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Guidelines for the treatment and prophylaxis of vitamin D deficiency and rickets in children and adolescents

Risk factors for vitamin D deficiency

Sunlight is a source of vitamin D, however, in the UK it is not possible for everyone to get enough vitamin D from sunlight exposure alone. Please see below for details on risk factors in children:

- Infants who are exclusively breastfed, especially if the mother is also at risk of vitamin D deficiency
- Pigmented skin
- Children and adolescents with disabilities which limit the time they spend outside
- Phenytoin and carbamazepine treatment

Recommendations for supplementation and prophylaxis

Daily supplementation of vitamin D is recommended for:

- Breastfed infants from birth
- Formula fed infants who take less than 500 mL of formula/day
- Children under 5 years of age
- Infants or children previously treated for rickets or vitamin D deficiency
- Children from ethnic minorities who have darker skin. Clinical deficiencies have been most reported among children of African-Caribbean and South Asian origin.
- Children who are not exposed to much sun, for example those who cover their skin for cultural reasons, who are confined indoors for long periods
- Children on phenytoin and carbamazepine

Dosing: 400 units daily (as part of a multivitamin preparation eg Abidec[®] or Dalivit[®]) are sufficient to prevent rickets and vitamin D deficiency in babies and children. For patients in high risk groups supplementation should continue indefinitely.

Treatment of Vitamin D deficiency and rickets

If the child is hypocalcaemic or has active rickets calcium supplementation should be prescribed. Increased milk intake should be encouraged and, if this is poor, additional calcium supplements can also be given.

1. Oral daily dosing

Dosing:

- < 12 months: 1 500 – 2 000 units daily, adjusted as necessary
- 1 to 12 years: 3 000 units daily, adjusted as necessary
- 12 to 18 years: 5 000 units daily, adjusted as necessary

Duration of treatment: minimum 3 months
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Note:

It is not practical to give a sufficient dose using combined calcium and vitamin D preparations so treatment doses should be given as either colecalciferol or ergocalciferol. Please see below for choice of Vitamin D preparations.

The above Vitamin D doses are lower than those recommended in the BNF for children. These lower doses that have been chosen do not require routine monitoring unless the patient is treated for active rickets (please see overleaf).

2. Dosing in intestinal malabsorption or in chronic liver disease

By mouth or by intramuscular injection:

- Child 1 to 12 years: 10 000 - 25 000 units daily
- Child 12 to 18 years: 10 000 – 40 000 units daily

The total monthly dose can be administered as a single dose as it is an oily formulation with a slow release effect (unlicensed dose).

3. Stoss therapy

Stoss therapy may be considered if there are concerns with regards to adherence. It involves oral or intramuscular administration of the total treatment dose of vitamin D given in two divided doses twelve hours apart if given orally or as a single dose if given IM. This may need to be repeated (usually every 3 months) if poor compliance persists with maintenance dosing.

Dosing:

1 to 12 months: 150 000 units in 2 divided doses PO or single dose IM

1 to 12 years: 300 000 units in 2 divided doses PO or single dose IM

12 to 18 years: 500 000 units in 2 divided doses PO or single dose IM

Monitoring

Note: Vitamin D levels are quoted as total Vitamin D (Vitamin D₂ + D₃).

1. Vitamin D deficiency

Pre-treatment	Serum 25 OHD, bone profile and U+Es to confirm diagnosis
Monitoring	If symptoms have resolved following treatment, no further monitoring is required and the patient should be switched to prophylactic doses.

2. Rickets with or without hypocalcaemia

Pre-treatment	Serum 25 OHD, bone profile and U+Es, PTH, X-ray	
Monitoring	U+Es Bone profile 25 OHD	At 2 - 4 weeks and end of 3 months treatment. Further monitoring depends on symptom resolution, healing of rickets and vitamin D levels. Aim for Vitamin D > 80 nmol/mL.
	X-ray	At 3 months. Further X-rays may be needed depending on degree of healing.

Dose titration

Serum 25 OHD after 3 months treatment	Action
> 80 nmol/mL	Prescribe prophylaxis
50-80 nmol/mL	Continue with current treatment dose and reassess in 3 months
< 50 nmol/mL	Increase dose or, in case of non-adherence, consider stoss therapy

Contraindications

- Hypercalcaemia
- Evidence of vitamin D toxicity
- Metastatic calcification

Adverse effects

If the recommended doses are adhered to side effects are rare. Side effects are generally associated with excessive intake of Vitamin D leading to the development of hypercalcaemia. The symptoms of hypercalcaemia include anorexia, nausea and vomiting, headache, dry mouth, fatigue and muscle weakness

Interactions

- Magnesium-containing antacids: hypermagnesaemia may develop in patients on chronic renal dialysis
- Digitalis glycosides: hypercalcaemia in patients on digitalis may precipitate cardiac arrhythmias
- Anti-convulsants: vitamin D requirements may be increased in patients taking anti-convulsants (e.g. carbamazepine, phenobarbital, phenytoin and primidone)

Preparations available

Colecalciferol (D₃) and ergocalciferol (D₂) are used for prophylaxis and treatment. Doses are equivalent, however ergocalciferol should only be prescribed if colecalciferol is unavailable, as colecalciferol is slightly more effective.

Alfacalcidol and calcitriol are not suitable for the management of nutritional rickets and vitamin D deficiency as they can cause hypercalcaemia and do not correct the deficiency. Therefore must not be used for the treatment of vitamin D deficiency.

Liquid form

Routine supplementation:

Abidec[®] / Dalivit[®] 0.6 mL contains 400 units ergocalciferol, Vit A, B group and C

Note: Abidec[®] contains peanut oil, please use Dalivit[®] in patients with nut allergies.

Vitamin D deficiency/Rickets:

1st choice: colecalciferol 1 000 units dispersible tablets (Vigantoletten[®], licensed German product)

2nd choice: colecalciferol 3 000 units/mL (UK specials product)

3rd choice: ergocalciferol 1 500 units/mL (UK specials product)

Doses of colecalciferol and ergocalciferol are equivalent. Only prescribe ergocalciferol preparations if colecalciferol preparations are unavailable.

Solid form

Ergocalciferol 50 000 units (1.25 mg) capsules

Injection

Ergocalciferol solution for injection 300 000 units/mL and 600 000 units/2 mL

Information for hospital prescribing at Barts and the London NHS Trust

Prescribing for prophylaxis and vitamin D deficiency, please refer patient back to GP.

Active rickets or symptomatic Vitamin D deficiency requiring urgent start of treatment – initiate treatment on hospital outpatient's prescription.

Information for GPs on prescribing and supply

Please choose the most appropriate preparation from the list above. Some of the preparations, especially the liquids may not be available on your computer system. If this is the case, a handwritten prescription would suffice, ensuring you clearly state the strength and dose on the prescription. If you have any queries, please contact the PCT Medicines Management team for advice.

Liquid vitamin D preparations are available from the following suppliers in case you get any queries from the community pharmacist. They may take up to 5 days to be delivered.

Vigantoletten® - Colecalciferol 1 000 units dispersible tablets

Idis

Phone: 01932 824 100

Fax: 01932 824 300

Ergocalciferol Oral Solution BP 1 500 units/mL

Colecalciferol Oral Solution BP 3 000 units/mL

Specials Laboratories

Tel: 0800 0284925

References

Vitamin D an essential nutrient for all.. but who is at risk of vitamin D deficiency? (2009). Retrieved July 12, 2010, from DoH website:

http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_111302.pdf

BMJ group (2009). *BNF for children* London: RBS publishing.

RCPCH (2003). *Medicines for children (2nd edition)*

Summary of Product Characteristic: Ergocalciferol injection 300000 and 600000 U (UCB Pharma Ltd). Last updated on 20/04/09

Summary of Product Characteristics: Vigantol Oel, 20 000 units/ml (Merck Serono). Last updated on 06.07.2009

Misra, M. Pacaud, D., Collett-Solberg, P.F., and Kappy, M. (2008). *Vitamin D deficiency in children and its management: review of current knowledge and recommendations*. *Pediatrics*, 122,398-417.

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Dear Parents/Carers of

You have been prescribed **Colecalciferol 1 000 units dispersible tablets (Vigantoletten 1000)**.

To obtain a supply you will need to visit your GP for a prescription. Please take a copy of your discharge letter or prescription to your GP with this letter.

It may be difficult for your Community Pharmacist to get hold of this medicine, so please visit your GP as soon as possible.

INFORMATION FOR YOUR COMMUNITY PHARMACIST

Dear Pharmacist,

This patient * has been discharged from/ Wards/Outpatient and has been prescribed:

Colecalciferol 1 000 units dispersible tablets (Vigantoletten 1000®), licensed German product)

This can be obtained from:

Idis
Phone: 01932 824 100
Fax: 01932 824 300

ADDITIONAL INFORMATION

If you have any problems please do not hesitate to contact us at the above number.

Reviewed February 2011
By Nanna Christiansen