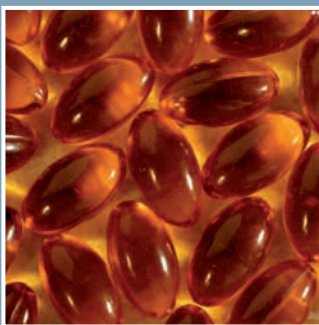
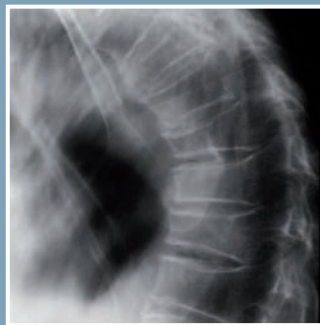
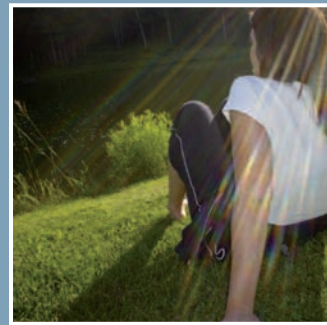




osteoporosis australia

CALCIUM, VITAMIN D & OSTEOPOROSIS



A Guide for GPs

2nd edition, 2008

KEY POINTS

- 1 in 2 women and 1 in 3 men over 60 years in Australia will suffer an osteoporotic fracture.
- Approximately half of all patients with a fracture due to osteoporosis will go on to have another, the so called 'cascade effect'. The risk of new fractures rises exponentially with each sequential fracture.
- Optimum calcium and vitamin D nutrition are key modifiable risk factors for developing osteoporosis, are important in the maintenance of musculoskeletal health, and can have broader effects on health in general.
- More than half of Australian adults do not reach their recommended daily intake of calcium.
- 1000mg dietary intake of calcium a day is recommended for all adults and 1300mg is recommended for women aged over 50 years and men aged over 70 years.
- Vitamin D deficiency is an emerging public health problem in Australia and can lead to bone pain and muscle weakness. It also increases the risk of osteoporosis, falls and fractures.
- Incidental exposure to sunlight, if practical, is the best source of vitamin D.
- Foods in general contain very little vitamin D unless they have been fortified.
- People who are at risk of vitamin D deficiency may need vitamin D supplementation.
- Groups most at risk of vitamin D deficiency are:
 - the elderly;
 - people who are housebound or in residential care;
 - naturally dark-skinned people;
 - those who cover their skin for cultural or religious reasons; and
 - babies of vitamin D deficient mothers.

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1. INTRODUCTION

WHAT IS OSTEOPOROSIS?

Osteoporosis is a condition where the bones become fragile and brittle and fracture more easily than normal bone. Even a minor bump or fall can cause a serious fracture of a bone affected by osteoporosis. In Australia, half of all women and one-third of men aged over 60 will have a fracture due to osteoporosis.

Osteoporosis and fractures are major causes of injury, long-term disability and even death in older Australians. Over 90% of hip fractures are osteoporosis related and more than 95% of patients require surgery to repair their hip fracture. Hip fractures reduce life expectancy. One-fifth of people who suffer a hip fracture will die within 6 to 12 months; of those who don't die, one-half will not be able to walk without assistance and between 15-25% require full-time nursing care.

Osteoporosis is often called a 'silent disease' because there are usually no signs or symptoms until a fracture occurs.

Any bone can be affected by osteoporosis but the most common fracture sites are bones in the hip, spine, wrist, ribs, pelvis and upper arm.

CURRENT STATISTICS

- 50% of women and 33% of men over the age of 60 will develop an osteoporotic fracture.
- Of all diagnosed fractures; 46% are vertebral spine, 16% hip and 16% wrist.

OSTEOPOROSIS: THE UNDERDIAGNOSED DISEASE

- More than half of all spinal fractures do not come to medical attention (although nearly all are associated with disability and pain).
- In Australia, it is estimated that up to 80% of people with osteoporotic fractures remain undiagnosed and untreated, even after coming to medical attention for their fracture.

THE FRACTURE CASCADE

Irrespective of fracture site, adults who sustain a fracture are at substantially greater (2-4 fold) risk of sustaining another fracture of a different type. This is called 'the cascade effect', as the risk of additional fractures increases exponentially with each new fracture. For example, women who have suffered a vertebral fracture are 4 times more likely to suffer a subsequent vertebral fracture within 12 months.

CALCIUM AND VITAMIN D

- Optimal calcium and vitamin D levels are important in the maintenance of musculoskeletal health but may also have broader effects on wellbeing in general.
- Overall, the average dietary intake of calcium in Australia is below the recommended daily intake and needs to be increased, particularly in young women.
- Vitamin D deficiency is an emerging public health problem and is surprisingly common, even in a sunny country like Australia.

In Australia, 1 in 2 women and 1 in 3 men over the age of 60 years will have an osteoporotic fracture.

2. CALCIUM AND VITAMIN D – PHYSIOLOGY

CALCIUM

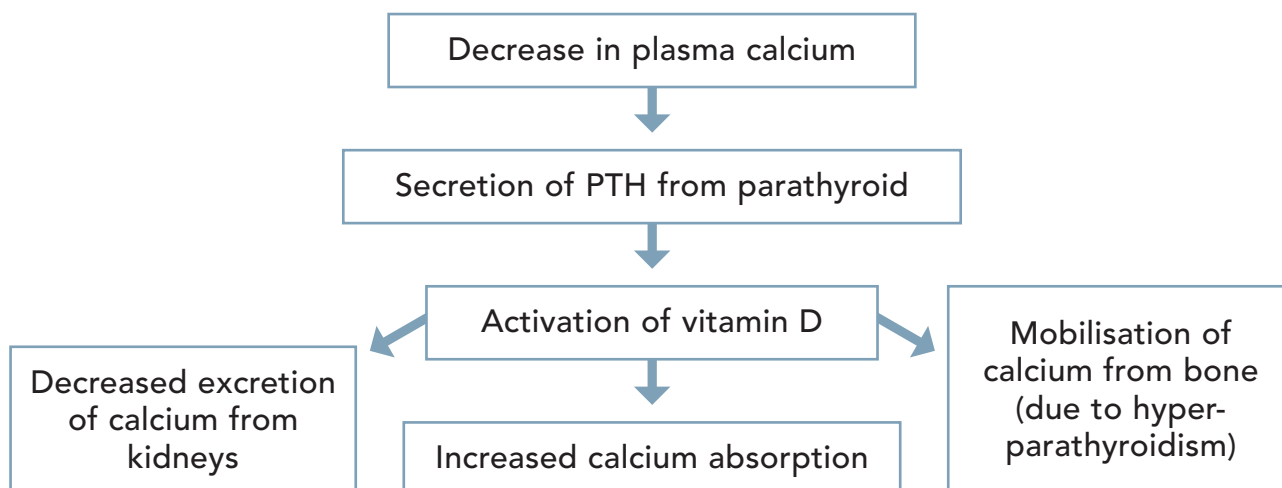
More than half of all Australian adults do not meet the recommended intake of calcium. The efficiency of calcium absorption declines with age, so over time, people require higher amounts of calcium.

The nutrient reference value (NRV, previously known as the Recommended Daily Intake) is 1000mg calcium per day for most adults. For women aged over 50 years and men aged over 70 years, the NRV is 1300 mg calcium per day.

Calcium is ingested in the diet, with substantial amounts present in only a limited variety of current foods. Bone has a structural requirement for calcium, which is deposited in the form of bone mineral, hydroxyapatite. This gives bone its compressive strength. Bone also acts as a reservoir of calcium, with calcium being released from bone through resorption, as a result of the actions of parathyroid hormone, active vitamin D metabolites and other factors.

Calcium is filtered in the glomerulus of the kidney, with the filtered load depending on blood concentrations. Most (around 98%) is reabsorbed. Parathyroid hormone increases renal calcium conservation. Urinary calcium losses tend to be higher in older individuals and with high protein or sodium intakes.

PHYSIOLOGY OF CALCIUM ABSORPTION



CASE STUDY The following highlights a typical patient with several osteoporotic risk factors:

SUBJECT: 67 year-old, post-menopausal female; slight body build, some visual impairment; taking sedating and antihypertensive medication; smoker, physically inactive, spends a lot of time indoors; low calcium intake; decreased intestinal calcium absorption associated with ageing; creatinine clearance 40 mL/min. **OVERALL:** GREATLY INCREASED FRACTURE RISK

VITAMIN D

Vitamin D is essential for the development and maintenance of bone. It assists calcium absorption from food in the intestine, and ensures the correct renewal and mineralisation of bone tissue.

Vitamin D deficiency in infants and children can cause rickets, which causes bone and muscle weakness and bone deformities.

Adults with low vitamin D are at risk of bone and joint pain, muscle and bone weakness, osteoporotic fractures and falls.

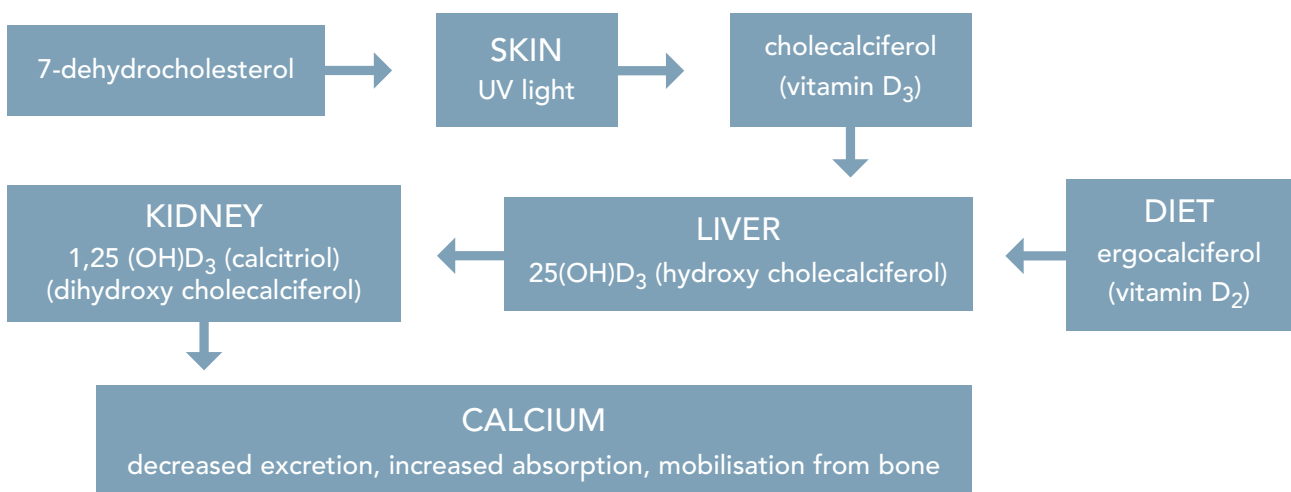
For most Australians, the main source of vitamin D is sunlight exposure, although not all people receive adequate vitamin D from casual exposure to sunlight.

Cholecalciferol (vitamin D₃) is formed in the skin through the action of ultraviolet light on 7-dehydrocholesterol. Vitamin D is also obtained from the diet as ergocalciferol (vitamin D₂), however food sources of vitamin D are limited. It is found in small quantities in a few foods, such as fatty fish (salmon, herring, mackerel), liver, eggs and fortified foods.

MINIMAL ERYTHEMAL DOSE (MED)

- One MED is the amount of sun exposure that produces a faint redness of the skin.
- Exposure of about 15% of body surface (e.g. hands, face and arms) to around one-third of a MED would produce approximately 1000IU (International Units) of vitamin D (25 mcg).
- A person needs to expose their hands, face and arms (or equivalent area of skin) to sunlight for about 6-8 minutes most days in summer to produce adequate amounts of vitamin D.
- In winter, in southern Australia, much longer exposures are needed even at midday to produce adequate amounts of vitamin D (see Table 2).
- People with olive or pigmented skin need longer exposures to sunlight to produce the same amount of vitamin D.
- For moderately fair people, sun exposure should take place just before 10am or after 3pm.

DIAGRAM 1 IMPORTANCE OF VITAMIN D



3. NUTRIENT REFERENCE VALUES

The *Nutrient Reference Value* (NRV) refers to what was previously known as *Recommended Daily Intake* (or RDI). There are some general guidelines for the NRV for both calcium and vitamin D in Australia, however the recommended level varies according to age, life stage, exposure to sunlight and the presence of other diseases.

CALCIUM

- The NRV for adults is **1000mg** of calcium per day. This increases to **1300mg** of calcium per day for women aged over 50 years and men aged over 70 years.
- **It is often difficult for most older people to meet a dietary intake of 1300mg of calcium per day, as many people in this age group only eat small amounts of food and have a low energy intake.**

VITAMIN D

The NRV for adults is at least **400-800IU (10-20 micrograms)** of vitamin D per day but is of limited relevance since most vitamin D comes from sunlight exposure.

4. CALCIUM INTAKE AND RECOMMENDATIONS

RISK FACTORS FOR CALCIUM DEFICIENCY

- Individuals at highest risk of inadequate calcium intake are also at highest risk of osteoporotic fracture due to other risk factors, including:
 - Older age
 - Corticosteroid use
 - Gastrointestinal diseases
 - Social isolation
 - Sex hormone deficiency
- The period of rapid skeletal growth in children is often a time of inadequate calcium intake.

Most currently approved treatments for osteoporosis have been evaluated in studies of patients with adequate vitamin D intake and calcium supplementation.

Recommendations

- Children 5-9 years should aim for 2-3 serves of calcium-rich foods each day to reach a total intake of 800-1000mg/per day.
- Children and adolescents aged 9-18 years should aim for at least 3 serves of calcium-rich foods a day to reach a total intake of 1000-1300mg/day.
- Women and men need at least 1000mg of calcium per day; women aged over 50 and men aged over 70 require at least 1300mg of calcium per day
- Dairy foods are a good source of calcium. Low-fat options are usually available and are preferable for some individuals. In general, 3 serves of dairy products per day will provide sufficient calcium (one serve is equal to 250ml milk, 1 tub yoghurt, 1 slice of cheese).

- A number of calcium-fortified foods can be consumed to achieve adequate calcium intake, especially in those patients who are lactose intolerant, vegetarian or vegan. Examples include calcium-fortified forms of soy milk, orange juice and some breads (check the label).
- Inadequate calcium intake is likely to be deleterious to bone. However, calcium intake over the recommended daily levels is unlikely to achieve any additional bone health benefit. Thus, strategies to increase calcium intake should be focused on those with the lowest calcium intakes and/or highest demands (e.g. during the pubertal growth spurt, pregnancy and lactation, and after menopause).
- Adequate calcium intake (obtained from dietary or supplement sources) is an essential part of osteoporosis management.
- **There is no significant difference in the absorption of calcium from supplements compared with different dietary sources, provided stomach acidification is normal.**

GPs should consider recommending calcium and/or vitamin D supplementation to all people taking osteoporosis medication (with the exception of calcitriol).

TABLE 1 THE CALCIUM CONTENT OF MANY COMMON FOODS

FOOD	STD SERVING SIZE	CALCIUM (MG)	KILOJOULES
Rump Steak (lean)	100g	5	883
Apples	1 medium (156g)	7	323
Lamb Chop (lean)	100g	8	1000
Bread - mixed grain	30g (slice)	15	272
Bread - wholemeal	30g (slice)	16	282
Chicken - roasted no skin	100g	16	783
Broccoli	60g	18	61
Strawberries	1 cup (145g)	19	118
Eggs - boiled	1 large (48g)	21	303
Baked Beans	100g	34	285
Oranges	1 medium (122g)	35	190
Apricots - dried	50g	35	410
Spinach	100g	50	80
Tahini	20g (1 tbsp)	65	520
Soy beans (boiled)	100g	76	540
Custard	100g	100	393
Almonds	50g	110	1235
Ice Cream	100g	133	800
Tofu (calcium set)	100g	150	479
Salmon - tinned, red	100g	220	814
Sardines - canned	100g	380	951
Cheese - mild	40g (piece)	300	676
Cheddar (reduced fat)	40g (2 slices)	323	548
Cheddar Cheese	40g (2 slices)	327	575
Yogurt - Plain	200g (std tub)	390	716
Milk - Reduced Fat (1%)	250ml (std glass)	352	525
Milk - Regular	250ml (std glass)	285	698
Milk - Skim	250ml (std glass)	320	377
Milk - Calcium Fortified	250ml (std glass)	353	523

TIPS FOR INCREASING CALCIUM INTAKE FOR YOUR PATIENTS

Advise people to:

- Include calcium-rich foods in their diet, especially low-fat dairy products such as milk, cheese and yoghurt.
- Add skim milk powder to soups, puddings, smoothies, milkshakes and sauces.
- Look for new products in the supermarket chilled sections that can add calcium to the diet, eg dairy desserts, creamed rice, flavoured milks.
- Eat broccoli, beans, almonds, tinned salmon and sardines as regular features of their diet.
- Choose foods with added calcium where available: many breakfast juices, wholegrain cereals and breads are now fortified.
- Drink calcium-fortified soy milk if they use this milk instead of cow's milk (soy milk ordinarily contains little calcium unless fortified).

CALCIUM SUPPLEMENTATION

- The effect of calcium supplementation on bone health is modest, as shown by increases in bone density and reductions in excessive bone turnover. The relative risk reduction for osteoporotic fracture is likely to be 10-20% at best, and thus is difficult to detect.
- There is no significant difference in the absorption of calcium from supplements compared with different dietary sources (excluding foods rich in phytate or oxalate).

Recommendations

- Adequate calcium intake should be encouraged in all people, particularly those at high risk of osteoporotic fractures.
- A higher calcium intake may be encouraged in the general population via dietary sources, or via supplements if increased dietary calcium is not possible.
- **Calcium carbonate requires gastric acidity for optimal absorption, therefore, it should be taken with meals.** Supplements containing calcium in other forms, such as citrate, or calcium in food sources, are not dependent on gastric acidity.
- Proton pump inhibitors may reduce calcium absorption, particularly calcium carbonate. However, they do not affect calcium absorption from dairy products.

It is critical that calcium supplements and oral bisphosphonates are taken at least two hours apart, as calcium binds with these medications and prevents their absorption.

OTHER BENEFITS AND CONSIDERATIONS

- In addition to calcium, dairy foods have the advantages of providing protein and other micronutrients that are also important for general health, particularly in the frail elderly.
- Higher calcium intakes may be beneficial in preventing colonic cancer, hypertension and in improving lipid profiles.
- Calcium supplementation is associated with renal calculus disease in patients with high baseline dietary calcium intakes. Calcium supplements may cause constipation.
- Calcium supplementation does not have major effects on the absorption of other micronutrients.

BARRIERS TO ADEQUATE CALCIUM NUTRITION

- Increasing dietary calcium intake can be difficult for older people who only eat small amounts of food each day.
- Adherence to calcium supplementation as long-term therapy is poor, which may be partly due to associated digestive problems, constipation and the cost of the product.

5. VITAMIN D INTAKE AND RECOMMENDATIONS

OPTIMUM LEVELS OF VITAMIN D

- The daily vitamin D requirement is at least 400-800 IU (10-20 micrograms) but likely to be higher (800-2000 IU [20-50 micrograms]) in people with limited sun exposure.
- Adequate vitamin D intake is particularly important for pregnant women at risk of vitamin D deficiency, in particular those with pigmented skin or those who, for cultural reasons, practise veiling and cover most of their bodies. This is because there can be long-term effects associated with foetal vitamin D deficiency. Infants who are breastfed by women with limited vitamin D exposure are also at risk.

MAJOR RISK FACTORS FOR VITAMIN D DEFICIENCY

- Limited sun exposure - including elderly age and/or being institutionalised, house-bound or non-ambulatory and individuals who are at high risk of skin cancer (due to sun avoidance)
- Cognitive impairment
- Gastrointestinal disease (e.g. coeliac disease), especially with malabsorption
- Certain medications (e.g. some antiepileptic agents)

GROUPS MOST AT RISK FOR VITAMIN D DEFICIENCY

- **Older adults:** Vitamin D deficiency is a problem in frail, housebound or institutionalised older Australians. It is related to increasing age, and low levels of exposure to sunlight. As the human body ages, it becomes less efficient at synthesising new bone and making vitamin D, adding to the problem. For this reason, older adults who are vitamin D deficient increase their risk of osteoporosis, falls, and fractures. The National Health and Medical Research Council recommends that older adults boost their vitamin D intake by taking a daily supplement at the recommended dose or as advised by a medical practitioner. For institutionalised or bed-bound elderly who have very restricted exposure to sunlight often accompanied by reduced food intake, supplementation with vitamin D in the order of 10-25 micrograms per day may be necessary. Older adults who are not at high risk of skin cancer and who are mobile should ensure they have incidental exposure to sunlight if vitamin D supplementation is not available or impractical, especially at times when ultraviolet radiation is less likely to cause other health problems.
- **People with dark skin:** People with naturally very dark skin require more ultraviolet radiation exposure to produce adequate levels of vitamin D as the pigment in their skin reduces ultraviolet radiation absorption. When people with dark skin cover themselves for religious or cultural reasons, this further reduces the ultraviolet radiation available for vitamin D production. Vitamin D supplementation is likely to be required for this population group. During early pregnancy is an important time to screen for vitamin D deficiency in this group and, if necessary, provide supplements. This is done by measuring levels of 25 (OH) vitamin D in the blood.

- **People who wear concealing clothing:** Some people, especially women who wear concealing clothing for religious or cultural reasons, are at increased risk of vitamin D deficiency because of very low skin exposure to sunlight. Vitamin D supplementation is likely to be required for this population group if culturally acceptable spaces are not available where they can expose more of their skin to sunlight. Again pregnancy is an important time to screen for vitamin D deficiency and, if necessary, provide supplements. The NHMRC dosage recommendation for vitamin D supplementation during pregnancy is 10 micrograms/day for pregnant and lactating women who have little or no access to sunlight.
- **Babies and infants of vitamin D deficient mothers:** Babies and infants of mothers with inadequate vitamin D levels are also likely to be vitamin D deficient. Babies most at risk are those who are exclusively or partially breastfed by mothers who are vitamin D deficient.
- **Individuals who are at high risk of skin cancer:** Certain people are at high risk of skin cancer. They include individuals who have had skin cancer, have received an organ transplant or are highly sun sensitive. These people need to have more rigorous sun protection practices and therefore should discuss their vitamin D requirements with their medical practitioner to determine if dietary supplementation rather than sun exposure is appropriate.

RECOMMENDATIONS TO MINIMISE RISK FACTORS

A. Sun Exposure Recommendations

TABLE 2 RECOMMENDED SUN EXPOSURE FOR PEOPLE WITH MODERATELY FAIR SKIN*

Region	DECEMBER - JANUARY		JULY - AUGUST	
	At 10am or 2pm [†]		At 10am or 2pm	At 12 noon
NORTHERN AUSTRALIA				
Cairns	6 to 7 minutes		9 to 12 minutes	7 minutes
Townsville	5 to 7 minutes		9 to 13 minutes	7 minutes
CENTRAL AUSTRALIA				
Brisbane	6 to 7 minutes		15 to 19 minutes	11 minutes
Perth	5 to 6 minutes		20 to 28 minutes	15 minutes
SOUTHERN AUSTRALIA				
Sydney	6 to 8 minutes		26 to 28 minutes	16 minutes
Adelaide	5 to 7 minutes		25 to 38 minutes	19 minutes
Melbourne	6 to 8 minutes		32 to 52 minutes	25 minutes
Hobart	7 to 9 minutes		40 to 47 minutes	29 minutes
NEW ZEALAND				
Auckland	6 to 8 minutes		30 to 47 minutes	24 minutes
Christchurch	6 to 9 minutes		49 to 97 minutes	40 minutes

* Recommended sun exposure times resulting in 1/3 minimal erythral dose. Exposure times for people with highly pigmented skin would be three to four times greater.

† 11am or 3pm daylight saving time, respectively.

Adapted from: Working Group of the Australian and New Zealand Bone and Mineral Society, Endocrine Society of Australia and Osteoporosis Australia. Vitamin D and adult bone health in Australia and New Zealand: a position statement. *Med J Aust* 2005; 182: 281-284.

B. Lifestyle and Vitamin D Levels

- Achieving 25-hydroxyvitamin D values above 50nmol/L may improve bone health. However, higher levels (around 75nmol/L) are desirable targets for optimal bone health.
- Some people may require lifestyle changes (i.e. increased exposure to incidental sunlight and dietary changes to include more vitamin D containing foods) or vitamin D supplementation to achieve adequate levels.
- Exposure of the face, hands and arms or of the legs to modest amounts of sunlight to reach one-third of a minimal erythemal dose (MED) on most days, as part of daily living, appears to be safe and likely to achieve sufficient levels of vitamin D. Exposure should occur before 10am or after 3pm for short periods, the duration of which depends on latitude and time of year (see Table 2 on previous page). Individuals with darker skin will require three to six times longer sun exposure. **(One MED is the amount of sun exposure that produces a faint redness of the skin.)**
- However people of all skin types (especially those with pale skin) need to use sun protection for longer exposures.

C. Vitamin D Supplementation

Vitamin D supplementation reduces the risk of falls by 30% among people in residential care. This is because vitamin D deficiency can cause muscle weakness.

Recommendations

- For people who do not get adequate sun exposure for a variety of reasons, then a supplement of at least 800IU (20 micrograms) per day is recommended.
- As vitamin D and calcium deficiency are common in older people especially those who are housebound or in residential care, a calcium-vitamin D combination is recommended to reduce the risk of falls and fractures.
- NHMRC dosage recommendation for vitamin D supplementation during pregnancy is 10 micrograms/day for pregnant and lactating women who have little or no access to sunlight.
- People who wear traditional or religious dress that covers most of the body are also at increased risk of vitamin D deficiency and may require supplements.
- Adjunctive therapy with some form of vitamin D should be considered for postmenopausal women and older men who take corticosteroids. The risk of hypercalcaemia is extremely low, even with high dose vitamin D supplementation.
- Vitamin D replacement is safe, generally not causing hypercalcaemia or hypercalciuria, even in higher doses up to 600,000IU (15mg) once per year by intramuscular injection (this must be specially imported by a doctor).
- In people with severe vitamin D deficiency, higher replacement doses (around 5,000-10,000IU [125-250mcg] per day) are often required to achieve normal vitamin D levels and optimal bone health. This treatment should be supervised by a medical practitioner.

TIPS FOR INCREASING VITAMIN D INTAKE

- Follow the advice set out in Table 2 for incidental sunlight exposure.
- Consider vitamin D supplementation if they are vitamin D deficient or at high risk of deficiency.
- Include foods that are high in vitamin D, eg fortified margarines & milks, fatty fish and eggs.

D. Toxicity

Vitamin D intoxication produces hypercalcaemia (anorexia, nausea, polyuria, constipation, weakness, weight loss, headache, depression, vague aches, stiffness, soft tissue calcification, nephrocalcinosis, hypertension, anaemia). In severe cases, hypercalcaemia may lead to irreversible renal and heart failure or coma and death. Hypercalcaemia is a contraindication for the administration of vitamin D.

- Vitamin D toxicity can be caused by excess oral intake through supplementation, but not by prolonged exposure of the skin to ultraviolet light.
- No clinical or biochemical evidence of toxicity have been noted with doses up to 4,000IU (100g) daily. High-dose intramuscular injections of 300,000IU at intervals of not less than 3-6 months and 600,000IU once a year cause little evidence of toxicity. However, such supraphysiological doses are yet to be firmly established as safe.
- Cod liver oil also contains vitamin A, which can be toxic at high doses.

6. SUNLIGHT AND VITAMIN D

A balance is required between avoiding an increase in the risk of skin cancer by excessive sun exposure and achieving enough sun exposure to maintain adequate vitamin D levels.

Australia has the highest reported rates of non-melanoma skin cancer in the world. Sun exposure is the cause of around 99% of non-melanoma skin cancers and 95% of melanomas in Australia, however exposure to small amounts of sunlight is also essential to good health. Ultraviolet radiation B (UVB) is the component of sunlight that is most likely to be responsible for both its beneficial and its harmful health effects. Ultraviolet radiation A (UVA) has recently been shown to have harmful health effects and is also now thought to contribute to the development of skin cancer. In Australia, where UVA and UVB levels are in the high to extreme range for much of the year, sun protective measures to reduce the incidence of skin cancer when the UV index is 3 or above must continue to be a high public health priority.

Many Australians are thought to have sufficient UVB exposure from sunlight to ensure adequate vitamin D production – serum 25-hydroxy vitamin D levels >50 nanomoles/Litre (nmol/L) – to form and maintain healthy, strong bones.

Vitamin D forms in the skin as a result of UVB exposure, but few studies have investigated the amount of UVB that people require to make enough vitamin D. There is evidence to suggest that prolonged sun exposure does not cause vitamin D levels to continue to increase. Therefore, people should continue to protect themselves from overexposure, especially during peak ultraviolet radiation periods (10am to 3pm). Further scientific investigation of the amount of ultraviolet radiation exposure required to ensure adequate vitamin D levels for people of different skin types in Australia is needed.

People who are at risk of vitamin D deficiency may need vitamin D supplementation if their exposure to ultraviolet radiation is not adequate. People living in the southern regions of Australia have a higher risk of vitamin D deficiency, particularly during the winter months.

Consistent and deliberate sun exposure without any form of sun protection when the UV index is 3 or above is not recommended, even for those diagnosed with vitamin D deficiency.

However, there are times during the day or year when it is safe to go outside without the need for sun protection, normally when the UV index is less than 3 (early morning, late afternoon, winter in certain Australian regions). Please refer to Table 3 overleaf, which gives the UV monthly average readings.

TABLE 3 UV INDEX* IN SELECTED AUSTRALIAN CITIES (MONTHLY AVERAGES)

Location	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Darwin	11	12	11	6	8	7	7	9	11	11	11	10
Brisbane	11	10	9	6	4	3	3	5	7	8	10	11
Perth	11	10	8	5	3	2	2	4	6	8	9	10
Sydney	10	9	7	5	3	2	2	3	5	7	8	8
Adelaide	11	10	7	5	2	2	2	2	5	7	9	10
Melbourne	9	9	6	4	2	1	1	2	4	6	8	9
Hobart [#]	8	7	4	3	1	1	1	2	3	4	6	7

* The UV (Ultraviolet Radiation) Index is a measure of the amount of UV from the sun at the earth's surface at solar noon on a particular day. Table is from Gies et al.

Hobart data is supplied from personal communication from the Australian Radiation Protection and Nuclear Safety Agency.

UV levels are published daily in all major Australian newspapers.

7. ACKNOWLEDGEMENTS

This guide has been developed for GPs as a practical, evidence-based tool.

The guide is based on recommendations generated from:

- the *Vitamin D and Calcium Forum*, held in Melbourne, July 28-29 2005;
- the *Calcium, Vitamin D and Osteoporosis: a Guide for GPs* published in 2006; and
- the *Risks and Benefits of Sun Exposure – Position Statement 2005* (updated 2007).

Osteoporosis Australia would like to thank and acknowledge the following people for their input into the content of this guide:

- Dr Jane Elliott (GP) and Dr Neil Hearnden (GP);
- various members of the Arthritis and Osteoporosis Awareness and Self-Management Project Advisory Committee; and
- Professor Peter Ebeling, Professor Rebecca Mason and members of the OA medical and scientific advisory committee.

For further information, contact the OA office in your State or visit our website www.osteoporosis.org.au. For more information on sun safety: www.cancer.org.au.

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Osteoporosis Queensland

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Osteoporosis South Australia

Tel: 08 8379 5345

Osteoporosis Western Australia

Tel: 08 9388 2199

Osteoporosis Tasmania

Tel: 03 6231 2988

Osteoporosis Australian Capital Territory

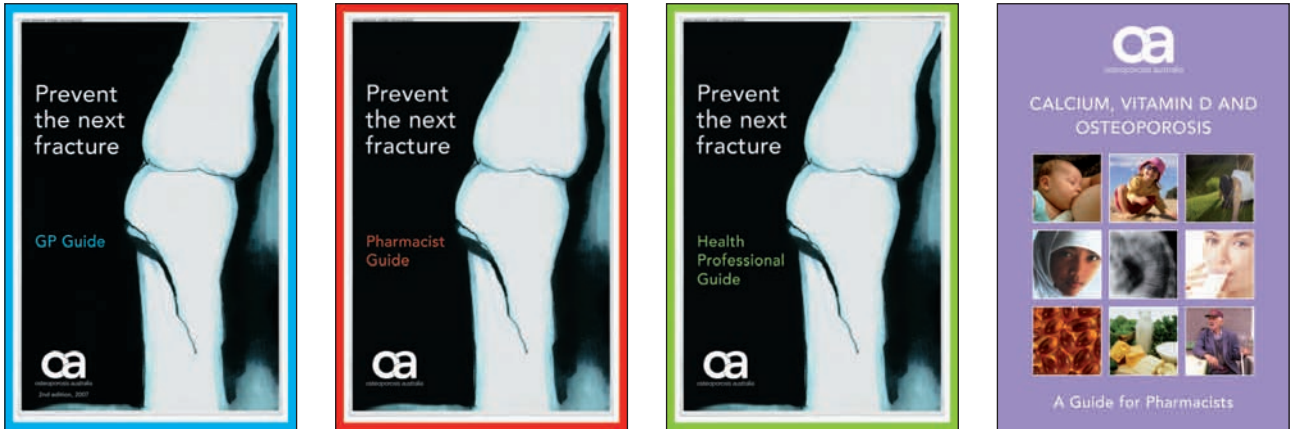
Tel: 02 6288 4244

Osteoporosis Northern Territory

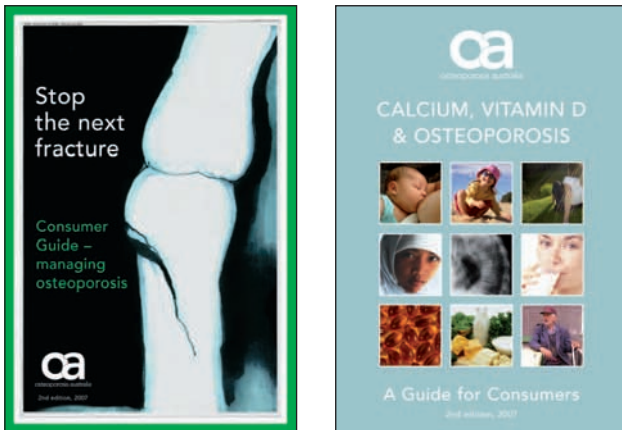
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8. RESOURCES

HEALTH PROFESSIONAL GUIDES

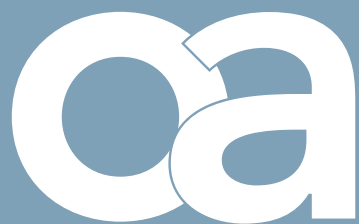


CONSUMER GUIDES



5 FACT SHEETS IN 5 LANGUAGES (PLUS ENGLISH): CHINESE, VIETNAMESE, ARABIC, GREEK AND ITALIAN





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