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**VITAMIN D STATUS: DETERMINANTS,
OPTIMAL LEVELS, AND
SUPPLEMENTATION**

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**A thesis presented in fulfilment of the requirements for the degree of Doctor of Philosophy
at the University of Auckland, 2009.**

ABSTRACT

Vitamin D deficiency, indicated by the circulating metabolite 25-hydroxyvitamin D [25(OH)D], can lead to osteomalacia, increased fracture risk in the elderly, and may increase the risk of other medical conditions. However, optimal levels of 25(OH)D are uncertain, with some cross-sectional studies suggesting optimal levels of >75 nmol/L. This thesis assessed optimal levels of vitamin D and strategies for its supplementation.

In a trial of high-dose vitamin D₃ regimens in frail elderly, data suggest that 25(OH)D levels of 40 – 50 nmol/L may be sufficient. In the same study, calcium intake appeared to modify the relationship between 25(OH)D and PTH and subsequent estimates of optimal 25(OH)D based on these data may be lower when calcium intake is >1552 mg/day. It was also noted that large loading doses (500 000 IU) rapidly normalise 25(OH)D levels, whilst monthly 50 000 IU doses were also effective but took 3 – 5 months to reach plateau.

An analysis of adverse events recorded for a 5-year calcium trial in postmenopausal women showed that whilst season-adjusted baseline 25(OH)D levels <50 nmol/L increased the risk of stroke and a composite event (stroke, myocardial infarction or sudden death) compared to levels ≥ 50 nmol/L, these effects disappeared when adjustment for baseline confounders was made.

Data from two studies indicate that vitamin D deficiency or insufficiency is prevalent amongst urban Chinese women of childbearing age, and that in the Auckland region young Maori and Pacific women and children and adults of Middle Eastern, Southern Asian and African ethnicity are over-represented in the group of people identified as vitamin D deficient or insufficient. In a final study of middle-aged and older New Zealand men, more than half (55%) reported use of dietary supplements which may make a contribution to vitamin D status.

In conclusion, data here suggest that 25(OH)D levels of 50 nmol/L may be satisfactory for bone health, that large loading doses of vitamin D₃ are safe with respect to hypercalcaemia and effective, and that a number of non-elderly populations are at high risk of having insufficient vitamin D status.

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My own contribution to Chapter Six entailed formulating an analysis plan to address the research questions described therein, and then writing this chapter.

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