

The Pharmacokinetics Difference between 10 μ g and 15 μ g Daily Vitamin D Doses

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Abstract

Aim The reference nutrient intake for vitamin D in people aged ≥ 4 years is 10 μ g/day (400 IU/day) in the UK, but the recommended daily allowance is 15 μ g/day (600 IU/day) for people aged 1-70 years in the US. Here, we aim to compare the 25-hydroxyvitamin D3 (25(OH)D3) serum concentration profiles between the two doses. **Methods** With adult trial data, we constructed a physiologically based pharmacokinetics (PBPK) model of serum concentrations of vitamin D3 and 25(OH)D3 using nonlinear mixed effects (NLME) modelling. We used this model to forecast the mean, 5% and 95% percentiles for serum 25(OH)D3 concentrations. **Results** Our final model uses bodyweight to adjust volume of each compartment and maximum clearance of 25(OH)D. No other covariate was identified. The model accurately predicted data from trials of a broad range of dose regimens. We simulated subjects of the average UK male and female weights with baseline 25(OH)D < 25 nmol/L. Simulation suggests circulating 25(OH)D concentrations in >5% of men and women taking 10 μ g/day for a year might fail to reach 50 nmol/L, while those on 15 μ g/day were predicted to attain this threshold. **Conclusion** The two doses generate significant difference in serum 25(OH)D3 concentrations. This needs to be considered for choosing the right dose for the public health guideline.

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