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Environmental, personal, and genetic determinants of response to vitamin D supplementation in older adults.

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Abstract

CONTEXT AND OBJECTIVE: Suboptimal vitamin D status can be corrected by vitamin D supplementation, but individual responses to supplementation vary. We aimed to examine genetic and nongenetic determinants of change in serum 25-hydroxyvitamin D (25(OH)D) after supplementation.

DESIGN AND PARTICIPANTS: We used data from a pilot randomized controlled trial in which 644 adults aged 60 to 84 years were randomly assigned to monthly doses of placebo, 30 000 IU, or 60 000 IU vitamin D3 for 12 months. Baseline characteristics were obtained from a self-administered questionnaire. Eighty-eight single-nucleotide polymorphisms (SNPs) in 41 candidate genes were genotyped using Sequenom MassArray technology. Serum 25(OH)D levels before and after the intervention were measured using the Diasorin Liaison platform immunoassay. We used linear regression models to examine associations between genetic and nongenetic factors and change in serum 25(OH)D levels.

RESULTS: Supplement dose and baseline 25(OH)D level explained 24% of the variability in response to supplementation. Body mass index, self-reported health status, and ambient UV radiation made a small additional contribution. SNPs in CYP2R1, IRF4, MC1R, CYP27B1, VDR, TYRP1, MCM6, and HERC2 were associated with change in 25(OH)D level, although only CYP2R1 was significant after adjustment for multiple testing. Models including SNPs explained a similar proportion of variability in response to supplementation as models that included personal and environmental factors.

CONCLUSION: Stepwise regression analyses suggest that genetic variability may be associated with response to supplementation, perhaps suggesting that some people might need higher doses to reach optimal 25(OH)D levels or that there is variability in the physiologically normal level of 25(OH)D.

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