant before immune responses are fully established, and this suggests a possible role of early polyunsaturated fatty acid (PUFA) exposure in allergic disease prevention. In the current study, atopic women were randomised to eating oily fish (salmon) during pregnancy or not in order to assess the immunological effects of *n*-3 PUFA in high risk neonates. It was hypothesised that maternal oily fish consumption during pregnancy would result in a higher *n*-3 PUFA content in neonatal (cord blood) mononuclear cells (CBMC) and an altered CBMC cytokine responses.

At 20 weeks gestation, 123 women with high risk of having atopic offspring and with low habitual intake of oily fish ( $\leq 2$  times/month) were randomised to consume two portions of salmon per week (each portion of salmon provided about 2 g of *n*-3 PUFA) or to continue their habitual diet of low oily fish consumption until delivery. All women were asked to keep a record of their fish intake during the study. Umbilical cord blood was collected at birth ( $n = 101$ ). CBMCs were isolated and their fatty acid composition determined by gas chromatography. CBMCs were cultured in the presence of allergens, mitogens and toll-like receptor agonists in order to induce cytokine production. Cytokine concentrations were measured using the flow cytometry based cytometric bead arrays.

Both eicosapentaenoic acid and docosahexaenoic acid were slightly higher in CBMCs in the salmon group, but the difference from the control group was not significant. Production of interleukin (IL)-10 by mitogen-stimulated and endotoxin-stimulated CBMCs was lower in the salmon group ( $P = 0.047$  and  $P = 0.034$ , respectively). Tumour necrosis factor (TNF)- $\alpha$  production by unstimulated and mitogen-stimulated CBMCs was lower in the salmon group ( $P = 0.032$  and  $P = 0.01$ , respectively).

In conclusion, increased consumption of salmon during pregnancy has limited impact on the fatty acid composition of CBMCs, although there appears to be an effect on the ability of those cells to produce certain cytokines. Thus salmon during pregnancy may affect neonatal immune responses, suggesting an effect on immune development.

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