

Vitamin D hormone regulates serotonin synthesis. Part 1: relevance for autism

Rhonda P. Patrick¹ and Bruce N. Ames¹

Author Affiliations

¹Correspondence: Nutrition and Metabolism Center, Children's Hospital Oakland Research Institute, 5700 Martin Luther King Jr. Way, Oakland, CA 94609, USA. E-mail: R.P.P., rpatrick@chori.org; B.N.A., bames@chori.org

Abstract

Serotonin and vitamin D have been proposed to play a role in autism; however, no causal mechanism has been established. Here, we present evidence that vitamin D hormone (calcitriol) activates the transcription of the serotonin-synthesizing gene tryptophan hydroxylase 2 (TPH2) in the brain at a vitamin D response element (VDRE) and represses the transcription of TPH1 in tissues outside the blood-brain barrier at a distinct VDRE. The proposed mechanism explains 4 major characteristics associated with autism: the low concentrations of serotonin in the brain and its elevated concentrations in tissues outside the blood-brain barrier; the low concentrations of the vitamin D hormone precursor 25-hydroxyvitamin D [25(OH)D₃]; the high male prevalence of autism; and the presence of maternal antibodies against fetal brain tissue. Two peptide hormones, oxytocin and vasopressin, are also associated with autism and genes encoding the oxytocin-neurophysin I preproprotein, the oxytocin receptor, and the arginine vasopressin receptor contain VDREs for activation. Supplementation with vitamin D and tryptophan is a practical and affordable solution to help prevent autism and possibly ameliorate some symptoms of the disorder.—Patrick, R. P., Ames, B. N. Vitamin D hormone regulates serotonin synthesis. Part 1: relevance for autism

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