

Perinatal essential fatty acid deficiency in mice - effects on metabolism and behaviour

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av

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Avhandlingen baseras på följande delarbeten:

- I Prenatal essential fatty acid deficiency in mice results in long-term sex-specific effects on body weight and glucose metabolism.**
Palsdottir V, Wickman A, Strandvik B, Gabrielsson BG and Olsson B.
Mol Med Report, in press, 2011
- II Postnatal deficiency of essential fatty acids in mice results in resistance to diet-induced obesity and low plasma insulin during adulthood.**
Palsdottir V, Wickman A, Andersson N, Hezaveh R, Olsson B,
Gabrielsson BG and Strandvik B.
Prostaglandins Leukot. Essent. Fatty Acids, 2011. 84: 85-92
- III Postnatal essential fatty acid deficiency in mice affects lipoproteins, hepatic lipids, fatty acids and gene expression.**
Palsdottir V, Olsson B, Borén J, Strandvik B and Gabrielsson BG.
Submitted manuscript
- IV Long-term effects on anxiety-related behaviour by postnatal essential fatty acid deficiency.**
Palsdottir V, Månsson JE, Blomqvist M, Egecioglu E and Olsson B.
Submitted manuscript



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Abstract

Maternal nutritional status during pregnancy and lactation influences the health of the adult offspring and an adequate supply of essential fatty acids is important for foetal and postnatal growth and development. The overall aim of this thesis was to study short- and long-term effects of perinatal essential fatty acid deficiency in mice on metabolism and behaviour.

An essential fatty acid deficient (EFAD) diet or a control diet was given to mouse dams during the latter half of pregnancy (prenatal EFAD) or 4 days before delivery and throughout lactation (postnatal EFAD). The pups were weaned to standard diet (STD) and were later subdivided into two groups, receiving high fat diet (HFD) or STD. Body weight, body composition, food intake, energy expenditure, glucose tolerance and plasma leptin were analyzed in the offspring in both the prenatal and postnatal EFAD studies. In the postnatal EFAD males, lipids, fatty acids and gene expression in the liver and plasma lipids were also analyzed. In addition, the short- and long-term effects of postnatal EFAD on brain fatty acids together with long-term effects on behaviour were studied in the female mice.

Prenatal EFAD resulted in sex-specific long-term effects with lower body weight and leptin levels in the adult female mice and higher fasting glucose and lower insulin sensitivity in the adult male mice compared to controls. Mice of both gender with postnatal EFAD exhibited lower body weight, reduced body fat and lower plasma leptin and insulin concentrations compared to controls. The postnatal EFAD mice were resistant to HFD-induced obesity, liver steatosis and hypercholesterolemia during adult life. Finally, postnatal EFAD had long-term effects associated with decreased anxiety and increased risk behaviour in adult female mice. In conclusion, these results suggest that both the sex and the period of exposure (prenatal or postnatal) modulate the long-term effects of EFAD in mice.

Keywords: essential fatty acids, perinatal period, maternal diet, insulin resistance, diet-induced obesity, lipids, behaviour