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The role of maternal low protein diet on neural stem cells and neurogenesis in the offspring brain?

Chris J Airey, Phoebe J Smith, Joanna M Gould, Stephanie J Marfy-Smith, Tom P Fleming & Sandrine Willaime-Morawek

Globally, malnutrition is the single greatest threat to public health. Maternal malnutrition during pregnancy is detrimental to foetal development and increases the risk of many chronic diseases in later life. Neurological consequences include increased risk of schizophrenia and abnormal anxiety-related behaviour. Previous studies have shown that maternal protein restriction has a negative effect on foetal brain development in vivo and we previously showed an effect on neural stems cells (NSCs) in vivo. With this in mind we investigated if a maternal low protein diet affects NSC number and proliferation in the foetal brain and if any impairment to neurogenesis will persist in the adult brain. Female mice were fed different diets from conception: normal protein diet (NPD), low protein diet (LPD), or embryonic LPD (Emb-LPD: LPD for 3.5 days, NPD thereafter). Offspring were maintained on standard chow after weaning at 3 weeks. Immunostaining of E14.5 brain sections showed a decrease in NSCs (Sox2 positive) in both LPD and Emb-LPD compared with NPD. Furthermore, decreased cellular proliferation (Ki67-positive cells) was demonstrated in both LPD and Emb-LPD, compared with NPD. Adult brains (6 months) were analysed by western-blot. Trends for a decrease in β3-tubulin (early neuronal marker) and an increase in NeuN (mature neuronal marker) were revealed in the cortex of LPD, compared with NPD. Taken together our data suggests that neurogenesis is profoundly altered in the embryonic brain following maternal protein restriction and this may result in permanent neuronal architectural changes in the adult brain.