5-5-2022

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Background: Vitamin E is an essential, fat-soluble nutrient with four isoforms: α-, β-, δ-, and γ-tocopherol. These isoforms differentially modulate inflammation and show variable associations with perinatal outcomes, such as preterm delivery and Apgar scores. However, little is known about the role of these isoforms on post-natal outcomes and their presence in maternal breast milk, a neonate's ideal nutrition source.

Significance of Problem: To analyze the role of tocopherols on post-natal growth and inflammation, it is critical to first assess their presence in maternal breast milk. Relating these measures to maternal dietary intake can advance our understanding of breast milk micronutrient composition and provide an avenue for counseling lactating mothers on the importance of maternal nutrition to ensure their neonate's health.

Experimental Design: Breast milk samples were collected from postpartum mothers (N=24) whose infants were admitted to the neonatal intensive care unit (NICU) and analyzed for α-, δ-, and γ-tocopherol concentrations using high-performance liquid chromatography (HPLC). Maternal dietary intake was assessed using the Harvard Food Frequency Questionnaire. Median tocopherol concentrations and isoform proportions were generated for breast milk concentrations and intake values. Tocopherol intake adequacy was defined using the Institute of Medicine's recommendation of 19mg of α-tocopherol daily. Mann-Whitney U-tests compared median breast milk tocopherol concentrations between intake adequate vs. deficient mothers and assessed for differences in isoform proportions between dietary intake and breast milk samples. A p-value <0.05 was statistically significant.

Results: 63.6% of mothers had deficient tocopherol intake (median daily intake=15.3mg α-tocopherol). Median concentrations of α-, δ-, and γ-tocopherol (ug/L) in breast milk samples were 3866.5, 768.1, and 118.6, respectively. There were no significant differences in breast milk tocopherol concentrations between intake adequate vs. deficient mothers. For both dietary intake and breast milk, α-tocopherol had the highest relative proportion (MBM=83%, intake=52%), followed by γ-tocopherol (MBM=14%, intake=39%) and δ-tocopherol (MBM=3% intake=8%). Proportions of δ- and γ-tocopherol were significantly higher in dietary intake compared to maternal breast milk (both $p<0.001$).

Conclusions: This study highlights the prevalence of overall tocopherol intake deficiency and increased proportional consumption of δ- and γ-tocopherol among lactating mothers. It also suggests a mechanism for maintaining breast milk α-tocopherol concentrations despite intake deficiency. Differences in the proportions of tocopherol isoforms between breast milk and intake measures further indicates that proportions of individual tocopherol isoforms in breast milk are influenced by factors other than dietary intake.