Multiple nutrient insufficiencies—hypovitaminosis D and C in young adult New Zealand males

Vitamins D and C are essential micronutrients with a number of important functions in the body.\(^1,2\) Vitamin D deficiency is particularly common in New Zealand, especially during the winter months.\(^3,4\)

We recently carried out a study in >50 young adult males (aged 18–35) measuring both their vitamins D and C status. Their mean serum 25-hydroxy vitamin D3 concentration was 47±21 nmol/l.

Overall, 62% of the young males had suboptimal vitamin D levels (<50 nmol/l), and 13% were moderately to severely deficient (<25 nmol/l). Of note, nearly 20% of the males had suboptimal levels of both vitamins D and C (<28 µmol/l vitamin C). This latter observation could indicate either an \textit{in vivo} association between vitamins D and C status or independent multiple nutrient insufficiencies.

The active form of vitamin D is synthesised from vitamin D3 via two hydroxylation steps to sequentially produce 25-hydroxy vitamin D3 and the bioactive 1,25-dihydroxy vitamin D3.\(^5\) Although vitamin C is a cofactor for a number of biosynthetic and regulatory enzymes which form hydroxyl groups on specific amino acids and proteins,\(^6\) it does not appear to act as a cofactor for the cytochrome P450 hydroxylases involved in vitamin D synthesis. However, it is possible that vitamin C may affect the level of cytochrome P450 gene expression,\(^7\) thus a positive association between vitamins D and C status may be expected.

In our study we observed only a very weak positive correlation between the subjects’ plasma vitamin C and serum 25-hydroxy vitamin D3 levels (R=116, P=0.246, n=101). Furthermore, only small (~5 nmol/l) non-significant increases in vitamin D levels were observed in the subjects following 6 weeks supplementation with 50 or 200 mg/d vitamin C (supplied as tablet or kiwifruit).

Another clinical trial supplementing ~30 critically ill patients with 1 g/d vitamin C also found no effect on their plasma 25-hydroxy vitamin D levels, i.e. they remained at ~50 nmol/l.\(^8\) In addition, a recent observational study carried out in ~1000 men and women found no association between circulating 25-hydroxy vitamin D and tertials of vitamin C.\(^9\)

Thus, there appears to be no discernible \textit{in vivo} association between vitamins D and C. It should be noted, however, that it is unknown whether the measurement of 25-hydroxy vitamin D3 levels is an accurate estimate of the levels of the bioactive 1,25-dihydroxy vitamin D3.

Overall, the hypovitaminosis D and C observed in our study participants is likely due to dietary and sunlight insufficiency. The implications of having both hypovitaminosis D and C are unknown, but it is likely to potentiate conditions which have deficiencies of both these vitamins in common.\(^1,2\)

As such, it is critical that young people are appropriately educated with regard to adequate dietary intakes of high vitamin C containing fruit and vegetables and, since most adults are
unlikely to obtain more than 5–10% of their vitamin D requirement from dietary sources,\textsuperscript{10} appropriate exposure to sunshine.

Appropriate nutrition in the younger population will likely prevent much onset of chronic diseases in later life.

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