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5-5-2022

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Tocopherol Content of Maternal Breast Milk and Impact on Neonatal Growth

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Background: Vitamin E is a fat-soluble nutrient consisting of α -, β -, δ -, and γ -tocopherol isoforms that has established effects on neonatal growth in utero. Higher maternal plasma tocopherol concentrations in pregnancy are associated with increased neonatal weight, length, and head circumference percentiles at birth. However, less is known about the impacts of tocopherols on post-natal growth. Since many neonates consume maternal breast milk as their post-natal nutrient source, it is important to understand the tocopherol content of breast milk and associations with neonatal growth.

Significance of Problem: Although the tocopherols demonstrate positive associations with neonatal growth in utero, the role of these breast-milk-derived nutrients on post-natal growth is unclear. Enhanced understanding of these relationships can help clinicians and mothers ensure ideal nutrition and growth in their neonates.

Hypothesis: We hypothesize there will be positive correlations between maternal breast milk tocopherol concentrations and post-natal growth parameters in neonates.

Experimental Design: Breast milk samples were collected from postpartum mothers (N=24) whose neonates were admitted to the neonatal intensive care unit (NICU) and analyzed for α -, δ -, and γ -tocopherol concentrations using high performance liquid chromatography (HPLC). Neonatal anthropometric percentiles at 36 weeks corrected gestational age (CGA) and discharge were collected from the medical record. The Fenton growth chart was used for neonates born <37 weeks CGA and the WHO growth chart for neonates born >37 weeks CGA. Spearman correlations assessed the relationships between breast milk tocopherol concentrations and neonatal growth percentiles. A p-value <0.05 was statistically significant.

Results: 70% of neonates were born preterm (median CGA=35.9 weeks). At 36 weeks CGA, median growth percentiles were 59.9 for weight, 68.4 for length, and 60.9 for head circumference. At discharge, median growth percentiles dropped to 33.6, 41.6, and 48.3, respectively. Breast milk concentrations of α - and γ -tocopherol were significantly correlated to increased neonatal length percentile at 36 weeks CGA (both R=0.70, both p=0.016), with γ -tocopherol concentration also correlating with increased weight percentiles at 36 weeks CGA (R=0.62, p=0.033). There were no significant associations between breast milk tocopherol content and discharge growth percentiles.

Conclusions: This study demonstrates the potential role of increased maternal breast milk tocopherol content on post-natal growth at 36 weeks CGA for preterm neonates. Limitations of this study include a small sample size and variability among neonates in total breast milk consumption prior to reported growth measures. Future research should assess total breast milk intake in neonates and evaluate neonatal plasma tocopherol concentrations.