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Sequential changes in PUFA composition of red blood cell membranes before and after small bowel transplant: a case report

S. V. Beath[1], T. Patel[2], S. Clarke[1], J. Sira[1], G. Gupte[1], S. Protheroe[1], D. A. Kelly[1], G. Griffiths[2] and J. Talcott[2]

[1]*Birmimgham Children's Hospital, B4 6NH, UK and* [2]*Departments of Life and Health Sciences and Chemical Engineering, Aston University, UK*

Children with intestinal failure are dependent on intravenous lipid solutions to survive and historically the lipid source has been soya oil, which is rich in essential fatty acids. Recently, there have been concerns that reliance on a single source of lipid, which contains a high proportion of so-called pro-inflammatory omega-6 fatty acids, may be a factor in the development of liver disease[(1)]. The use of a multi-source lipid (SMOFresnius) consisting of soya oil, medium chain fatty acids, olive oil and fish oil became available in the UK in 2007 and is being increasingly used, although the long-term effects on the liver function and other tissues have not yet been determined.

The aim of this study was to evaluate the PUFA status in an 11-year-old boy prior to small-bowel transplant, when he was receiving SMOF as part of his parenteral nutrition, and periodically until 12 months after transplant, when he was established on the enteral feed Peptamen. PUFA levels were measured in red blood cell (RBC) membranes by gas chromatography-flame ionised detection. The dietary intake of fatty acids was calculated from the PN prescription and dietetic records.

	Pre-transplant	2 months after Tx	5 months after Tx	8 months after Tx	12 months after Tx
Intravenous FA* intake 18:1, 18:2 18:3n3, 20:4, 22:6 (w3:w6 ratio)	556; 374; 50;10; 44 (0.24)	0	0	0	0
Enteral FA* intake 18:1, 18:2, 18:3n3, 20:4, 22:6 (w3:w6 ratio)	0	132: 320; 70; 0; 0 (0.22)	132: 320; 70; 0; 0 (0.22)	155; 374; 82; 0 (0.22)	155; 374; 82; 0 (0.22)
RBC PUFA% 18:1; 18:2; 18:3 20:4; 22:6 (w3:w6 ratio)	20; 10; 9; 11.3; 12.1 (0.71)	10; 10; 11; 11.9; 8.4; (0.79)	8; 10: 10; 10; 9.4 (1.05)	10; 8; 11; 10; 9.9; (0.92)	10;11;11; 11.4; 9.9 (0.88)

*mg/kg/d oleic acid 18:1, linoleic acid 18:2, linolenic acid, 18:3 arachidonic acid, 20:4, docosahexaenoic acid 22:6 (DHA).

The markers of both omega-6 (20:4) and omega-3 (22:6) PUFA decreased significantly and came down to just above the range for healthy volunteers by 5 months post transplant. This change in PUFA was associated with reduced intake of long chain fatty acids when PN was stopped and Peptamen Junior commenced. We conclude that the PN fat source may have been over-providing essential fatty acids and DHA, and despite a reduction in EFA intake and lack of DHA in Peptamen Junior, this child was able to synthesise DHA satisfactorily from his enteral food source.

1. Koletzko B & Goulet O (2010) Fish oil containing intravenous lipid emulsions in parenteral nutrition-associated cholestatic liver disease. *Curr Opin Clin Nutr Metab Care* **13**, 321–326.