

South East London Clinical Guideline for the Management of Vitamin D Deficiency in ADULTS

NOTE: this guidance excludes management of deficiency in pregnancy and breastfeeding

'If being read as a paper copy, please refer to the version on the SEL APC website to ensure that this is the current version'

This document is for guidance only and not intended to replace the health professional's clinical judgement for individual patients. The APC has separate guidance for [management of Vitamin D deficiency in children](#), and [in pregnancy and lactation](#).

1. Introduction

Vitamin D is essential for musculoskeletal health as it promotes calcium absorption from the bowel, enables mineralisation of newly formed osteoid tissue in bone and plays an important role in muscle function.¹ The term 'vitamin D' generally refers to two very similar molecules. Vitamin D₃, also known as colecalciferol, is the most abundant in humans and is produced in the skin following exposure to sunlight.¹ Vitamin D₂, or ergocalciferol, occurs naturally in some mushrooms and yeast. The amount in most other vegetables is negligible.

The body converts both forms of vitamin D to 25-hydroxyvitamin D (25OHD). Tests to assess vitamin D status measure levels of 25OHD in the blood. 25OHD is itself converted in the body to the biologically active form 1,25-dihydroxyvitamin D, also known as calcitriol.

The main manifestation of vitamin D deficiency is osteomalacia in adults, which is generally associated with a serum 25OHD concentration of less than 30 nmol/L. There is a growing understanding of the importance of vitamin D in terms of its potential role in the prevention of non-skeletal disorders such as auto-immune disease, cancer, mental health problems and cardiovascular disease.

2. Purpose and Scope

This document is a South East London wide guideline broadly based on the [National Osteoporosis Society \(NOS\) Vitamin D and Bone Health Guidelines 2013](#)¹, as well as expert opinion. It sets out to provide guidance on:

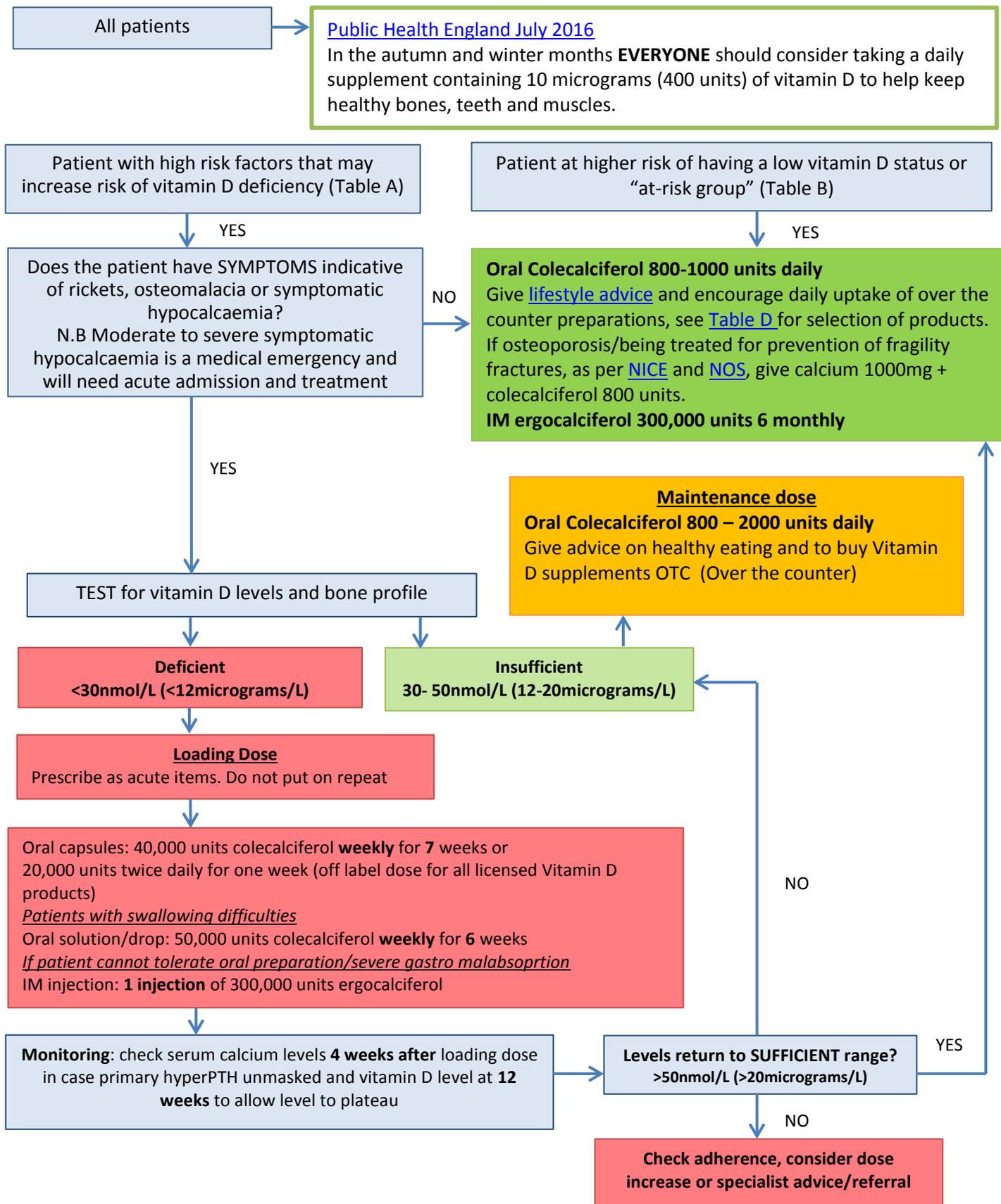
- Who to test for vitamin D deficiency
- Interpreting test results
- Treatment of vitamin D deficiency
- Product and allergy information
- Symptoms of Vitamin D overdose

Before using this guidance refer to a specialist for advice if:

1. The patient has a diagnosis of stage 5 CKD
2. The patient has a history of renal stones or sarcoidosis
3. The patient has hypercalcaemia / hyperparathyroidism

Flow Chart 1: Management of Low Vitamin D Levels in Adults over 18 years old and including patients with CKD 3A

Routine testing for 25 Hydroxy Vitamin D level is not recommended



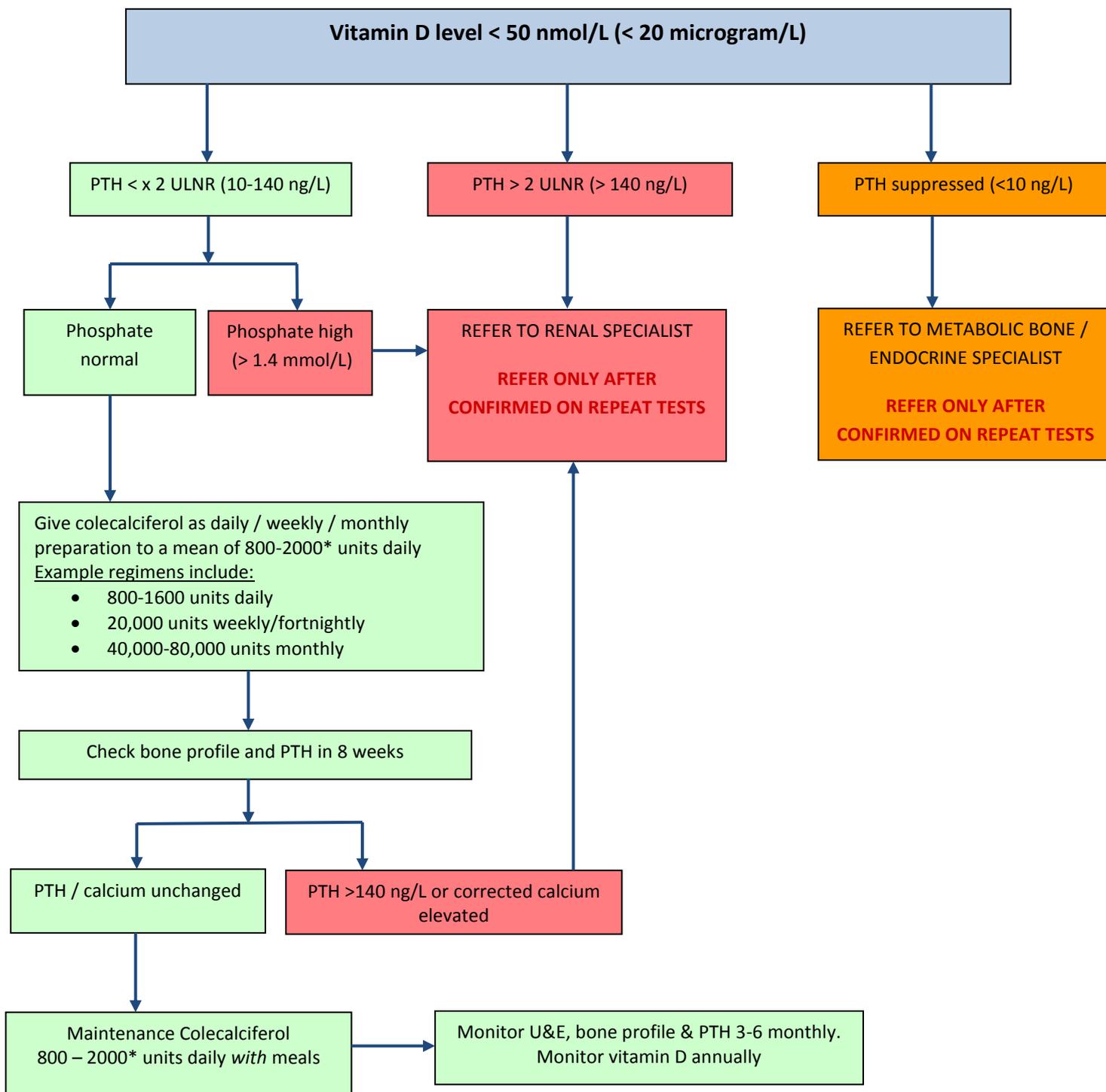
South East London Area Prescribing Committee. A partnership between NHS organisations in South East London: Bexley, Bromley, Greenwich, Lambeth, Lewisham and Southwark Clinical Commissioning Groups (CCGs) and GSTFT/KCH/SLAM & Oxleas hospital trusts/ Lewisham & Greenwich NHS Trust

Date approved: August 2017

Review Date: February 2019 (or sooner if evidence or practice changes)

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Flow Chart 2: Management of Low Vitamin D Levels in Adults with CKD 3B-4 and who have normal serum calcium (best managed in liaison with secondary care)



*no specific reference for this, but comes from the renal specialists at GSTT & KCH

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GSTT laboratory reports in nmol/L.
KCH laboratory reports in microgram/L
2.5 X microgram/L= nmol/L

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3. Who to test for vitamin D deficiency (adults)

Although prevalence of vitamin D deficiency is widespread, routine laboratory testing of vitamin D may be unnecessary and costly. Clinicians should only consider checking vitamin D levels in patients with high risk factors (Table A) who show symptoms indicative of rickets, osteomalacia or symptomatic hypocalcaemia. If patients with risk factors (Table A) do not display symptoms they should be given maintenance doses of vitamin D. In some groups of patients (Table B) a more pragmatic approach would be to offer vitamin D treatment at a maintenance dose on the basis of a presumptive diagnosis.

Table A: Patient with risk factors that may increase risk of vitamin D deficiency	
Testing for vitamin D deficiency is recommended if symptoms indicative of osteomalacia or symptomatic hypocalcaemia	
Patients with a significant risk of osteoporosis e.g.	
<ul style="list-style-type: none"> • High corticosteroid use e.g. inflammatory bowel disease, rheumatoid arthritis, COPD • Hyperparathyroidism • Active cancer • Sickle cell disease 	<ul style="list-style-type: none"> • Prolonged immobilisation • Liver disease • Anorexia nervosa • Vegan diet
Patients with malabsorption states e.g.	
<ul style="list-style-type: none"> • Small bowel resection • Coeliac disease • Bariatric surgery 	
Fragility fracture despite osteoporosis drug treatment	
Fragility fracture at young age (<60 years)	
Patients on parenteral potent anti-resorptive agent (IV Bisphosphonate/Teriparatide/Denosumab)	
Musculoskeletal symptoms that may be attributed to vitamin D deficiency e.g. muscle pain, proximal myopathy, chronic widespread pain.	

Table B: Patients who can be presumed to have a low vitamin D status or “at-risk group”
Testing for Vitamin D deficiency NOT recommended but require a pragmatic approach based on presumptive diagnosis
Black or South Asian patients or those with dark skins
Patients taking antiepileptics, antiretrovirals or aromatase inhibitors (these can impair vitamin D metabolism)
Patients with mental health conditions such as epilepsy, schizophrenia and bipolar disorder who are commonly treated with anti-epileptic drugs
Patients who have a sun sensitive condition, low or no exposure to the sun, for example, those who cover their skin for cultural reasons
Housebound patients and patients in institutionalised settings e.g. care homes, learning disability homes etc. (calcium intake should also be considered)
Patients who have a high risk of falling/have fallen frequently
Pregnancy or breastfeeding women
Elderly >65 years
Obesity (BMI > 30kg/m ²)
Menopause
<i>If Alkaline Phosphatase (ALP) is noted as being raised in any patient in the above groups this may indicate more severe osteomalacia, in which case check 25OHD level.</i>

4. Interpreting vitamin D levels (what do the test results mean)

GSTT, KCH and LGT laboratories report results of Vitamin D testing in nmol/L.

Opinions on optimal serum concentrations of Vitamin D (25OHD) vary but the following have been taken from NOS guidelines:

Serum 25OHD		
> 50nmol/L or > 20microgram/L	Sufficient	Treatment/Replacement not needed
30-50nmol/L or 12-20microgram/L	Insufficient	Maintenance Therapy
< 30nmol/L or <12microgram/L	Deficient	Treatment recommended

5. Treatment of Vitamin D deficiency

Natural ways of increasing Vitamin D levels

1. Safe Sun exposure

Sun exposure is the main source of vitamin D and this should be balanced with the risks of excessive exposure. **Sunburn should always be avoided.** Little and often sun exposure is best for Vitamin D synthesis. For most lighter-skinned people the target is to spend 10-15 minutes per day in the sun at least twice a week between 11.00am to 3.00pm with the face and arms exposed without sun cream, to achieve adequate Vitamin D levels. On 21st July 2016 [Public Health England](#) (PHE) issued new advice on vitamin D based on the recommendations of the Scientific Advisory Committee on Nutrition. The advice notes that vitamin D is made in the skin on exposure to UVB in sunlight but since this is difficult to quantify a daily dietary intake of 10 micrograms equivalent to 400 international units (IU) is being recommended, particularly in the autumn and winter months. PHE advice also considers people whose skin has little or no exposure to the sun, like those in institutions such as care homes, or who always cover their skin when outside and recommends that they need to take a supplement throughout the year.

Ethnic minority groups with dark skin, from African, Afro-Caribbean and South Asian backgrounds, may not get enough vitamin D from sunlight in the summer and therefore they should also consider taking a supplement all year round.

Unprotected sun exposure should be avoided in patients with the following conditions:

sensitive skins, skin cancer, porphyrias, xeroderma pigmentosum, albinism, granulomatous disease (sarcoid but not tuberculosis) and lymphoma.

Unprotected sun exposure should also be avoided in patients who are taking the following medications:

sulphonamides, phenothiazines, tetracyclines, quinolones, psoralens, isotretinoin or other photosensitising medications such as some anti-epileptics, diuretics and amiodarone.

Sunbed use increases the risk of skin cancer, and is not recommended as a method for enhancing vitamin D status.

2. Dietary advice

Diet is a poor source of vitamin D hence sun exposure is a far better way of naturally increasing vitamin D levels. However, foods which are relatively good sources include:

- Oily fish such as salmon, mackerel, herring, tinned tuna and sardines
- Eggs
- Fortified spreads and breakfast cereals
- Powdered milk

These should be taken as part of a healthy balanced diet.

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New guidance from [NICE](#) recommends that people who are at risk of low vitamin D should be given better access to supplements to protect their health.

Vitamin D supplements are measured in both micrograms (μg or mcg) and International Units (IU) or units.

1 microgram (mcg) is equivalent to 40 units of vitamin D₂ or D₃ and 10mcg is equivalent to 400 units

There are two types of vitamin D supplements: vitamin D₂ (ergocalciferol) and vitamin D₃ (colecalfiferol). Vitamin D₃ produces higher and more sustained blood levels of 25OHD and is generally recommended over vitamin D₂^{1,2}

The primary aim of treatment is to replenish vitamin D stores and then continue with a lower maintenance dose of vitamin D. See [Table C](#) for licensed Vitamin D products.

Prescribing Points:

- Clinicians should be aware of the new [PHE](#) advice which consistently refers to "*dietary sources*" of vitamin D including foods naturally containing or fortified with vitamin D and supplements. Prescribing of vitamin D purely for supplementation following this advice should be avoided.
- Refer to local schemes of Vitamin D supply e.g Healthy Start/ Universal vitamin D schemes or suggest buy/over the counter.
- Prescribe licensed colecalfiferol preparations, which are listed in the [Drug Tariff](#).
- If prescribing outside the guidelines e.g. where higher strengths are required for maintenance doses, use licensed products.
- Avoid using multivitamin/nutrient preparations. Achieving the correct vitamin D dose might give inappropriate amounts of other nutrients e.g. Cod Liver Oil use might result in vitamin A toxicity.
- In patients with swallowing difficulties 800 unit tablets can be crushed or licensed oral solutions of Vitamin D can be prescribed
- [NICE](#) and [NOS](#) guidelines recommend that supplementary calcium and vitamin D should be offered to patients with osteoporosis and prevention of fragility fractures. It is important to promote the relevance of adequate dietary calcium intake particularly if patients have a low intake of dairy products and fish.
- The following web calculator can be used to assess calcium intake.
<http://www.cgem.ed.ac.uk/research/rheumatological/calcium-calculator>
- Results of a recent study on the use of calcium in fracture prevention were published in the [BMJ](#). This study adds that dietary calcium intake is not associated with risk of fracture, and there is currently no evidence that increasing calcium intake prevents fractures.
- New guidance from [NICE](#) recommends that people who are at risk of low vitamin D should be given better access to supplements to protect their health.

6. Vegetarians & vegans

Colecalciferol is animal derived (from sheep's wool in most instances) and unlikely to be acceptable for most vegans. Ergocalciferol (in a gelatin free product) could be used at equivalent doses for vegans.

- Vegetarians: Invita D3[®], Desunin[®], Plenachol[®] brands are suitable.
- Vegans: Ergocalciferol should be prescribed for vegans as colecalfiferol is animal-based. Licensed high dose 50,000 units capsules are available.

For further information refer to:

[UKMi Q & A 387.4](#) Which vitamin D preparations are suitable for a vegetarian or vegan diet?

7. Product and Allergy Information for selection of Vitamin D products

Table C shows a selection of licensed colecalciferol products available on prescription. This list is not exhaustive and prescribers are advised to check the [Drug Tariff](#) for updated information on licensed Vitamin D products available. For full prescribing details and further product information refer to the Summaries of Product Characteristics (SPCs) on [Electronic Medicines Compendium](#).

Table C: Licensed colecalciferol products available on prescription						
Product	Suitable in soy or peanut allergy?	Suitable for vegetarians	Kosher and Halal considerations	Additional Information	Pack Size	Drug Tariff Cost Dec 2016
Aviticol [®] caps 20,000 units	Yes	No	Gelatin is of porcine and bovine origin	Lactose free	14	£12.62
Desunin [®] tabs 800 units	Yes	Yes	Contains no gelatin or porcine sourced excipients	Licensed in UK for doses 1-5 tablets daily. Tablets can be swallowed whole or crushed or taken with food.	30	£3.60
Fultium-D3 [®] caps 800 units	Yes	No	Gelatin is of bovine origin, no porcine sourced excipients	Lactose free Contains maize oil	90	£8.85
Fultium-D3 [®] caps 3,200 units	Yes	No	Gelatin is of bovine origin, no porcine sourced excipients	Lactose free Contains maize oil Only licensed product in pregnancy & breast feeding	30	£13.32
Fultium-D3 [®] caps 20,000 units	Yes	No	Gelatin is of bovine origin, no porcine sourced excipients	Lactose free Contains maize oil	30	£29.00
*Invita D3 [®] oral dropper solution 2,400 units/ml	Yes	Yes	Contains no gelatin or porcine sourced excipients	1ml solution (36 drops) equivalent to 2,400 units	10ml (360 drops)	£3.60
*Invita D3 [®] oral solution 25,000 units/ml	Yes	Yes	Contains no gelatin or porcine sourced excipients	Plastic 1 ml ampoule with twist top	3 amps	£4.45
*Invita D3 [®] oral solution 50,000 units/ml	Yes	Yes	Contains no gelatin or porcine sourced excipients	Plastic 1 ml ampoule with twist top	3 amps	£6.25
*Plenachol [®] caps 20,000 units	Yes	Yes	Contains no gelatin or porcine sourced excipients	Lactose free	10	£8.33
*Plenachol [®] caps 40,000 units	Yes	Yes	Contains no gelatin or porcine sourced excipients	Lactose free	10	£15.00
*Thorens [®] oral solution 25,000 units/2.5ml	Yes	Yes	Halal and kosher certified	Lactose free	3x2.5 ml	£4.45
*Thorens [®] oral drops 10,000 units/ml	Yes	Yes	Halal and kosher certified	Lactose free 1 drop equivalent to 200 units	10ml (500 drops)	£5.85
*Healthy Start Vitamin Drops for Children	Yes	Yes	Halal and kosher certified	5 drops equivalent to 300 units	10ml	Healthy Start helpline on 0845 607 6823 www.healthystart.nhs.uk

*Colecalciferol is derived from sheep's wool fat

Desunin[®] is synthetically produced in a process that includes wool grease/lanolin from healthy live sheep. However there are no carriers of animal origin in the active pharmaceutical ingredient (API)/vitamin D3 and consequently not in the finished product.

It would remain the patient's decision as to whether the ingredients are acceptable under their vegan/vegetarian dietary guidelines.

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Table D notes a selection of coledcalciferol/ergocalciferol products available to buy over the counter. All products listed **do not** have a UK marketing authorisation and are marketed as nutritional supplements only. The prices mentioned are intended as a guide and may vary amongst retailers.

Table D: Colecalciferol/ergocalciferol products available to buy over the counter				
Product	Suitable for vegetarians	Additional Information	Pack Size	Retail price (Dec 2016)
Biohealth® Vitamin D2 800 units with calcium capsules	Yes	Ergocalciferol from vegetarian/fungi Additive free	60	£5.15
Bio-Vitamin D3® Pharma Nord 800 units “pearls”	Yes	Halal certified. Available from pharmacies and supermarkets	120	£6.95
Bio-Vitamin D3® Pharma Nord 1000 units “pearls”	Yes	Halal certified. Available from pharmacies and supermarkets	80	£6.95
BioLife® Vitamin D3 25µg (1000 units) tablets	Yes	Yeast, wheat, gluten, dairy and sugar free Available for purchase only from www.lifestylenaturalhealth.co.uk	90	£9.98
Boots Pharmaceuticals® Vitamin D3 10µg (400 units) tablets	Yes	Gluten and lactose free. No artificial colours, flavours or preservatives Available for purchase only from Boots www.boots.com	100	£2.19
Boots Pharmaceuticals® Vitamin D3 25µg (1000 units) tablets	Yes	As above	90	£4.99
Holland and Barrett Sunvite® vitamin D3 10µg (400 units) tablets	Yes	Yeast, wheat, gluten, lactose, soya, dairy and sugar free .No artificial colours, flavours or sweeteners. Available for purchase only from Holland and Barrett www.hollandandbarrett.com	100	£3.59
Holland and Barrett Sunvite® vitamin D3 25µg (1000 units) tablets	Yes	As above	100	£8.19
Solgar® Vitamin D3 10µg (400 units) Softgels	Yes	Yeast, wheat, gluten, soya and dairy free. No artificial colours, flavours, sweeteners or preservatives Available from health food store and online at www.solgaronline.co.uk	100	£6.49
Solgar® Vitamin D3 25µg (1000 units) Softgels	Yes	As above	100	£8.72
Solgar®Vitamin D3 25µg (1000 units) tablets	Yes	As above	90	£7.89
Superdrug ®Vitamin D3 25µg (500 units) tablets	Yes	Available for purchase only from Superdrug	90	£2.15
Tesco ®Vitamin D3 25µg (500 units) tablets	Yes	No artificial colours, flavours, or preservatives. Available for purchase only from Tesco.	90	£2.75
Valupak ® Vitamin D3 1000 units tablets	Yes	Free from sugar, gluten, yeast , artificial flavours, colours and preservatives.	60	£0.99
Vitabiotics® Ultra Vitamin D3 25µg (1000 units) tablets	Yes	Yeast, gluten, lactose and gelatin free. No preservatives	96	£5.10
Abidec® containing ergocalciferol 400 units/0.6ml		Contains arachis oil; avoid in those with allergy to peanuts Available from pharmacies and supermarkets	25ml	£5.00 - £6.00
Dalavit® containing ergocalciferol 400 units/0.6ml	Yes	Does not contain peanut oil Suitable for orthodox Jews, Hindus, Muslims if keen to avoid animal source Available from pharmacies and supermarkets	25ml	£5.19 - £10.49

8. Symptoms of Vitamin D Overdose

The Food and Nutrition Board of the Institute of Medicine (IOM) has summarised the evidence from a number of supplementation studies of vitamin D ¹³, which covered a range of doses (800 to 300,000 units/day) and duration (months to years). They concluded that vitamin D below 10,000 units/day is not usually associated with toxicity, whereas doses equal to or above 50,000 units/day for several weeks or months are frequently associated with toxicity, including documented hypercalcaemia.

The symptoms of vitamin D overdose can vary from mild to serious. Some, like nervousness and irritability, are emotional. But physical signs can present as nausea, vomiting, loss of appetite and accompanying weight loss. Sufferers may also become dehydrated and experience increased thirst and severe headaches. As symptoms progress, the nerves and muscles become affected, **leading to itchy skin**, fatigue and weakness. More serious issues of vitamin D toxicity in the body leads to elevated levels of calcium that reside in the blood and soft tissues (like the lungs, heart and kidneys). At this point, bone pain or bone loss can occur. Sufferers will also exhibit urinary tract symptoms ranging from excessive production of urine to kidney stones or renal failure. High blood pressure and an increased risk of heart disease are concerns and ultimately can lead to irrevocable damage to major organs.

9. References

1. National Osteoporosis Society (NOS) Vitamin D and Bone Health: A Practical Clinical Guideline for Patient Management. The National Osteoporosis Society April 2013
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3. NICE Clinical Guideline [PH56]. Vitamin D: increasing supplement use among at-risk groups. November 2014, available on <https://www.nice.org.uk/guidance/ph56> <Accessed 05.12.16>
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5. NHS GGC – Vitamin D Supplementation Frequently asked Questions <Accessed 05.12.16>
6. Lewisham and Greenwich Division of Long Term Conditions and Cancer – Clinical Guideline for the Management of Vitamin D Deficiency and Insufficiency in Adults February 2015
7. Kings College Foundation trust – Vitamin D Guidelines 2013
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9. IOM (Institute of Medicine). Dietary reference intakes for calcium and vitamin D. Washington: DTNAP; 2011.
10. Calcium intake and bone mineral density: systematic review and meta-analysis. BMJ 2015; 351 doi: <http://dx.doi.org/10.1136/bmj.h4183> (Published 29 September 2015)
<http://www.bmj.com/content/351/bmj.h4183>
11. Vitamin D Deficiency including Osteomalacia and Rickets <http://patient.info/health/vitamin-d-deficiency-including-osteomalacia-and-rickets-leaflet>
12. [SACN vitamin D and health report - Publications - GOV.UK](#) <Accessed 05.12. 2016>