

Low vitamin D in Victoria

Key health messages for doctors, nurses and allied health

health

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Vitamin D is essential for musculoskeletal health in all age groups and is likely to be important for other aspects of health.

Low vitamin D is an important public health issue and is common in Australia. Adequate levels for vitamin D are > 50 nmol/L in adults and children¹.

Classification of Vitamin D levels in adults and children

Adequate	> 50 nmol/L
Mild deficiency	26–50
Moderate deficiency	12.5–25
Severe deficiency	< 12.5

Appropriate dosages of vitamin D¹ supplements have been shown to reduce falls and fractures in older people.

Very low vitamin D causes bone and muscle pain and poor bone mineralization. This can result in *rickets* in children and *osteomalacia* in adults. Low vitamin D is also a contributor to *osteopaenia* and *osteoporosis*.

More recently low vitamin D has been linked to multiple sclerosis, diabetes (type 1 and type 2), various types

¹ Vitamin D is a generic term applied to the two molecules cholecalciferol and ergocalciferol. Cholecalciferol (vitamin D₃) is formed through the action of UVB radiation on 7-dehydrocholesterol in the skin and is also the preferred supplement. Ergocalciferol (vitamin D₂) is produced by UVB radiation of the plant steroid ergosterol, and is used in the production of some vitamin D supplements.

of cancers (particularly colon cancer), heart disease, all cause mortality including cardiovascular mortality, worse outcomes in stroke, altered immunity and other auto-immune diseases; however, more research is needed.

The major source of vitamin D is via exposure to sun's ultraviolet-B (UVB) radiation.

Most Australians obtain less than 10 per cent of their daily vitamin D requirements from diet. Only a few foods naturally contain vitamin D (for example, some fish, eggs). Margarine and some types of milk have added vitamin D.

The daily requirement for vitamin D is 400 IU in children, 600 IU in adults aged 70 years or under and 800 IU in adults 70 years or over.

Groups at risk of low vitamin D

- **People with naturally very dark skin.** The pigment in skin (melanin) acts as a filter to UVB radiation and reduces synthesis of vitamin D.
- **People with little or no sun exposure.** This group includes:
 - older adults: frail, medium to long-term residential care or aged care, housebound
 - people who wear concealing clothing for religious and cultural purposes
 - people who deliberately avoid sun exposure for cosmetic or health reasons



- people at high risk of skin cancers
- people hospitalised or institutionalised long-term
- people with a disability or chronic disease
- occupations such as office workers, taxi drivers, factory workers and night-shift workers.
- **People with conditions or medications affecting vitamin D metabolism.** For example, obesity, end-stage liver disease, renal disease, drugs that increase degradation such as rifampicin/anticonvulsants, fat malabsorption syndromes including cystic fibrosis, coeliac disease, inflammatory bowel disease.
- **Breast-fed babies with other risk factors for low vitamin D.** Breast milk contains little vitamin D. Infants depend on maternal stores initially and are at risk of low vitamin D if their mother has low vitamin D and/or if they have naturally very dark skin.

Sun exposure and vitamin D

Most Victorians with fair to olive skin get enough vitamin D through incidental sun exposure in September–April when UV levels are high, during normal daily outside activities.

Table 1: Safe sun exposure in vitamin D

	Fair to olive skin (Fitzpatrick skin types I–IV)	Naturally very dark skin (Fitzpatrick skin types V–VI: rarely or never burns)
	Higher risk of skin cancer	Higher risk of low vitamin D
From September to April – when average UV levels are 3 and above	A few minutes of sun exposure to the face, arms and hands (or equivalent area of skin) mid-morning or mid-afternoon most days of the week.	3–6 times the exposure level of fair to olive skin. It may not be possible to maintain vitamin D levels and supplementation may be required.
	A combination of sun protection measures is needed during these months.	It is not really necessary for people with this skin type to wear sunscreen but they should still wear sunglasses to protect the eyes.
From May to August – when average UV levels are below 3	Approximately 2–3 hours of sun exposure to the face, arms and hands (or equivalent area of skin) spread across the week.	3–6 times the exposure level of fair to olive skin. It may not be possible to maintain vitamin D levels and supplementation may be required.
	Sun protection is not needed unless in alpine regions, outside for extended periods or near highly reflective surfaces such as snow and water.	Sun protection (hat or sunglasses only) is usually not required unless in alpine regions or near highly reflective surfaces such as snow.

25 (OH) vitamin D testing and treatment

- **Test adults and children with risk factors for low vitamin D.** Include pregnant or lactating women with risk factors and their children.
- **Treat if vitamin D levels < 50 nmol/L.** Vitamin D supplements can be low dose (given daily) or high dose form (given monthly or less often). High dose vitamin D is not used during pregnancy or lactation, or in very young children. High dose vitamin D is becoming more widely available. For information on authorized clinics/pharmacies and dosing please refer to <http://www.health.vic.gov.au/vitamind>
- **Cod liver oil capsules are not suitable for vitamin D replacement,** as they typically contain 60–85 IU of vitamin D per capsule but 8–10 times more vitamin A per capsule. The number of capsules required to provide adequate daily vitamin D would exceed the recommended daily intake for vitamin A and may lead to toxicity (including fractures).

- **It is not recommended to prescribe a single dose of more than 50,000 IU vitamin D for adults.** Contraindications to high dose vitamin D include hypercalcaemia and kidney disease. There is inadequate evidence to support the use of high dose vitamin D during pregnancy or lactation, or in children younger than three months old.
- **Breast fed babies with risk factors for low vitamin D should be supplemented** with 400 IU vitamin D daily (for example, in infant multivitamin drops) from birth until at least 12 months.

- **People with low vitamin D need adequate dietary calcium** and may need supplements if their dietary calcium intake is poor.
- **Low vitamin D is a long-term problem.** Once low vitamin D is treated the aim is to maintain normal vitamin D levels. People with risk factors for low vitamin D should have their levels checked every year once normal levels are achieved, and may need lifelong supplements.
- **Information on follow-up** should be incorporated into GP software management programs to ensure recall/reminders occur.

Table 2: Adult dosing schedule

Vitamin D level nmol/L ¹	ADULT alternative dosing regimens		Testing regimen ⁴
	High dose regimen vitamin D3 ^{2,3}	Daily dose vitamin D3 ³	
26–50	50,000 IU/month	1,000–2,000 IU/day	Re-check vitamin D level at 3 months then every 12 months
12.5–25	50,000 IU/month	1,000–2,000 IU/day	
< 12.5	50,000 IU/month	1,000–2,000 IU/day	

1 Seasonal variation occurs with vitamin D, the lowest levels being in late winter and early spring.

2 Not readily available for use in Australia.

3 Calcium intake of 1,000–1,300 mg per day is also recommended.

4 Target level for treatment = > 50 nmol/L

For pregnant women with levels 25–50 nmol/L, commence 1,000 IU daily. Pregnant women with levels < 25 nmol/L should commence 2,000 IU daily, repeat levels at 28 weeks gestation.

For breastfeeding women, aim for normal levels during pregnancy, then continue on 1,000 IU daily during breastfeeding. Consider neonatal supplements in babies with risk factors for low vitamin D.

Table 3: Paediatric dosing schedule

Vitamin D level (nmol/L)	Treatment vitamin D3	Maintenance/prevention in children with ongoing risk factors	Testing regimen
Neonate – young infant (age < 3 months)			
25–50	400 IU daily	400 IU daily	Recheck vitamin D, Ca, PO ₄ , and ALP at 1 month, and ALP annually.
< 25	1,000 IU daily for 3 months		
Infant (age 3–12 months)			
25–50	400 IU daily for 3 months	400 IU daily	Recheck vitamin D, Ca, PO ₄ , and ALP at 3 months, then vitamin D and ALP annually. If high dose used, may need re-testing at one month.
< 25	1,000 IU daily for 3 months or 50,000 IU stat and review after 1 month, consider repeating dose		
Children and adolescents (age 1–18 years)			
25–50	1,000–2,000 IU daily for 3 months	400 IU daily or 150,000 IU at the start of Autumn	Recheck vitamin D, Ca, PO ₄ , and ALP at 3 months, then vitamin D and ALP annually.
< 25	1,000–2,000 IU daily for 6 months or 150,000 IU stat and repeat at 6 weeks		

Children with low calcium, low phosphate or clinical rickets require urgent specialist assessment and further investigations.

Acknowledgements

The document is based on information generated from the following resources:

Cancer Council Australia, The Australian and New Zealand Bone and Mineral Society, Osteoporosis Australia and the Australasian College of Dermatologists (2007) *Risks and benefits of sun exposure Position Statement*.

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