Clinical Guideline

VITAMIN D DEFICIENCY IN CHILDREN

SETTING
Bristol Royal Hospital for Children (BRHC) and Bristol, North Somerset and South Gloucestershire (BNSSG) Primary Care

FOR STAFF
Primary and secondary care

PATIENTS
Children either at risk of, or with known, vitamin D deficiency

Overview
This guidance is for all clinical staff seeing children, including primary care. This vitamin D deficiency guideline covers: doses for prevention, when to do blood tests and then treatment.

Background Notes on Vitamin D

Vitamin D deficiency is prevalent. Effective supplementation programs occurred in 1960s (castor oil), 1970s (stamp-out rickets). Vitamin D deficiency remains problematic in the UK¹.

Vitamin D deficiency is often asymptomatic, or can cause tiredness. Severe effects include hypocalcaemic seizures¹, tetany, neonatal cardiomyopathy and rickets (abnormal bone). Prevention of these complications is the aim of universal supplementation.

Prevention of Deficiency by Supplementation

400 units daily is the safe Intake for all ages recommended by the Scientific Advisory Committee on Nutrition (SACN), July 2016².

The SACN report uses recommended nutrient intake (RNI) and safe intakes, subtly different terms but similar clinical meaning. SACN concludes these intakes are hard to achieve from diet.

400 units (10 micrograms) is RNI for all over 4 years.
400 units (10 micrograms) is safe intake for 1 – 4 years.
340-400 units (8.5-10 micrograms) is safe intake for <1 year.

NICE recommends routine vitamin D supplementation in all children from birth to 5 years³; NICE clarifies that ‘from birth’ applies to both breast fed and formula fed babies.

Supplementation Practical Points

A blood test for serum vitamin D level is not needed to start supplements³.

Remind families that supplementation is recommended from birth to 5 years and encourage them to buy over the counter vitamins (unless they qualify for Healthy Start vitamins, in which case ensure they access via that route).

Children in the following groups are at higher risk and have greater need for supplements⁴:

- Dark skinned ethnic background;
• Reduced sun exposure;
• Medications: anti-epileptic drugs or on steroids e.g. prednisolone.

So remember the need for supplements in these children and remember that starting supplements does not rely on a blood test level.

Which supplements? – a variety are available.

### Routine Vitamin D Supplementation

In general: drops for those <5 years, older children could have drops or tablets

Remember routine screening of Vitamin D serum levels is not needed.

<table>
<thead>
<tr>
<th>Suggested Preparations (Those in bold are stocked at BRHC)</th>
<th>Dose and Vitamin D content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various Vitamin D Drops</td>
<td>Thorens® drops 2 drops daily (400 units) (colecalciferol 10,000 units/ml)</td>
</tr>
<tr>
<td></td>
<td>Fultium® D3 drops 6 drops daily (400 units)</td>
</tr>
<tr>
<td></td>
<td>Dalivit® 0.6ml (400 units)</td>
</tr>
<tr>
<td></td>
<td>Abidec® 0.6ml (400 units)</td>
</tr>
<tr>
<td>Fultium®-D3 800 unit capsule</td>
<td>1 daily (for those &gt;12 years of age)</td>
</tr>
<tr>
<td>Adcal D3® (or Calcichew D3 Forte® or other)</td>
<td>1 tablet daily (400 units vitamin D and calcium)</td>
</tr>
</tbody>
</table>

Notes:
Dalivit® 0.6ml also has Vitamin A 5000 units.
Abidec® 0.6ml also has Vitamin A 1333 units and is in peanut oil.

Over the counter (OTC) preparations are an option, although often contain only 200 units (= 5 micrograms). (40 units = 1 microgram).

### Is a blood test needed?

Do not blood test just to determine need for supplements – start on clinical grounds (see page 1)

**Clinical features of Vitamin D Deficiency?**
Do a blood test if any of the following:
- Deformed bones: bow legs/knock knees
- Tender or swollen joints, usually wrists or costochondral junctions;
- Bone pain and tenderness;
- Delayed walking or a waddling gait;
- Carpopedal spasm, seizures or irritability;
- Breathing difficulties (apnoea or stridor).

**If child qualifies for a blood test (see left)**
- Serum Vitamin D, bone profile, full blood count, U&E, creatinine, LFT, coeliac screen.
- Do a wrist x-ray as well if there are clinical signs of rickets (bow legs or wrist swelling or tenderness).
- Symptoms of hypocalcaemia (irritability, tetany, and seizures) should prompt immediate referral to hospital-based paediatric services.

Blood tests are appropriate for symptomatic vitamin D deficiency.

Most cases of symptomatic vitamin D deficiency can be managed in primary care

Refer cases to secondary care if either of:
- Hypocalcaemia (urgent referral);
- Moderate-Severe rickets e.g. leg deformity.
## Table 2 Vitamin D Thresholds with Actions

<table>
<thead>
<tr>
<th>Vitamin D level</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;75 nmol/L OPTIMAL</td>
<td>No changes required.</td>
</tr>
<tr>
<td>50 – 75 nmol/L is SUBOPTIMAL</td>
<td>Lifestyle advice: dietary measures and sufficient sun exposure (see page 3)</td>
</tr>
</tbody>
</table>
| 25 – 50 nmol/L = VITAMIN D INSUFFICIENCY | Supplementation at 400 units per day (refer back to page 2)  
Also ask yourself, if they were asymptomatic, should you have just started routine supplements without a blood test (refer back to page 1)?  
In children with chronic disease under secondary care, if repeat test is done and shows persisting low levels despite 400 units/day supplementation, consider 800 units as ongoing daily dose e.g. adolescents (Fultium-D3 800 p2) |
| <25 nmol/L = VITAMIN D DEFICIENCY | Treatment of deficiency with symptoms⁶⁻⁹.  
| Age                      | Dose (Generic prescription)                                            |
|                          | Example preparations (Those in bold are stocked at BRHC)             |
| < 6 months               | Colecalciferol 3000 units orally daily for 8-12 weeks.               |
| Thorens® drops 0.3ml daily  
10,000 units/ml  
(Colecalciferol Solution)  
Prescribe 2 – 3x10ml bottles |
| 6 months – 12 years      | Colecalciferol 6000 units orally daily for 8-12 weeks;  
6400 units orally daily also acceptable (ie capsules). |
| Thorens® drops 0.6ml daily  
10,000 units/ml  
(Colecalciferol Solution)  
Prescribe 3 – 5x10ml bottles  
If child prefers capsules, instead use two Fultium D3 3200 capsules per day. (4 packs of 30 covers 8 week course) |
Notes on treatment of Vitamin D Deficiency (<25nmol/L):

Previous Bristol guideline recommended similar total doses, but given over 1 – 2 weeks. Recent national guidance recommends similar total spread over longer duration.

If clinician concerned of poor compliance with longer duration, could consider giving above total course over 1 – 2 weeks in individual clinical situations.

Also give calcium supplementation if bone involvement i.e. rickets is present (if dietary calcium intake <500mg/day). Options to give a dose of ~500mg/day (regardless of age/weight) include Alliance Calcium syrup 10ml twice daily or half a Sandocal 1000 tablet daily.

Repeat blood test for 25(OH) vitamin D recommended after 3 months.

Treatment should be followed by ongoing maintenance daily supplementation (table on page 1, otherwise deficiency will recur unless risk factors resolved).

Intramuscular calciferol is less effective, so no longer recommended.

Additional Notes

Siblings and mothers of children with vitamin D deficiency are often also deficient. Start them on preventative supplements (above). Blood test only if clinical features of deficiency.

Background on Sun and Dietary Sources

- 90% of vitamin D requirement is obtained from UVB action on skin (only April – Sept in UK).

- There are few naturally rich food sources of vitamin D. Good sources are oily fish, with small amounts in margarine, eggs and fortified breakfast cereals:
  - Oily fish (trout, salmon, mackerel, herring, sardines, anchovies, pilchards and tuna): Amount varies: herring smoked 4 microgram (160 units)/100g, while raw 40 microgram (1600 units)/100g.
  - Cod liver oil and other fish oils are a good source.
  - Egg yolk: only 2 microgram (=80 units) per yolk.
  - Shiitake Mushrooms: contain small quantities.
  - Supplemented breakfast cereals: typically 2 – 8 microgram (80 – 320 units) per 100g, so approximately 30 – 80 units per 30g serving.
  - Margarine and infant formula. Statutory supplementation in the UK, but not of cow’s milk.
Notes on serum 25(OH) – Vitamin D Assay

The assay reports 3 different measurements:

- Vitamin D2 often <6nmol/L. Don’t worry. Reflects plant derived vitamin D/ergocalciferol.
- Vitamin D3 reflects endogenous vitamin D and any recent colecalciferol treatment.
- Total Vitamin D = Vitamin D2 + D3. It is Vit D3 or the Total Vit D that is relevant.

Supplementary Notes for Community Pharmacists

Main Options: for community prescribing (at July 2016). Note that there are now many options of coleccalciferol available if these are not suitable/not tolerated. Some products available are unlicensed or marketed as a food supplement. Licensed products are recommended over unlicensed products where possible. The options chosen for this guidance are based on the cost-effective options that meet the recommended dosage regimens for children (approximate prices are outlined below as guidance for the clinician. Although it should be appreciated that prices do vary over time and between hospital and community prescribing and between suppliers).

- **Thorens Drops 10 000 units/ml** Presented in bottle with dropper. Dose can be measured as drops for small doses or using a 1ml syringe for larger doses. Licensed. Suitable for vegetarians, and gluten, lactose and nut-free. Halal and Kosher certified. Approximate cost £5.00 for 10ml bottle.
- **FultiumD3® (Colecalciferol 800 unit capsules)** is for maintenance in adolescents (see page 2). Licensed. Contains gelatin but is Halal and Kosher certified. Batches manufactured since June 2014 do not contain arachis oil. Approximate cost £3 for 30 caps. Patient feedback is very good.
- **Fultium D3® 3200 unit capsules (Colecalciferol 3200 units capsules)**. Licensed. Contains gelatin but is Halal and Kosher certified. Nut-free. Approximate cost £13 for 30 caps
- **Fultium D3 20,000 unit capsules (Colecalciferol 20,000 unit capsules)**. Licensed. Contains gelatin but is Halal and Kosher certified. Nut-free. Approximate cost £29 for 30 caps
- **Plenachol 20,000 unit capsules** Licensed. Gelatin and nut-free. Suitable for vegetarians. Approximate cost £5 for 10 caps.
- **Alliance Calcium syrup** 7.65mmol of Ca /15ml. Approximate cost £11 for 250ml. Marketed as a food supplement.
- **Colecalciferol Injection.** As on previous page, this is not recommended. It does not increase serum vitamin D levels as effectively, or for as long. If clinician opts for this approach, a dose of 150,000 units is suggested for children of all ages. A blood test in 3 – 6 months would indicate if repeat doses were required at 6 or 12 monthly intervals. However, we would strongly recommend instead opting for one of the oral preparations, as above. Even patients with malabsorption can be managed with high dose oral (see BNFc).

References

9. RCPCH – Guide for vitamin D in childhood -
http://www.rcpch.ac.uk/system/files/protected/page/vitdguidancedraftspreads%20FINAL%20for%20website.pdf

RELATED DOCUMENTS

AUTHORISING BODY  Children’s Clinical Effectiveness Committee

SAFETY

QUERIES  Contact Dr Burren 0117 342 0203 or Ceri Gaskell, Paediatric Medicine Pharmacist, 0117 342 7042, bleep 3121 (via switchboard on 0117 923 0000).