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Arachidonic and docosahexaenoic acids are strongly associated in maternal and neonatal blood.

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BACKGROUND: The red cell membrane fatty acid composition has frequently been used as an index of essential fatty acid (EFA) nutrition. After birth there is a decline in plasma arachidonic acid (AA) and docosahexaenoic (DHA) acids in babies fed on conventional formula which contains only the parent linoleic and alpha-linolenic acids. In human studies, the red cell phosphoglyceride composition appears to be more constant than that of plasma. In infants fed fish oil without AA, the AA proportions fall in the plasma but much less so in the red cells. This result might be considered to mean that there is no need for preformed AA. On the other hand, in a study where the levels of AA fell there was reduction of infant growth. Indeed, where cell membrane composition does change there is often an associated alteration in physiological functions of membranes. We therefore felt it worth investigating the balance between AA and DHA in a physiological situation where plasma levels are known to change, namely in pregnancy. PURPOSE: The aim of the study was to investigate a relationship between blood phosphoglyceride AA and DHA in pregnant women and neonates. SUBJECTS: Health pregnant women from London, England (n=193) and their term babies (n=45); healthy pregnant women from Seoul, South Korea (n=40) and their term babies (n=40); and preterm neonates (n=72) from London. METHOD: Blood samples were taken from British and Korean pregnant women during the third trimester, and from term and preterm babies at birth. These samples were taken for routine monitoring purposes in Korea and were a part of a study on pregnancy outcome for which ethical permission was granted from the East London and The City Health Authority and Lambeth, Southwark and Lewisham Health Authority. Approval was also obtained from the Ethical Committee of the Asan Medical Centre, Seoul, South Korea. RESULTS: AA and DHA correlated in plasma choline phosphoglycerides (CPG) of the British mothers ($r=0.52$ $P<0.0001$). The correlation coefficients and significance were much stronger in the red cell CPG and even more so in the term and preterm infant red cell CPGs ($r=0.75$, 0.80 and 0.88, respectively). Similarly, AA and DHA correlated in red cell CPGs of the Korean women and their term babies. There was also a significant relationship between the two fatty acids in red cell ethanolamine phosphoglycerides in the mothers and their babies. Both linoleic (LA) and alpha-linolenic acids (ALA) were inversely associated with AA and DHA in some of the phosphoglyceride fractions of the mothers and babies. CONCLUSIONS:

Although AA and DHA have different primary dietary origins, there were significant relationships between AA and DHA in the phosphoglycerides of the red cell membrane. This finding seems surprising if the red cell composition is determined by diet. These results suggest a physiological mechanism which attempts to maintain an appropriate balance between AA and DHA. It is plausible that there is an optimum balance between AA and DHA for membrane stability, deformability, enzyme and receptor function.