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The effect on habitual dietary vitamin D intake of changing to a plant-based diet

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The number of people following a plant-based (PB) diet has increased in recent years. This has led to concerns regarding vitamin D intake, as natural dietary sources of vitamin D are primarily animal based[(1)] and cross-sectional studies have reported lower intakes amongst vegetarians and vegans[(2)]. Some PB foods, primarily dairy alternatives, are now fortified with vitamin D. Whilst vitamin D is synthesised in the skin following exposure to UV light, this does not happen in the autumn and winter months in areas of northern latitude (such as the UK). Hence, dietary supply of vitamin D becomes particularly important. This study aimed to investigate whether it is possible to maintain dietary vitamin D intake when transitioning to a PB diet, through careful choice of PB alternatives.

A subset of 4-day diet diaries, from 81 women (72 Caucasian and 9 South Asian, mean age 52 ± 12y) living in South East England, was randomly selected from those collected for the D-FINES study (Vitamin **D**, **F**ood **I**ntake, **N**utrition and **E**xposure to **S**unlight in Southern England, 2006–2007; FSA funded Project N05064, NHS REC 06/Q1909/1)[(3)] and analysed for vitamin D intake. No subjects followed an entirely PB diet at baseline. Data modelling was carried out to substitute animal-based foods with equivalent amounts of PB alternatives. For dairy products, the equivalent fortified PB alternatives were chosen. Meat, fish and eggs were replaced with equivalent amounts of protein from PB sources, such as lentils and tofu, as no fortified direct alternatives were found. The diaries were then re-analysed. Pre- and post-substitution intakes were compared by paired *t* test, and ethnic groups by independent *t* test.

There were no differences in Vitamin D intake between ethnicities either at baseline ($p = 0.087$) or post-substitution ($p = 0.361$). Vitamin D intake increased in the South Asian group post-substitution (from 2.4 ± 1.3 to 4.3 ± 1.8 μg/day, $p = 0.002$), with no change observed in the Caucasian group (3.6 ± 2.0 to 3.7 ± 1.8 μg/day, $p = 0.660$). There was no difference between vitamin D intake pre- and post-substitution overall (3.5 ± 2.0 and 3.8 ± 1.8 μg/day respectively, $p = 0.222$). Twenty cases decreased by ≥1 μg/day, all in the Caucasian group, with the largest decrease being from 9.6 to 2.2 μg/day.

This study demonstrates that it is possible to move to a PB diet, whilst maintaining existing dietary patterns, without a reduction in vitamin D intake, but it is largely dependent on dairy intake in the original diet, as no meat/fish substitutes in the UK are currently fortified. It also requires care when choosing PB dairy substitutions as many, including organic options, are not fortified. Mean daily intakes, both pre- and post-substitution, were substantially below the recommended intake of 10 μg/day[(4)], suggesting that supplementation may be necessary, particularly during winter months.

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