

Optimisation of Vitamin D Status for Enhanced Immuno-protection against Covid-19

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Healthcare Professionals Summary

Background

Vitamin D can be made in our skin, taken in the diet or derived from supplements. Historically, humans received most of their vitamin D from sunshine exposure during the Summer months, with diet contributing only very modest amounts in relation to our overall needs. As our sunlight exposure has declined over recent decades, we have become increasingly reliant on inadequate dietary sources to meet our physiological demands for vitamin D¹.

Consequently, most people cannot now meet their vitamin D requirements from diet alone without taking supplements^{2,3}.

Prevalence of Vitamin D Deficiency

It has been shown that many people in Ireland, particularly in late Winter and early Spring, have low serum levels of 25-hydroxy vitamin D (25(OH)D)⁴, the metabolite used to assess vitamin D status. While many experts contend that optimal serum levels are those above 75-80nmol/l⁵, there is general agreement that levels below 50nmol/l constitute deficiency, and that levels less than 30nmol/l signify severe deficiency⁶.

Older adults are much more likely to have low serum 25(OH) D than younger adults. In Ireland, the National Adults Nutrition Survey (NANS) showed that 36% of adults aged 50-64 years, and 44% of adults aged 65-84 years had serum vitamin D levels less than 50nmol/l on a year-round basis, while the prevalence of deficiency in those age groups rose to 55% and 48% respectively in winter⁴. It has further been shown that hospital inpatients and nursing home residents in Ireland have serum vitamin D levels which are even lower than those of community-dwelling older adults.⁷

Other groups who are likely to have low serum 25(OH)D levels include:

- those with darker skin
- those who avoid sun exposure during Summer
- vegetarians and vegans
- those who are overweight or obese
- smokers

Vitamin D and Respiratory Infection

Epidemiological studies, including several meta-analyses, have shown that people with low vitamin D levels have a higher risk of acute respiratory tract infection and community-acquired pneumonia^{8,9}.

While these data do not necessarily infer causality, multiple molecular mechanisms have been identified by which vitamin D deficiency impairs resistance to viral respiratory tract infection^{10,11}.

There are also a significant number of studies, including several meta-analyses, which have indicated that vitamin D supplementation may reduce the likelihood of acute respiratory tract infection, and decrease its severity and duration where such infection does occur^{12,13}.

These respiratory tract infections may include Covid-19.

Proposed Protective Mechanisms against Covid-19

In this regard, vitamin D supplementation has been shown to suppress CD26¹⁴, a cell surface receptor which is thought to facilitate entry of the Covid-19 virus into the host cell¹⁵.

There is also good evidence that enhanced vitamin D status may protect against the critical immunological sequelae which are thought to elicit poorer clinical outcome in Covid-19 infection. These include prolonged interferon-gamma response¹¹, and persistent interleukin 6 elevation, a negative prognostic indicator in acutely-ill pneumonia patients¹⁶, including those with Covid-19.

Supplementation Guidelines

The Food Safety Authority of Ireland (FSAI), the European Food Safety Authority (EFSA) and many other international agencies already recommend that both adults and children supplement with vitamin D. While the FSAI recommends a supplement of 10 micrograms per day for older adults³, most countries in Europe now recommend 15-20 micrograms per day for these older age groups⁶. In the US, the Institute of Medicine (IoM) has suggested an oral intake of 20 micrograms per day for those aged 70 years and over¹⁷, while the Endocrine Society has proposed an intake of 37.5-50 micrograms per day for older adults to optimise their serum 25(OH)D levels⁵.

Research has indicated that Irish adults require ~25-30 micrograms of vitamin D per day to reliably maintain their serum levels above 50nmol/l on a year round basis^{18,19}, while numerous studies have also demonstrated the safety of supplementing with vitamin D at doses of 20-50 micrograms per day (800-2000 iu per day)²⁰⁻²². The latter finding is perhaps unsurprising as this is an oral dose which is lower than the amount of vitamin D typically synthesised by skin exposure to sunshine on a Summer's day^{23,24}.

Conclusions and Recommendations

For those with serum levels less than 50nmol/l, each additional microgram of intake per day from supplements elicits a serum 25(OH)D increase of about 1nmol/l²⁵. This implies that supplementing at 20-50 micrograms per day will raise serum 25(OH)D to the levels above 50nmol/l which have been associated with reduced risk of viral respiratory tract infection.

It is proposed that such vitamin D supplementation may enhance resistance to Covid-19 infection or limit its damaging immunological sequelae and improve clinical prognosis in those who do become infected.

Consequently, all older adults, hospital inpatients and nursing home residents should be supplemented with a *minimum* 20 microgram daily dose of vitamin D. This guidance should also be prioritised in other vulnerable groups including those with diabetes mellitus or compromised immune function, individuals with limited habitual sun exposure, those with darker skin, vegans, vegetarians, smokers and those who are overweight or obese. It is further recommended that given their potential occupational exposure, this advice be urgently promoted to all healthcare professionals, and ultimately extended to the remainder of the adult population to mitigate their risk of Covid-19 infection.

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