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Omega-3 long-chain polyunsaturated fatty acids in plasma phospholipids of 12-month-old infants consuming cow's milk, breast milk or formula: a cross-sectional study

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Background - Docosahexaenoic acid (DHA; 22:6n-3) is a long-chain polyunsaturated fatty acid (LCPUFA) derived endogenously from ALA and the high LA/ALA ratio in formula is thought to contribute to the poor DHA status of formula-fed infants. Butterfat contains some n-3 LCPUFA however it contains no DHA and has a low LA/ALA ratio. Even so, studies with animals fed butterfat have shown increased DHA concentrations.
Objective - To determine the n-3 LCPUFA status of 12-month old infants changing from breastmilk or formula to cow's milk as their main drink compared with breastfed and formula-fed infants.
Design - A cross-sectional study of ninety 12-month-old infants who were either breastfed (reference), formula-fed (reference), breastfed then formula-fed, breastfed then cow's milk fed or formula-fed then cow's milk fed. Infants included in the cow's milk groups were fed cow's milk for at least 4 weeks. The primary outcome was plasma phospholipid n-3 LCPUFA concentrations.
Outcomes - Cow's milk fed infants had significantly higher plasma phospholipid eicosapentaenoic acid (EPA; 20:5n-3) and docosapentaenoic acid (DPA; 22:5n-3) but not DHA compared to formula fed infants at 12-months of age (Table).

	Breastfed n = 24	Formula n = 21	Breastfed then formula n = 11	Breastfed then cow's milk n = 10	Formula then cow's milk n = 20
EPA[1]	0.53 ± 0.20^{a}	0.46 ± 0.18^{a}	0.37 ± 0.07^{a}	0.93 ± 0.26^{b}	0.84 ± 0.33^{b}
DPA	1.15 ± 0.25^{ab}	0.99 ± 0.21^{ac}	0.83 ± 0.12^{b}	1.13 ± 0.19^{b}	1.32 ± 0.41^{c}
DHA	4.12 ± 0.90^{a}	2.09 ± 0.54^{bc}	2.75 ± 0.87^{b}	2.87 ± 0.63^{c}	$2.05 \pm 0.51b^{c}$

[1] mean ± SD, different subscript letters indicate significant difference between dietary groups, $P<0.05$
Conclusions – Feeding cow's milk in late infancy can improve the n-3 LCPUFA status at 12 months of age.

Effects of omega-3 fatty acid deficiency on rat intestinal structure and microbiology

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Background - The omega-3 (n-3) fatty acids are known to influence inflammatory responses in the body. However little attention has been given to n-3 fatty acid effects on structures such as the intestinal tract. In order to determine if further research is warranted, a pilot study was conducted into the effects of n-3 fatty acid deficiency on rat intestinal structure and microbe populations.
Method - Eight female Wistar rats were divided evenly by random selection into a control and experimental group. The control group were given 30 g of feed daily containing 3.9 g/kg of α-linolenic acid (ALA) and the experimental group given 30 g of feed daily containing 0.6 g/kg of ALA from age nine to 11 weeks until sacrifice at age 38 to 40 weeks. Plasma phospholipids were analysed using thin layer chromatography and gas chromatography. Intestinal segment contents were collected, cultured onto a variety of media and colony forming units counted. Segment pieces were processed using standard histological techniques and section structure assessed under a light microscope.
Results - The plasma phospholipid of the control group contained greater ($P<0.05$) total n-3 fatty acid. Increased proportions ($P<0.05$) of haemolytic bacteria were in the ileum and increased numbers ($P<0.05$) of total bacteria and lactic acid bacteria were in the caecum of the experimental group. Villi in the duodenum of the experimental rats was more cellular, while an elevated mitotic activity and inflammatory cell infiltration was seen in their ileum.
Conclusion - This pilot study established that n-3 fatty acid deficiency does affect rat intestinal structure and microbe populations. Results suggest that a deficiency of n-3 fatty acid can lead to increased cell proliferation, inflammation and microbe overgrowth in the normal intestinal tract. An association was identified between the structural changes and microbe population present in the ileum due to n-3 fatty acid deficiency. Hence further research on this topic is undoubtedly warranted in the future.