Low vitamin D in Victoria

Key health messages for doctors, nurses and allied health

May 2010

Low Vitamin D is an important public health issue and is common in Australia. Optimum levels for vitamin D are > 50–75 nmol/L in adults and > 50 nmol/L in children[1].

Vitamin D is essential for musculoskeletal health in all age groups.

- Vitamin D supplements have been shown to reduce falls and fractures in older people
- 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 a contributor to ***osteoporosis***

More recently low vitamin D has been linked to various types of cancers (particularly colon cancer), heart disease, worse outcome in stroke, altered immunity and auto immune diseases; although more research is needed.

The major source of vitamin D is via exposure to sun's ultraviolet (UV) radiation. Most Australians only obtain 10–25% of their daily vitamin D requirements from diet. Only a few foods naturally contain vitamin D (fish, eggs). Margarine and some types of milk have added vitamin D.

The daily requirement for vitamin D is ≥ 800 IU in adults and 400 IU daily in children with risk factors for low vitamin D.

Groups at risk of low vitamin D

- **People with naturally very dark skin.** The pigment in skin (melanin) acts as a filter to UVB (Ultraviolet B) 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 long-term
  - People with a disability or chronic disease
  - Occupations such as taxi drivers, factory workers, night-shift workers
- **Breast fed babies with other low vitamin D risk factors.** 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

Medications that induce liver enzymes (e.g. anticonvulsants) increase breakdown of vitamin D and reduce vitamin D levels.

1 To convert ng/mL to nmol/L multiply by 2.5; 1 mcg = 40 IU

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Sun exposure and vitamin D

Most Australians with fair to olive skin get enough vitamin D through incidental sun exposure during normal daily outside activities even if they apply sunscreen.

Table 1: Safe sun exposure for vitamin D

In Victoria	**Fair to olive skin** (Fitzpatrick skin types I–IV) Higher risk of skin cancer	**Naturally very dark skin** (Fitzpatrick skin types V–VI: rarely or never burns) 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) before 10am or after 3pm on most days of the week should provide enough vitamin D.	3–6 times the exposure level of fair to olive skin. More sun exposure and supplementation may be required.
	Sun protection is needed during these months.	It is not really necessary for people with this skin type to wear sunscreen but they should still wear a hat.
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) across the week should help maintain vitamin D levels.	3–6 times the exposure level of fair to olive skin. More sun exposure and supplementation may be required.
	Sun protection is not needed unless you are in alpine regions or near highly reflective surfaces such as snow and water.	Sun protection is not needed unless you are in alpine regions or near highly reflective surfaces such as snow and water.

Vitamin D screening and treatment

- **Screen people with risk factors for low vitamin D** including pregnant women and children. Check serum 25(OH)D, Ca, PO_4, ALP and renal function
- **Treat if vitamin D levels <50 nmol/L in children or <50–75 nmol/L in adults.** Vitamin D supplements can be low dose (given daily) or high dose form (given monthly or less often). High dose vitamin D is becoming more widely available. Currently a high dose tablet (Cal D Forte 50,000 IU) is being trialled in Melbourne. This is an unregistered product. For information on authorized clinics/ pharmacies and dosing please refer to Osteoporosis Australia website (http://www.osteoporosis.org.au)
- 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 pregnancy (inadequate evidence), hypercalcaemia and complicated renal disease
- **Breast fed babies with risk factors for low vitamin D should be supplemented with 400 IU vitamin D daily** (e.g. in infant multivitamin drops) from birth until 12 months
- **People with low vitamin D need adequate dietary calcium** and may need supplements if their dietary 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 and may need lifelong supplements
- **Information on follow-up should be incorporated into GP software management** programs to ensure recall/reminders occur.

Table 2: Available oral vitamin D formulations (at June 2008)

Formulation	Strength	Cost (approximate)	Cost per month
HIGH DOSE			
Cal.D.Forte (D_3)	50,000 IU tablets	$25/12	$2.00
RCH Vitamin D_3 in olive oil	100,000 IU/ml	$13/200 ml	a few cents
D-3-50	50,000 IU capsules	$1/per capsule	$1.00
DAILY DOSE			
Blackmores D_3	1,000 IU capsules	$12/60	$6.00
Blooms D_3	1,000 IU capsules	$10/60	$5.00
OsteVit-D (D_3)	1,000 IU tablets	$14/90 $35/250	$4.60 $4.20
Ostelin (D_3)	1,000 IU capsules	$15/60 $49/250	$7.50 $5.90
Penta-vite (D_3)	400 IU/0.45 ml syrup	$6/20 ml syrup $14/50 ml syrup 0.45 ml/d = 13.5 ml/m	$4.00 $3.80

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 amount of capsules required to provide adequate daily vitamin D would exceed the RDI for Vitamin A and may lead to toxicity.

Table 3: Adult Dosing Schedule

	High Dose Therapy[1]		OR Conventional Therapy	
ADULT Vitamin D level nmol/L[2]	**High dosage vitamin D required?**	**ADULT Loading dose recommended?**	**ADULT Daily Dose vitamin D[3]**	**ADULT Testing regimen[4]**
50–75	NO	NO	1000 IU per day recommended in patients with established risk factors	Recheck vitamin D level at 3 mths then every 12 mths
25–50	YES 50,000 IU/mth	NO	1000–2000 IU/day	Recheck vitamin D level at 3 mths then every 12 mths
12.5–25	YES 50,000 IU/mth	NO	1000–2000 IU/day	Recheck vitamin D level at 3 mths then every 12 mths
<12.5	YES 50,000 IU/mth	NO	1000–2000 IU/day	Recheck vitamin D level at 3 mths then every 12 mths

1 Not readily available for use in Australia.

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

3 Calcium intake of 1200 mg per day is also recommended.
Pregnant women at risk of low vitamin D: recommend 1000 IU/day.

4 Target level for treatment = 75 nmol/L

Table 4: Paediatric Dosing Schedule

Neonate–young infant (age < 3 months)

Vit D level nmol/L	High dose vitamin D required?	Treatment	Maintenance	Testing regimen
MILD 25–50	NO	400 IU daily	400 IU daily	Recheck vitamin D Ca, PO_4 and ALP, at 3 months then Vit D and ALP annually
MOD 12.5–25 OR SEVERE <12.5	NO	1,000 IU daily for 3 months		

Infant (age 4–12 months)

Vit D level nmol/L	High dose vitamin D required?	Treatment	Maintenance	Testing regimen
MILD 25–50	MAY BE USED	400 IU daily for 3 months[5] or 50,000 IU stat	400 IU daily	Recheck vitamin D Ca, PO_4 and ALP, at 3 months then Vit D and ALP annually
MOD 12.5–25 OR SEVERE <12.5	MAY BE USED	1,000 IU daily for 3 months or 100,000 IU stat		

Children and adolescents (age 1–18 years)

Vit D level nmol/L	High dose vitamin D required?	Treatment	Maintenance	Testing regimen
MILD 25–50	MAY BE USED	1,000–2,000 IU daily for 3 months or 150,000 IU stat	400 IU daily or 150,000 IU at start of autumn[6]	Recheck vitamin D Ca, PO_4 and ALP at 3 months then Vit D and ALP annually
MOD 12.5–25 OR SEVERE <12.5	MAY BE USED	1,000–2,000 IU daily for 6 months or 150,000 IU stat and repeat at 6 weeks		

Note: Neonates/infants are at higher risk of hypocalcaemic seizures due to low vitamin D

Urgent specialist referral if

- Abnormal serum calcium (high or low)
- Clinical rickets
- No response after 2 doses vitamin D (high dose regimen)

5 If an infant has low vitamin D levels *despite* daily dosing use the high dose option.

6 Once treatment has restored Vitamin D levels, aim to maintain Vitamin D > 50 nmol/L; some children may require dosing more frequently to maintain Vitamin D levels. Review Vitamin D level 3 months after initial treatment; further dosing may be required.

Acknowledgement

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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