Early-Life Effects of Vitamin D: A Focus on Pregnancy and Lactation

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Key Insight

Long known for its role as a preprohormone in calcium and bone homeostasis, our understanding of vitamin D now extends to its functions in regulating innate and adaptive immunity. From early in pregnancy, there is a rise in circulating levels of 1,25-dihydroxyvitamin D, but drop to prepregnancy levels after birth. A growing body of evidence indicates that vitamin D can affect gene expression, including genes associated with immune defense pathways. In turn, vitamin D metabolism during pregnancy is modulated by the individual’s genetic background. In the future, this knowledge may enable us to fine-tune the dosing of vitamin D supplements during pregnancy, as well as identify subgroups of women who may be at greater risk of vitamin D deficiency.

Current knowledge

There are 2 forms of vitamin D: ergocalciferol (or vitamin D2, synthesized by plants and fungi) and cholecalciferol (or vitamin D3, synthesized in human skin and by animals). Humans are able to metabolize both forms of vitamin D. The initial step in metabolic activation of vitamin D is an enzyme-catalyzed insertion of an OH group at carbon 25, resulting in 25(OH)D, the most abundant form of vitamin D in the circulation. Parathyroid hormone (PTH) is an important mediator of vitamin D status. When vitamin D levels decrease, PTH increases, affecting intestinal absorption of vitamin D and skin conversion from its precursor. Thus, measurement of intact PTH levels also has been used as an indicator of vitamin D deficiency.

Practical implications

When mother is vitamin D insufficient or deficient, breast milk has a relatively low vitamin D content. Consequently, all breastfed babies should receive a vitamin D supplement of 400 IU/day. Most infants in technologically dependent societies are not exposed to direct sunlight until after 6 months of age; therefore, endogenous synthesis is not a reliable source of vitamin D. Currently, a major challenge is lack of compliance among parents in giving vitamin D supplements to their breastfed infants. Where maternal compliance with taking a vitamin D supplement is greater than that of parental adherence to infant supplementation, maternal vitamin D supplementation remains a viable alternative that safely and effectively treats both the mother and her breastfeeding infant.

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