

# South East London Clinical Guidance for the Management of Vitamin D Deficiency and Insufficiency in Children up to the age of 18 years but excluding neonates in Neonatal Units

***'If being read as a paper copy, please refer to the your host organisation's intranet to ensure that this is the current version'***

*This document is for guidance only and not intended to replace the health professionals' clinical judgement for individual patients. SEL APC has separate guidance for [management of Vitamin D deficiency in Adults including CKD](#) 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.<sup>1</sup> The term 'vitamin D' generally refers to two very similar molecules. Vitamin D<sub>3</sub>, also known as colecalciferol, is the most abundant in humans and is produced in the skin following exposure to sunlight.<sup>1</sup> Vitamin D<sub>2</sub>, 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 rickets in children. Based on the overall evidence, it is not possible to discern a clear threshold serum 25OHD concentration below which rickets occurs. However rickets with unknown aetiology, often with serum 25OHD concentration < 25 nmol/L, is usually defined as vitamin D deficiency rickets.<sup>1</sup>

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 [Royal College of Paediatricians & Child Health \(RCPC\) Guide for Vitamin D in childhood October 13](#)<sup>2</sup>, [National Osteoporosis Society \(NOS\) Vitamin D and Bone Health Guidelines 2013](#)<sup>3</sup> as well as expert opinion. It sets out to provide guidance on:

- Management of low Vitamin D levels in children
- What is vitamin D deficiency
- Signs and symptoms of vitamin D deficiency in children
- General information and advice
- Licensed Vitamin D products available to treat for Vitamin D deficiency in children
- Symptoms of Vitamin D overdose

### **Before using this guidance refer to a specialist for advice if a child or young person:**

- Has clinical features of rickets
- Has repeated hypocalcaemia
- Has raised parathyroid hormone levels - primary hyperparathyroidism (hypercalcaemia)
- Has a fragility fracture, documented osteoporosis, or high fracture risk, or is being treated with an antiresorptive drug for bone disease
- Has a malabsorption disorder (for example Crohn's disease, Cystic Fibrosis)
- Has a history of sarcoidosis, renal stones, tuberculosis, or lymphoma
- Has a diagnosis of stage 3b CKD (or greater)

New advice from Public Health England states that in the autumn and winter months **EVERYONE** including children should consider taking a daily supplement containing 10 micrograms (400 IU) of vitamin D.

[Public Health England July 2016](#) <sup>4</sup>

**Children (from birth to 18 years old)**

**Birth up to one year of age:** Should take 8.5-10 micrograms (340-400 IU) vitamin D. Formula fed babies should not be given a vitamin D supplement until they are receiving less than 500ml of formula milk a day.

**One year and above:** Should take a daily supplement containing 10 micrograms (400 IU) vitamin D.

**Flow Chart for Management of Low Vitamin D Levels in Children**

SYMPTOMS and signs of vitamin D deficiency in infants and children

YES

NO

TEST for vitamin D levels and bone profile

**No treatment required**

**Dietary advice and consider prevention** [PHE July 2016](#)

Buy OTC preparation or via Healthy Start Schemes if applicable

**Deficiency**  
<25nmol/L

**Insufficient**  
25-50nmol/L

**Sufficient**  
>50nmol/L

**RCPCH Prevention Dose**

Age	Dosage and frequency	APC recommendation
Newborn up to 1 month	300 – 400 units daily	Buy OTC preparations or Healthy Start Scheme if applicable
1 month - 18 years	400 – 1,000 units daily	Buy OTC preparations or Healthy Start Scheme if applicable

**RCPCH Treatment Dose**

Age	Dosage and frequency	Duration	*APC recommendation (See Table B for other recommended licensed options)
Up to 6 months	1,000 – 3,000 units daily	4 - 8 weeks	<b>Thorens® 10,000 units/ml oral drops</b> – 5-15 drops (1,000-3,000units) daily for 6 weeks ( 1 or 2 bottles to complete treatment course)
6 months - 12 years	6,000 units daily	4 - 8 weeks	<b>Thorens® 25,000 units/2.5ml oral solution</b> – 5ml (50,000units) once a week for 5 weeks (10 bottles to complete treatment course) <b>OR</b> <b>Thorens® 10,000 units/ml oral drops</b> – 30 drops (6,000units) daily for 6 weeks (3 bottles to complete treatment course)
12 - 18 years	10,000 units daily	4 - 8 weeks	<b>Thorens® 25,000 units/2.5ml oral solution</b> – 5ml (50,000units) once a week for 8 weeks (16 bottles to complete treatment course) <b>OR</b> <b>Thorens® 10,000 units/ml oral drops</b> – 50 drops (10,000units) daily for 6 weeks (5 bottles to complete treatment course) <b>OR</b> <b>if able to swallow capsules</b> <b>Plenachol capsules 20,000 units</b> three times a week for 7 weeks (21 capsules to complete treatment)

**Monitoring:** check vitamin D levels at 12 weeks to allow level to plateau

**Check adherence, refer to paediatric/specialist advice/referral**

**Levels return to SUFFICIENT range?**

NO

YES

\* Please note that the dosing options used are based on those recommended in the [RCPCH guide for Vitamin D in childhood](#), and these differ from doses recommended by currently licensed preparations (off - label dosing). Best practical options for patients are given due to difficulty in measuring small volumes or very large quantity of drops.

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Date approved: August 2017

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

### 3. What is Vitamin D deficiency?

Vitamin D deficiency historically has been defined as a blood level of 25hydroxyvitamin D below 25nmol/L in children. There is scientific debate about the optimal Vitamin D blood level.

Clinicians are advised to refer to the [Royal College of Paediatricians and Child Health \(RCPCH\) Guide for vitamin D in childhood October 13](#).<sup>2</sup>

Serum 25OHD		
> 50nmol/L or > 20microgram/L	Sufficient	RCPCH Standard Prevention dose
25-50nmol/L or 12-20microgram/L	Insufficient	RCPCH Standard Prevention dose
< 25nmol/L or <12microgram/L	Deficient	RCPCH Treatment dose

### 4. Signs and symptoms of Vitamin D deficiency in children

Infants	Seizures, tetany and cardiomyopathy (features of hypocalcaemia)
Children	Aches and pains (unexplained); myopathy causing delayed walking; rickets with bowed legs, knock knees, poor growth and muscle weakness e.g. difficulty climbing stairs, waddling gait, difficulty rising from a chair.
Adolescents	Aches and pains, muscle weakness, bone changes of rickets or osteomalacia

### 5. General information and advice

#### 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. On 21<sup>st</sup> July 2016 [Public Health England](#) 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 and that in spring and summer, the majority of the population get enough vitamin D through sunlight on the skin and a healthy, balanced diet. However since it is difficult to quantify, a daily dietary intake of 10 micrograms equivalent to 400 international units (IU) is being recommended for everyone particularly in the autumn and winter months. Children from 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 should consider taking a supplement all year round.

Prescribing of vitamin D purely for supplementation following Public Health England advice should be avoided and patients should be requested to purchase Vitamin D supplements over the counter.

**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 following medications:**

sulphonamides, phenothiazines, tetracyclines, quinolones, psoralens, isotretinoin or other photosensitising medications.

##### 2. Dietary advice

All children should be encouraged to get more vitamin D by eating plenty of vitamin D rich foods, including:

- Oily fish such as salmon, mackerel and sardines
- Eggs
- Fortified spreads and breakfast cereals and
- Yoghurts and fortified yoghurts

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These should be taken as part of a healthy balanced diet. However adequate vitamin D intake may be difficult to achieve with diet alone and parents may choose to supplement by purchasing vitamin D products. Children from six months old to their fourth birthday who are eligible beneficiaries can access free Healthy Start vitamins via coupons under the government Healthy Start scheme. Refer to the [website](#) for further details.

Some Clinical Commissioning Groups may supply Healthy Start vitamins freely to **all** children under four years old. Therefore please refer to local vitamin D supply arrangements. Free Healthy Start vitamins should be recommended for eligible groups, in preference to issuing Dalivit or Abidec on FP 10 prescriptions.

For children who are not eligible for free vitamins via the Healthy Start coupon scheme, supplements can be purchased over the counter. A wide range of inexpensive palatable and chewable children's vitamin supplements containing appropriate doses of vitamin D are available over the counter at pharmacies and supermarkets.

**Table A** shows 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.

<b>Table A: Vitamin D products containing standard prevention doses available to buy over the counter</b>				
<b>Arachis oil should be avoided in peanut allergy</b>				
<b>Product</b>	<b>Suitable for vegetarians</b>	<b>Additional Information</b>	<b>Pack Size</b>	<b>Retail price (Dec 2016)</b>
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 <a href="http://www.lifestylenaturalhealth.co.uk">www.lifestylenaturalhealth.co.uk</a>	90	£9.98
Boots Pharmaceuticals® Vitamin D3 10µg (400 units) tablets	Yes	Gluten,lactose free. No artificial colours, flavours or preservatives Available for purchase only from Boots. <a href="http://www.boots.com">www.boots.com</a>	100	£2.19
Boots Pharmaceuticals® Vitamin D3 25µg (1000 units) tablets	Yes	As above	90	£4.99
Holland & 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 & Barrett stores <a href="http://www.hollandandbarrett.com">www.hollandandbarrett.com</a>	100	£3.59
Holland & 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 <a href="http://www.solgaronline.co.uk">www.solgaronline.co.uk</a>	100	£6.49
Solgar® Vitamin D3 25µg (1000 units) Softgels	Yes	As above	100	£8.72
Superdrug® Vitamin D3 12.5µg (500 units) tabs	Yes	Available for purchase only from Superdrug	90	£2.15
Tesco® Vitamin D3 12.5µg (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, gelatin and preservatives free.	96	£5.10
Abidec® containing ergocalciferol 400 units/0.6ml	Yes	Contains arachis oil; avoid in those with peanut allergy 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 vegans. Available from pharmacies and supermarkets	25ml	£5.19 - £10.49

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## 6. Licensed Vitamin D products available to treat for Vitamin D deficiency in children

Table B shows a selection of licensed colecalciferol products available for treating Vitamin D deficiency. Please note that licensed vitamin D products for children are constantly emerging on to the market and the list below is not exhaustive. Prescribers are advised to check the [Drug Tariff](#) for updated information on licensed Vitamin D products available

Table B: Examples of currently licensed Vitamin D products available on FP10				
Dosage / quantity required to meet dosing recommendations of RCPCH guidance will differ from those recommended by currently licensed preparations (off – label dosing)				
Product	Size	Cost DT July 2017	Availability	Information
<b>Fultium D<sub>3</sub> drops®</b> Colecalciferol 2740 units/ml	25mls	£10.70	FP10 Prescribe by <b>BRAND</b> to treat deficiency symptoms	<b>Licensed</b> in UK from birth including pregnant & breastfeeding women* 3 drops contains 200units colecalciferol Gluten free, lactose-free. Suitable for vegetarians and people with nut allergies. See <a href="#">manufacturer's SPC</a> for dosage information
<b>Invita D<sub>3</sub>® oral dropper solution</b> Colecalciferol 2400 units/ml	10mls	£3.34	FP10 Prescribe by <b>BRAND</b> to prevent symptoms	<b>Licensed</b> in UK for age 0-18 years and adults 1 ml solution (36 drops) equivalent to 2,400 units vitamin D <sub>3</sub> . To be taken preferably with food. Can be mixed with food prior to use Suitable for vegetarians. Not certified for halal or kosher diets See <a href="#">manufacturer's SPC</a> for dosage information.
<b>Invita D<sub>3</sub>® oral solution</b> Colecalciferol 25,000 units/ml Olive oil based solution	3x 1ml	£4.45	FP10 Prescribe by <b>BRAND</b> to treat deficiency symptoms	<b>Licensed</b> in UK for age 0-18 years and adults To be taken preferably with food. Can be mixed with food prior to use. Suitable for vegetarians. Not certified for halal or kosher diets. See <a href="#">manufacturer's SPC</a> for dosage information.
<b>Plenachol® capsules</b> Colecalciferol 20,000 units	10		FP10 Prescribe by <b>BRAND</b> to treat deficiency symptoms	<b>Licensed</b> in UK for age 12 -18 years and adults Peanut, soya or gelatin free. Suitable for halal and kosher diet See <a href="#">manufacturer's SPC</a> for dosage information
<b>Thorens®</b> Colecalciferol 10,000units/1ml oral solution 1 drop = 200 units Olive oil based solution	10ml	£5.85	FP10 Prescribe by <b>BRAND</b> to treat deficiency symptoms	<b>Licensed</b> in UK from birth including pregnant & breastfeeding women* Gluten free, lactose-free. Suitable for vegetarians and people with nut allergies. Halal and kosher certified. Should be preferably taken with a meal. Can be mixed with small amount of food such as yogurt, milk or other dairy products but entire dose must be taken. Shelf life 6 months after opening. See <a href="#">manufacturer's SPC</a> for dosage information.
<b>Thorens®</b> Colecalciferol 25,000units/2.5ml oral solution Olive oil based solution	2.5ml	£1.55	FP10 Prescribe by <b>BRAND</b> to treat deficiency symptoms	<b>Licensed</b> in UK from birth. Not recommended in pregnant and breastfeeding women. Single dose bottle. Gluten free, lactose-free. Suitable for vegetarians and people with nut allergies. Halal and kosher certified. See <a href="#">manufacturer's SPC</a> for dosage information
* Licensed for doses up to and including 4000 units daily				
<b>Abidec®</b> Ergocalciferol 400	25mls	Around £5.00 over	Available over the counter	<b>Licensed</b> in UK from birth to 12 years Contains arachis oil; avoid in those with allergy to peanuts

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units/0.6ml Multivitamin drops containing 400 units ergocalciferol in 0.6ml		the counter		
<b>Dalavit®</b> Ergocalciferol 400 units/0.6ml Multivitamin drops containing 400 units ergocalciferol in 0.6ml	25mls	Around £5.29 over the counter	Available over the counter	<b>Licensed</b> in UK from birth to 12 years Does not contain peanut oil and suitable for vegans, vegetarians and orthodox Jews, Hindus, Muslims if keen to avoid animal source
<b>Healthy Start Vitamin Drops for Children</b> Colecalciferol 300 units/ 5 drops	10mls	Not available	Obtained from Childrens' Centres Available in Pharmacies via Unichem Can prescribe on FP10 Healthy Start helpline on <b>0845 607 6823</b> <a href="http://www.healthystart.nhs.uk">www.healthystart.nhs.uk</a>	Suitable for vegetarians and free from milk, egg, gluten, soya and peanut residues Contain: 233 micrograms of vitamin A 20 milligrams of vitamin C 7.5 micrograms of vitamin D3

## 7. Symptoms of Vitamin D Overdose

Vitamin D toxicity is rare. The Food and Nutrition Board of the Institute of Medicine (IOM) summarised the evidence from a number of supplementation studies of vitamin D<sup>1,3,6,7</sup>, which covered a range of doses (800 to 300,000 units/day) and duration (months to years). They concluded that in adults 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 tolerable upper limit for vitamin D for children nine years and older is 4000 IU daily but is “scaled down” for children 1 to 8 years of age. Taking 25 micrograms (1000 units) or less a day of vitamin D supplements is unlikely to cause any harm.

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 lead 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.

## 8. Additional Information for all prescribers

Viapath Pathology Laboratories used by GSTT (Guy's and St Thomas' NHS Foundation Trust) and KCH (Kings College Hospital) define 30 nmol/L as their deficiency cut-off for vitamin D in adults and children. This differs from the RCPCH deficiency cut-off at 25nmol/L for vitamin D in children. Viapath have given their assurance, that their cut-off ensures that no child with a value of <25 nmol/L for 25OHD would be mis-diagnosed as having normal D status.

Lewisham and Greenwich Laboratories have aligned their cut-off for vitamin D deficiency levels in children and young persons to reflect those of the RCPCH.

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## 9. References

1. [SACN vitamin D and health report - Publications - GOV.UK](#) <Accessed 04.12.16>
2. [Royal College of Paediatricians and Child Health \(RCPCH\) Guide for vitamin D in childhood](#) October 2013 <Accessed 04.12.16>
3. [National Osteoporosis Society \(NOS\) Vitamin D and Bone Health Guidelines 2013](#) <Accessed 04.12.16>
4. [PHE new advice on vitamin D](#) <Accessed 04.12.16>
5. Electronic Medicines Compendium (eMC) [www.emc.medicines.org.uk](http://www.emc.medicines.org.uk) <Accessed 04.12.16>
6. [IOM \(Institute of Medicine\)](#). Dietary reference intakes for calcium and vitamin D. Washington: DTNAP; 2011. <Accessed 04.12.16>
7. [Statement on adverse effects of high levels of vitamin D](#) <Accessed 04.12.16>
8. [Healthy Start](#) <Accessed 04.12.16>