

Notes from the NUTRIMENTHE symposium - Nutrition and Cognitive Function.

Fish eating in pregnancy, genes, omega-3 fatty acids and the impact on 'brain power' in children - the NUTRIMENTHE project.

17th November 2011

The statement that 'fish is good for the brain' is increasingly backed-up by scientific evidence but what the actual outcomes are in terms of mental performance or 'brain power' is still being discovered. Oily fish is the predominant source of long-chain omega-3 fatty acids, including docosahexaenoic acid (DHA), an important structural component of cells, especially the cell membranes of the brain and which accumulates in the brain during development. Indeed, the EC recently supported health claims that intake during pregnancy of DHA "contributes to the normal brain development of the foetus and breastfed infants" and "to the normal development of the eye of the foetus and breastfed infants" (Commission Regulation No. 440/2011).

The EC-funded NUTRIMENTHE project hosted a symposium "Nutrition and Cognitive Function" at the recent European Nutrition Conference in Madrid (26th - 29th October 2011). NUTRIMENTHE partner Dr Eva Lattka from the Helmholtz Zentrum München, German Research Centre for Environmental Health, presented results published from the ALSPAC study and the NUTRIMENTHE project. Previously, ALSPAC has shown that fish eating in pregnancy is related to later childhood IQ in particular verbal intelligence when measured at age 8. In this study, children born to women who reported the highest fish intake while pregnant, demonstrated better outcomes in tests for verbal intelligence, fine motor skills and prosocial behaviour (giving helping and sharing). NUTRIMENTHE is investigating further and examining what in fish might be mediating the effect (omega-3 fatty acids are among the hot candidates) and the contribution made by genetic variation. In particular, NUTRIMENTHE is concerned with polymorphisms in the fatty acid desaturase (*FADS*) gene cluster that codes for the enzymes delta-5 and delta-6 desaturase that are involved in the synthesis of omega-3 and omega-6 fatty acids.

Dr Lattka presented results showing that polymorphisms in the *FADS* gene cluster influence how fatty acids are processed by a woman during pregnancy. Blood samples were taken from women at 20 weeks of pregnancy and from the umbilical cord at birth, for the analysis of omega-3 and omega-6 fatty acids and for the genotyping of 18 *FADS* single nucleotide polymorphisms. Omega-3 and omega-6 fatty acids are supplied to the developing child by placental transfer via the umbilical cord but the influence of maternal and child *FADS* genotypes on the levels of these fatty acids have not been explored until now. Fatty acids from cord blood from over 2000 mothers and children were analysed and the dominant genetic influence (mother or child) on cord blood fatty acids was determined.

Dr Lattka showed that the composition of fatty acids in cord blood is dependent on maternal and child genotypes, such that maternal genotypes are mainly associated with omega-6 precursors and that child genotypes are mainly associated with omega-6 products. DHA amounts were equally associated with maternal and child genotypes. Dr Lattka noted that "there is more contribution to omega-6 fatty acid synthesis by the foetus than previously expected, DHA levels are dependent on both maternal and child metabolism" and that "DHA supplied by the mother might be very important".

As shown by ALSPAC, fish eating in pregnancy is related to verbal IQ at age 8 but what in fish is mediating the effect? Fish-eating is associated with maternal levels of DHA but it has not been shown until now whether DHA levels are directly related to outcomes in children. In a study of 2750 mother-child pairs from the ALSPAC cohort, and after adjustment for a number of confounders, no associations were found between the level of maternal DHA and childhood IQ. "DHA did not appear to be the missing link" noted Dr Lattka "but it could be another nutrient, or nutrients, in fish that influence IQ or perhaps, IQ is not an optimal measure. The child's diet is also likely to be important". This work is as yet unpublished and is being taken forward by the NUTRIMENTHE project.

Finally, Dr Lattka also presented further results showing how *FADS* genotypes and breastfeeding can influence a child's IQ at age 8. Breast milk contains considerable amounts of omega-6 and omega-3 fatty acids. In 5934 children from the ALSPAC cohort, children carrying a particular 'minor' variant in the *FADS* gene cluster, that were never breastfed, demonstrated the lowest performance in the IQ test, suggesting that fatty acid metabolism indeed might be important for later IQ. Breastfed children had similar IQ's irrespective of genotype. The results from this gene-nutrient interaction study suggest that the fatty acid hypothesis might not be too far-fetched. Dr Lattka noted that more studies are required and that "we are a long way from dietary recommendations based on genotypes but gene-nutrient interaction studies might be a way forward".

The work of the NUTRIMENTHE project is ongoing until March 2013. For more information and to keep up to date with the progress of the project, please visit the website and register for the newsletter www.nutrimenthe.eu

The 11th European Nutrition Conference took place in Madrid between 26th and 29th October 2011 and attracted over 2000 nutrition experts from countries worldwide under the banner "Diversity versus Globalisation: A Nutritional Challenge for a Changing Europe"

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