Influence of maternal dietary n-3 fatty acids on breast milk and liver lipids of rat dams and offspring - a preliminary study

The impact of triacylglycerol (TAG) structure and level of n-3 fatty acids on the fatty acid profile of total breast milk lipids and total liver phospholipids (PL) of dams and offspring (1, 3 and 13 weeks of age), when administered during development, was examined. Pregnant rats were fed experimental diets from the 8(th) day of pregnancy throughout lactation. After weaning and until 13 weeks of age, the offspring were fed the same diet as their dams. The experimental diets contained either a specific structured oil, linseed oil or fish oil. In the specific structured oil, α-linolenic acid (18:3n-3) was predominantly located in the sn-2 position of the TAG and the level of 18:3n-3 was 2 mol% or 10 mol%. In the linseed oil diets the level of 18:3n-3 was 2 mol% or 10 mol% as well. Finally, the fish oil diet contained 18:3n-3 as well as 20:5n-3 and 22:6n-3 adding up to a total of 2 mol% n-3 fatty acids. Samples from three animals in each group were analyzed. The highest level of 22:6n-3 in the breast milk was obtained with diets containing this fatty acid itself. The fatty acid profile of rat dam liver PL was very different from the milk lipids indicating that the maternal dietary fats and the fatty acid synthesis in the mammary gland are the major determinants of the fatty acid profile of breast milk, whereas the liver does not significantly add to this. The 20:4n-6 was decreased in breast milk lipids and liver PL of dams and offspring when 18:3n-3 was increased in the diet. When the diet was based on 10 mol% 18:3n-3 from structured lipid trace levels of 22:6n-3 occurred in breast milk. The 22:6n-3 in liver PL of 1 week old offspring was significantly higher when the diet was based on the specific structured oil (2 mol%) compared to linseed oil. The metabolism of fatty acids may therefore be related to their positions in the dietary TAG. In liver PL of 1 week old offspring 22:6n-3 was highest in the groups, in which the breast milk contained pre-formed 22:6n-3. This demonstrates that the milk fatty acids influence the fatty acid composition of liver PL in young offspring. The results showed, furthermore, that dietary 22:6n-3 is a more effective precursor of tissue 22:6n-3 than an equivalent amount of dietary 18:3n-3.