

WORLDWIDE INFANT BLOOD CONCENTRATIONS OF DIETARY CAROTENOIDS BY NUTRITIONAL SOURCES AND FEEDING STAGES

Yusuf Zaidi¹, Rachel Stroh², Nancy E. Moran³

¹ Baylor College of Medicine, Department of Pediatrics, Nutrition

² Baylor College of Medicine, School of Medicine, M.D. Program

³ Baylor College of Medicine, Pediatrics, Nutrition

Keywords: beta-carotene, nutrition, bioavailability, human milk, infants

Background: Pediatric intake of carotenoids, fat soluble phytochemicals found in foods, human milk, and infant formula, is associated with improved vitamin A status and visual and cognitive functions. Studies have suggested infant carotenoid status differs by primary nutrition source and feeding stage. However, infant blood carotenoid concentration patterns by diet and feeding stage have not been examined on a worldwide basis.

Materials/Methods: Searches for major dietary carotenoid concentrations in infant blood were performed on PubMed, EMBASE, and Web of Science. Full-text articles in English were screened for duplicates and relevance, and blood (plasma or serum) concentrations of beta-carotene, lutein, lycopene, beta-cryptoxanthin, alpha-carotene, zeaxanthin, and alpha-cryptoxanthin in healthy ≤ 1 y.o. infants were extracted. Worldwide means and 95% confidence intervals were calculated by age range (newborn, <6 mo, and >6 mo), and dietary source and stage (exclusive human milk or formula, or complementary feeding); and data were compared to the youngest group available from the 2003-06 U.S. NHANES database, children, ages 6-11.

Results: Forty-seven of 665 unique publications reviewed met inclusion criteria, with publication dates ranging from 1989 to 2021 and 22 unique nations being represented. Eleven publications (23%) reported on US infants, 35 (75%) on non-US infants, and 1 (2%) on both US and non-US infants. Beta-carotene was the most abundant carotenoid in newborns' cord blood (6.1 ± 3.7 ug/dL) and in <6 mo human milk-fed infants (15.7 ± 8.5 ug/dL), while zeaxanthin was the most abundant carotenoid in <6 mo formula-fed infants (8.0 ug/dL). Lutein was the most abundant carotenoid in >6 mo complementary fed-infants blood (9.9 ± 2.3 ug/dL). Blood carotenoid concentrations tended to be greater across all analytes in infants fed human milk, compared to formula (analytes were 2.7 to 3.9 times greater). Mean blood carotenoid concentrations in >6 mo complementary fed-infants were generally lower than the lower 95% C.I. limits reported by NHANES for 6-11 year olds (e.g. beta-carotene 95% C.I.s of 2.8-8.6 vs. 12.1-14.0 ug/dL).

Conclusions: Infants experience marked dietary carotenoid exposures, though lower than those reported in older children, which may differ across infant feeding stages and dietary sources. Estimates of infant dietary carotenoid exposure can be used to interpret and design future experiments on dietary carotenoids and infant health.

Images / Graph / Table: No image uploaded