

Effect of quality of feeding on serum lipoprotein levels in premature infants

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The effect of the quality of feeding on serum lipoprotein levels was studied in 30 premature infants (mean gestational age 31.7 ± 2.0 weeks, birth weight 1568 ± 238 g). The neonates were classified into three groups fed with breast milk and two different formulae with low and high lipid contents. No significant differences in the serum triglyceride, total cholesterol, VLDL-, LDL-, and HDL-cholesterol values were found after six week's feeding of various lipid and protein intake.

Recent studies have shown that postnatal changes in plasma cholesterol concentrations in the healthy mature neonate are dependent on the quality of feeding [4, 8, 9], however, it is not known whether this is valid also for the premature infant.

Here we report on serum lipid and lipoprotein values in premature babies after six week's feeding with breast milk and with two different formulae containing high and low amounts of lipids.

SUBJECTS AND METHODS

In 30 premature infants serum triglyceride, total cholesterol, very low density lipoprotein (VLDL)-, low density lipoprotein (LDL)-, and high density lipoprotein (HDL)-cholesterol concentrations were measured in blood samples taken after 6 h fasting on the 2nd and on the 42nd day after birth.

Triglyceride, total cholesterol, and HDL-cholesterol levels were determined by the Boehringer enzymatic test. LDL- and VLDL-cholesterol values were calculated according to the formulae of Hardell and Carlson [3].

On the basis of the different type of feeding, the infants were classified into three groups the gestational age and birth weight distribution of which was very similar (Table I). No significant differences in the frequency of IRDS, mechanical ventilation and drug administration during the first week were observed either. Seriously sick prematures were not involved in the study. Feeding was started within 4-6 h of birth. Each of the babies required intravenous fluid and glucose supplementation for 4-10 days, but thereafter they were fed exclusively with breast milk or one of the formulae chosen. Neither the amount of feeding, nor the weight gain were statistically different in any of the following groups:

Group I = breast milk. Preferably the milk of the own mother was given, but when for any reason this was not possible, pooled human breast milk was applied.

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TABLE I
Survey of the material (mean \pm S.D.)

	Breast milk	Robolact®	Pre-Aptamil®
Number of prematures examined (boys/girls)	10 (5/5)	10 (6/4)	10 (5/5)
Gestational age (week)	31.2 \pm 1.6	32.0 \pm 2.2	32.0 \pm 2.3
Birth weight (g)	1643 \pm 249	1543 \pm 228	1520 \pm 238
Weight gain in the first six weeks (g/week)	89 \pm 48	77 \pm 47	93 \pm 50

Group II = Robolact® (EGIS) formula. Protein-rich solution with a relatively low lipid concentration.

Group III = Pre-Aptamil® (Milupa). The formula was characterized by high lipid and low protein content.

The composition of the three feeding liquids is given in Table II.

RESULTS

Since no sex differences were found, only the combined results are demonstrated in Table III.

As shown by the figures, a certain variation in the mean values of the 2nd day was found, however, only

the concentrations of triglyceride and VLDL-cholesterol in the breast milk group proved to be significantly lower than in the Pre-Aptamil® fed prematures.

After six week's feeding an increase of total cholesterol level was seen in each group, but these were still lower than usual in mature infants. The serum triglyceride concentrations were somewhat higher in the babies fed with the lipid-rich Pre-Aptamil® but the difference was not significant statistically. In any other comparison the values of the three groups did not differ from each other.

TABLE II
Composition of breast milk and of the formulae administered (g/100 ml)

	Breast milk	Robolact®	Pre-Aptamil®
Proteins	0.9	2.6	1.5
Lipids	2.9	1.5	3.6
Carbohydrates	7.0 (lactose)	10.0 (lactose 3.7 saccharose 1.3 dextrine- maltose 5.0)	7.2 (lactose)

TABLE III

Lipid and lipoprotein levels on the 2nd and 24th day of postnatal life in milk and formula-fed premature neonates (mmol per l; mean \pm S.D.)

	2nd day		
	Breast milk	Robolact®	Pre-Aptamil®
Triglyceride	0.62 \pm 0.20 ^a	0.99 \pm 0.53	1.08 \pm 0.58 ^a
Total cholesterol	2.26 \pm 0.69	2.23 \pm 0.49	2.22 \pm 0.52
VLDL — cholesterol	0.31 \pm 0.10 ^b	0.46 \pm 0.24	0.49 \pm 0.22 ^b
LDL — cholesterol	1.48 \pm 0.56	1.32 \pm 0.51	1.27 \pm 0.45
HDL — cholesterol	0.47 \pm 0.31	0.45 \pm 0.10	0.46 \pm 0.09

	42nd day		
	Breast milk	Robolact®	Pre-Aptamil®
Triglyceride	1.08 \pm 0.82	0.97 \pm 0.52	1.23 \pm 0.67
Total cholesterol	2.73 \pm 0.76	2.83 \pm 0.48	2.77 \pm 0.83
VLDL — cholesterol	0.38 \pm 0.12	0.45 \pm 0.24	0.51 \pm 0.36
LDL — cholesterol	1.53 \pm 0.55	1.63 \pm 0.26	1.49 \pm 0.73
HDL — cholesterol	0.82 \pm 0.26	0.75 \pm 0.31	0.76 \pm 0.21

^a $p \sim 0.05$; ^b $p < 0.05$

DISCUSSION

The present findings did not confirm a long-term effect of the quality of feeding on serum lipoprotein levels in premature infants. This is in accordance with the recent observations of Lane and McConathy [5]. At the same time, our results seem to contradict those of Kirstein et al [4] and Van Biervliet et al [8, 9]. In their studies, however, only full-term healthy neonates were included, whereas we investigated relatively lowbirth-weight prematures. A further difference is that while the earlier investigators followed the babies for at most 30 days, and focused on a

more detailed evaluation of the first postnatal week, we measured serum lipoprotein concentrations on the 2nd day and after six weeks of feeding.

In agreement with the results of several authors, including Csákó et al. [2], Strobl et al [6], and Tóth et al [7], the serum lipoprotein levels increased with age, however, the absolute values remained overall lower than in the infants of higher gestational age and greater birth weight previously examined. Since all the prematures involved in our study were symptomless and thrived well during the 42 days of observation, the effect of possible pathological events such as infection [1] could be ruled out.

Although subfractions of lipoproteins and apoproteins could not be determined in this study, the results suggest that the total lipid and protein contents of the feeding do not influence the serum concentrations of the main lipoprotein fractions in premature infants.

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