Guideline for the Management of Vitamin D Deficiency in Adults from 18 years of age in Primary Care

This local guideline aims to provide guidance on the diagnosis, treatment and prevention of vitamin D deficiency in adults from 18 years of age in the primary care setting.

NB: Vitamin D is also known as, and referred to throughout the document as 25[OH]D or 25-hydroxyvitamin D.

Contents

The following organisations contribute to and participate in the BLMK APC – Bedfordshire, Luton and Milton Keynes Integrated Care Board; Bedfordshire Hospitals NHS Foundation Trust; Cambridgeshire Community Services NHS Trust; Central and North West London NHS Foundation Trust; East London NHS Foundation Trust; Milton Keynes University Hospital NHS Foundation Trust

Causes of vitamin D deficiency

- Insufficient exposure to sunlight
- Inadequate dietary and supplemental vitamin D
- Conditions that impair vitamin D absorption, such as coeliac disease, cystic fibrosis, Crohn's disease, ulcerative colitis, or following weight loss surgery.
- Conditions that impair vitamin D activation
- Other conditions (chronic kidney disease, nephrotic syndrome)
- Some drugs (e.g. antiepileptic drugs, antiretroviral treatment, drugs that reduce fat absorption)

Risk factors for vitamin D deficiency

People with the following are at a higher risk of vitamin D deficiency:

- Limited sunlight exposure, e.g. those who cover their skin for cultural or health reasons, those who are housebound, in care facilities or confined indoors for long periods.
- People with darker skin tones – more sunlight exposure is required to produce the same amount of vitamin D compared with people with lighter skin tone due to higher concentration of melanin; melanin absorbs a proportion of the UVB radiation needed for skin synthesis of vitamin D.
- People aged 65 years and over
- People with a gastrointestinal or malabsorption disorder, or following weight loss surgery, resulting in a reduced ability to absorb fat-soluble vitamin D.
- People with severe liver or end-stage chronic kidney disease
- Pregnant women and breastfeeding women
- People who are obese (BMI greater than 30 kg/m^2 or have had a gastric bypass), due to vitamin D being a fat-soluble vitamin that is sequestered in adipose tissue, leading to reduced bioavailability.
- People at increased risk of nutritional deficiency, e.g. vegans, people who do not eat fish, people who have generally poor diet.
- People who take certain medicines that increase the risk of vitamin D deficiency, e.g. drugs that reduce fat absorption (for example Orlistat) can lead to a decreased bioavailability of vitamin D. Antiepileptic medicines (especially carbamazepine, phenobarbital, and phenytoin), colestyramine, rifampicin, corticosteroids, thiazide diuretics, digoxin, calcium-channel blockers, antacids, and highly active antiretroviral treatment can actively destroy vitamin D by activating the catabolism of both 25(OH)D and $1,25(OH)_2D$.

When to test for vitamin D deficiency – 25[OH]D testing indicators

Do not routinely test for vitamin D deficiency in people who are asymptomatic.

Asymptomatic people at higher risk of vitamin D deficiency do NOT need routine testing for vitamin D deficiency, but should be advised on the need for maintenance dose vitamin D supplementation.

Check the person's vitamin D level by measuring serum 25[OH]D if the person has one or more of the following:

- Musculoskeletal symptoms that may be attributable to vitamin D deficiency, such as:
  - Suspected osteomalacia (bone discomfort/pain, bone pain in the shoulder, ribs, pelvis or legs; impaired physical function, muscle pain and weakness, marked waddling gait)
  - Chronic widespread pain with other features of osteomalacia (such as proximal muscle weakness)
- Suspected bone disease that may be improved with vitamin D treatment, such as osteomalacia or osteoporosis.
- Known bone disease, where correction of vitamin D deficiency is needed prior to specific treatment, such as prior to osteoporosis treatment with a bone active therapy (e.g. zoledronate, denosumab, or teriparatide), or prior to Paget's disease treatment with a bisphosphonate.
- Symptoms of hypocalcaemia (rare), including muscle cramps, carpopedal spasm, numbness, paraesthesias, tetany, or seizures.
- If clinically indicated, e.g. postmenopausal women with fragility fractures, people at risk of/ suffering from osteoporosis such as long term use of steroids, people commencing bone active therapies.

Note: People with osteoporosis or fragility fracture who are treated with vitamin D supplementation and an oral antiresorptive agent do **not** need routine testing for vitamin D deficiency.

For information on what additional investigations might be needed and what other conditions may present similarly to vitamin D deficiency with bone pain and/or muscle weakness (differential diagnosis), please see:

Additional investigations | Diagnosis | Vitamin D deficiency in adults | CKS | NICE

Differential diagnosis | Diagnosis | Vitamin D deficiency in adults | CKS | NICE

Vitamin D thresholds

Vitamin D Deficiency	Serum 25[OH]D levels less than 25 nmol/L
Vitamin D Inadequate/ Insufficient (treatment may or may not be required depending on the individual)	Serum 25[OH]D levels between 25-50 nmol/L
Vitamin D Sufficient	Serum 25[OH]D levels greater than 50 nmol/L

Lifestyle advice

- **Safe sunlight exposure** – A good source of vitamin D can be obtained naturally by exposure to the sun; the sunlight has to fall directly on to bare skin (through a window is not enough).
  - For people with fair skin, around 20-30 minutes of sunlight on areas of the skin that are often exposed uncovered, such as forearms, hands and lower legs,

around the middle of the day (11am-3pm), 2-3 times a week is enough to make sufficient vitamin D in the summer months in the UK.
    - People with darker skin may need longer periods of sun exposure although they may not be able to make enough from sunshine and diet alone, so should consider taking a vitamin D supplement all year round.
    - In the UK, solar UV levels are highest in the spring and summer months (between late March/early April and September), and around midday (11am-3pm), and are reduced by cloud cover. As a result, sunlight-induced vitamin D synthesis is only effective between these months in the UK.
    - If a person plans to be out in the sun long enough to risk burning or when they are out in strong sunlight for more than a short period of time (both in the UK and abroad), they should protect their skin by covering up with suitable clothing, seeking shade and applying sunscreen. The UV index level, combined with the individual's skin type and behaviour, can be used to assess someone's risk of sunburn. Further details on the risks and benefits of sunlight exposure can be found in the NICE guideline.
    - Prolonged exposure to strong sunlight (e.g. leading to burning or tanning) can be damaging and should be avoided (increased risk of skin cancer). Use of sunbeds is ineffective for vitamin D synthesis, is potentially harmful, and should be avoided.

- **Seasonal variation in vitamin D levels** – It is important to take into account seasonal variation when interpreting vitamin D results.

- **Dietary intake of vitamin D** – Vitamin D can be acquired from dietary sources such as oily fish (e.g. salmon, mackerel, herring and sardines), egg yolks, red meat, wild mushrooms, liver, and kidney. Vitamin D-fortified foods include most margarines and fat spreads, some dried or evaporated milks, infant formula milk, unsweetened soya products, and breakfast cereals. Cod liver oil contains high amounts of vitamin D (but avoid in pregnancy). The British Dietetic Association (BDA) Vitamin D: food fact sheet may be helpful.

- **Dietary intake of calcium** – Rich sources of calcium include dairy foods (milk, cheese, and yoghurts) and tinned sardines with bones. If the person has an inadequate calcium intake of less than 700mg a day (or less than 1000mg a day if the person has osteoporosis), advise to increase dietary calcium intake. The online calcium calculator can be used to calculate dietary calcium intake. The BDA Calcium: food fact sheet and the Royal Osteoporosis Society (ROS): Calcium may also be helpful.

- **Long term supplementation and SELF-CARE** –
    - Adults with risk factors should take a daily supplement containing 400 international units (IU) of vitamin D throughout the year.
    - Other adults should consider taking a daily supplement containing 400 IU of vitamin D, particularly in the autumn and winter.
    - For those who have received treatment for deficiency, long term supplementation with vitamin D should be adhered to in order to prevent recurrence of deficiency and to maintain bone health.
    - **SELF-CARE** is promoted for patients on maintenance supplementation with vitamin D. There is a wide array of affordable supplements available for all adults in the UK to purchase from pharmacies, supermarkets and health food shops.

- A **patient information leaflet** on vitamin D deficiency is available online at: https://patient.info/bones-joints-muscles/osteoporosis-leaflet/vitamin-d-deficiency

Figure 1 – Management flow chart

Guideline for the Management of Vitamin D Deficiency in Adults from 18 years of age in Primary Care

Check serum Vitamin D (25[OH]D) level if appropriate (see Vitamin D testing indicators)

For differential diagnosis, consider additional investigations where clinically appropriate, e.g. bone profile, renal, liver, thyroid function test, parathyroid hormone levels, full blood count, malabsorption screen, rheumatoid and other autoimmune screening, inflammatory markers (CKS – additional investigations; CKS – differential diagnosis)

< 25 nmol/L - Vitamin D deficiency

Seek specialist advice or refer to specialist team before treatment if the patient has:

- eGFR <30 ml/min/1.73m^2
- Pregnancy
- History of or current renal stone disease
- Hypercalcaemia or hypercalciuria
- Sarcoidosis
- Severe liver disease or jaundice
- Tuberculosis
- Lymphoma or metastatic cancer
- Parathyroid disorders/ hyperparathyroidism
- Malabsorption disorders

If patient has none of the above conditions and no contraindications, treat for vitamin D deficiency as below.

25 – 50 nmol/L - Vitamin D insufficiency

Do any of the following apply to the patient?

- **Bone disorders**, e.g. osteoporosis, fragility fracture, high fracture risk, prescribed or about to start antiresorptive or anabolic medication for bone disease.
- **Long term drug treatment** known to cause or increase the risk of vitamin D deficiency, e.g. oral corticosteroids, colestyramine, antiepileptics (see Risk factors for vitamin D deficiency).
- **Conditions known to cause vitamin D deficiency**, e.g. CKD, Crohn's disease, liver disease, gastric bypass, conditions associated with malabsorption.
- **Identified as high risk** (see Risk factors) with symptoms suggestive of vitamin D deficiency.

Yes

No

> 50 nmol/L - Vitamin D sufficient

Do NOT prescribe vitamin D – Follow prevention advice

All adults living in the UK should take vitamin D (colecalciferol) 400 units (10 micrograms) supplement daily (**SELF-CARE**) during the autumn and winter. Those at higher risk of vitamin D deficiency (see Risk factors for vitamin D deficiency) should continue throughout the year.

People eligible for the NHS Healthy Start scheme can obtain free Healthy Start vitamin tablets.

Give lifestyle advice to maintain vitamin D levels, e.g. safe sun exposure, diet (see Lifestyle advice).

If musculoskeletal symptoms persist, consider alternate diagnosis.

High dose oral treatment (Loading regimen)

Prescribe a full course of 280,000 to 300,000 units of colecalciferol in total, as weekly split doses, over 6-7 weeks. See Figure 2 for the preferred formulary product choices and their corresponding dosing regimens. Give lifestyle advice (see Lifestyle advice).

Check adjusted serum calcium level 1 month after the last loading dose to detect subclinical primary hyperparathyroidism. See Box 1 for action depending on calcium level.

Maintenance (preventative) supplementation

Colecalciferol 800 to 2000 units daily (20 – 50 micrograms) via SELF-CARE. These preparations are easily available in supermarkets/ pharmacies and should not be prescribed. In exceptional circumstances if a prescription is required (i.e. those with osteoporosis, a chronic condition or surgery that results in deficiency or malabsorption), see Figure 2 for formulary choices. Some patients with certain conditions, e.g. malabsorption, may require higher maintenance doses up to max. 4000 units daily following specialist advice. Counsel patients on the importance of long-term adherence to prevent recurrence of deficiency and to maintain bone health. Give lifestyle advice (see Lifestyle advice).

Box 1 – Action to take depending on adjusted serum calcium level

If plasma level indicates hypocalcaemia OR if patient has bone disorders AND failed/ unable to maintain adequate dietary calcium intake – Consider use of a calcium supplement if unable to meet needs through diet (i.e. dietary calcium intake < 700mg daily, see Lifestyle advice). Combined vitamin D & calcium supplements are easily available in supermarkets and **SELF-CARE** is recommended. In exceptional circumstances where a prescription is required, see Figure 3 for formulary choices.
These combined supplements should NOT be used as sources of vitamin D for deficiency/insufficiency regimens. If patient already on calcium supplement, refer to specialist team.

If hypercalcaemia is detected – Stop any vitamin D or calcium supplements if taking, assess hydration state and consider admission if appropriate. See NICE CKS for management advice and refer to specialist team as appropriate.

If serum calcium level normal – Stop calcium supplement if patient taking.

Box 2 – When to re-test vitamin D levels, and suggested actions depending on level from re-testing

DO NOT routinely re-test / monitor vitamin D levels unless symptoms of vitamin D deficiency continue OR patient has malabsorption problems OR where poor compliance with medication is suspected. Re-testing may also be appropriate for patients who have received high dose vitamin D replacement. In any case, **ensure 3-6 months have passed after treatment** to allow serum vitamin D levels to reach a steady state before re-testing. Adjusted serum calcium levels post-treatment can be used as a pre-indicator (in addition to previous criteria stated) of vitamin D re-testing. Vitamin D testing is not recommended for patients who are on ergocalciferol (D_2), e.g. vegan patients.

If serum vitamin D level is more than 50 nmol/L, advise on the use of lower dose maintenance supplementation with vitamin D (800 units daily).
Treatment failure: If serum vitamin D level is less than 50 nmol/L, assess adherence to treatment and consider referral to specialist team.

Figure 2: Vitamin D treatment options and formulary choices in BLMK

Note:

- Vitamin D supplements are easily available in supermarkets / pharmacies and **SELF-CARE** is recommended even where higher doses, such as 800 to 2000 units daily, are required. Vitamin D may be prescribed for people with osteoporosis or a chronic condition or surgery that results in deficiency or malabsorption, in which case see below for cost effective formulary choices.
- **Prescribe full treatment (loading) course on acute prescription by brand** to ensure a licensed product which is suitable for the patient is dispensed.
- In secondary care, different brands of vitamin D may be used depending on the hospital contract brands, however these should be changed to the appropriate formulary options in primary care.
- Where a deficiency is diagnosed in secondary care, the full treatment course should be issued by the hospital when the patient is discharged or on an outpatient prescription if the patient isn't an inpatient.
- Vitamin D supplements should be taken with food to aid absorption.

Diagnosis and management strategy	Licensed colecalciferol product formulary choices Prescribe by brand name	Dose & Frequency	Suitable for vegetarian?	Suitable in peanut/soya allergy?
Deficiency (vitamin D level < 25 nmol/L): High dose (loading) treatment course followed by maintenance supplementation	**1st line choice:** **Colextra D3® 20,000 unit capsules**	2 capsules once weekly, for 7 weeks (Total of 280,000 units over treatment course)	**No** (contains gelatin)	Yes
	2nd line choice (if patient has swallowing difficulty or is vegetarian): **InVita D3® 50,000 units/1ml oral solution unit dose ampoules (sugar free)**	1ml once weekly, for 6 weeks (Total of 300,000 units over treatment course)	Yes	Yes
	Alternative option: **Domnisol® (calcifediol 266 microgram capsules)** – not a colecalciferol product but a metabolite of colecalciferol. ○ Preferred for patients with malabsorption, obesity, or impaired hepatic function (if ALT or AST is ≥ 2x upper limit of normal) ○ Consider for patients with poor adherence to 1st line treatment or those unable to become replete with 1st line option.	One capsule once a month	**No** (contains gelatin)	Yes
Insufficiency (vitamin D level 25 – 50 nmol/L): Maintenance supplementation	For maintenance supplementation, advise patient to purchase vitamin D supplement which will provide 800 to 2000 units per day. Products listed below are only to be prescribed if the patient has osteoporosis or is at risk of vitamin D deficiency or malabsorption secondary to a chronic condition or surgery (excluding bariatric surgery).			
	For 800 unit dose: **Colextra D3® 800 unit capsules** (preferred choice over the 1000 unit preparation below)	Daily dose dependent on individual's risk and requirements (range 800-2000 units per day)	**No** (contains gelatin)	Yes

Prior high dose treatment course may or may not be needed (see Figure 1). If needed, see above choices as for Deficiency.	For 1000 unit dose: **Stexerol D3® 1000 unit tablets**	Daily dose dependent on individual's risk and requirements (range 800-2000 units per day)	Yes	Yes
	Alternative option: **Domnisol® (calcifediol 266 microgram capsules)** – not a colecalciferol but a metabolite of colecalciferol. ○ Preferred for patients with malabsorption, obesity, or impaired hepatic function (if ALT or AST is ≥ 2x upper limit of normal) ○ Consider for patients with poor adherence to 1st line treatment or those unable to become replete with 1st line options.	One capsule once a month	**No** (contains gelatin)	Yes
Sufficient (vitamin D level > 50 nmol/L): Give lifestyle advice (see Lifestyle advice)	All adults living in the UK should take colecalciferol 400 units (10 micrograms) supplement daily via **SELF-CARE** during the autumn and winter. Those at higher risk of vitamin D deficiency (see Risk factors for vitamin D deficiency) should continue throughout the year. **Do NOT prescribe vitamin D – Follow prevention and lifestyle advice.** **400 unit colecalciferol preparations are non-formulary.** Patients are to purchase from supermarkets / pharmacies.			

Information provided here is accurate as at the time of writing based on available licensing information. As manufacturers may change the formulations of their products, it is recommended to check the most up to date information on excipients and product ingredient origins on any prescribed item for any patient with specific dietary requirements or allergy to peanut, soya or soya bean.

Vitamin D for vegans:

Colecalciferol (vitamin D3) is derived from lanolin (wool fat), therefore such products are unacceptable to vegans. There are currently no licensed vitamin D3 preparations available that would be suitable for vegans. There are, however, unlicensed vitamin D products (food supplements) available that may be suitable for vegans to purchase (**SELF-CARE**). These are classified as foods rather than medicines. Please see Choosing vitamin D products for vegetarians or vegans – SPS - Specialist Pharmacy Service for available options.
For further information on medications in veganism including general considerations and appropriate management, please see:

- Vegan society: Veganism and medications
- SPS - Specialist Pharmacy Service - Excipients: Avoiding animal contents within medicines

Intramuscular (IM) injection:

Injection of ergocalciferol is not recommended due to considerable inter-individual variability in absorption via this route and slower onset of vitamin D repletion. IM ergocalciferol is considered to have a high risk of being ineffective or causing toxicity. It should only be used if the patient is unable to take or comply with an oral preparation (capsule / tablet / oral solution). Ergocalciferol IM injection is Red on the BLMK formularies.

Figure 3: Combined Vitamin D & Calcium supplements formulary choices in BLMK

Note:

- Combined vitamin D & calcium supplements are easily available in supermarkets / pharmacies and **SELF-CARE** is recommended.
- In exceptional circumstances where a prescription is required, see below for formulary choices (all Green on the BLMK formularies).
- Calcium supplementation is contraindicated in primary hypercalcaemia, hypercalciuria and metastatic skeletal disease.
- Give calcium supplements with caution to people with a history of nephrolithiasis, sarcoidosis, tuberculosis, lymphoma, or primary hyperparathyroidism – seek specialist advice. Also use with caution in renal impairment.
- In secondary care, different brands of combined vitamin D with calcium may be used depending on the hospital contract brands, however these should be changed to the appropriate formulary options in primary care.

Product	Composition	Dose	Suitable for vegetarian?	Suitable in peanut/soya/soya bean allergy?
First line product choice:				
Calci-D chewable tablets	1000mg calcium / 1000 unit colecalciferol	One tablet once daily	Yes	Yes
Accrete D3 One a Day chewable tablets	1000mg calcium / 880 unit colecalciferol	One tablet once daily	**No**	Yes
TheiCal-D3 chewable tablets	1000mg calcium / 880 unit colecalciferol	One tablet once daily	Yes	Yes
Second line product choice (if different formulations are required / if patient prefers a non-chewable tablet):				
Accrete D3 film-coated tablets	600mg calcium / 400 unit colecalciferol	One tablet twice a day	**No** (contains gelatin)	**No**
Adcal D3 caplets	300mg calcium / 200 unit colecalciferol	Two tablets twice a day	Yes	Yes
If an effervescent formulation is required, e.g. swallowing difficulty or enteral feeding (note: these contain higher sodium content):				
Adcal-D3 Dissolve effervescent tablets	600mg calcium / 400 unit colecalciferol	One tablet twice a day	Yes	Suitable for patients allergic to peanut, soya, yeast and gluten
Cacit-D3 effervescent granules sachets *(Only for enteral feeding tube administration)*	500mg calcium / 440 unit colecalciferol	One sachet twice a day	**No** (contains gelatin)	**No**
There are currently no licensed calcium and vitamin D products available that would be suitable for vegans. There are, however, unlicensed products (food supplements) available that may be suitable for vegans to purchase (**SELF-CARE**). These are classified as foods rather than medicines. Please see Choosing vitamin D products for vegetarians or vegans – SPS for further information and available options.				

Vitamin D during pregnancy

In the UK, it is recommended that pregnant women take a daily supplement containing 10 micrograms (400 units) of vitamin D as routine supplementation to prevent vitamin D deficiency. Those eligible for the NHS Healthy Start scheme can obtain free Healthy Start vitamin tablets. Otherwise, pregnant women should purchase vitamin D supplement (**SELF-CARE**).

Where a pregnant woman is not necessarily vitamin D insufficient or deficient but may require a higher maintenance supplementation dose as advised by the midwife due to a higher risk of eclampsia or higher risk pregnancy, they should still be purchasing vitamin D supplement via **SELF-CARE**. Alternatively, the midwife/secondary care team may prescribe this for the patient if they wish, but primary care is not expected to be asked to prescribe this.

Vitamin D deficiency in pregnancy may be associated with an increased risk of small for gestational age infants, preterm delivery, infantile rickets and maternal pre-eclampsia. The management of vitamin D deficiency in pregnancy is based on specialist consensus opinion as there is no specific guidance for this group of patients.

To treat vitamin D deficiency during pregnancy, prescribe oral colecalciferol – some products are licensed for use in pregnancy such as:

- **Invita D3 800 unit capsules (1st line)** – not suitable for vegetarians (contains gelatin)
- **Desunin 800 unit tablets (2nd line)** – suitable for vegetarians

Do not prescribe vitamin D injections in pregnancy.

Seek specialist advice in complex cases such as a history of rickets in a previous pregnancy.

Consider a daily dose between 1000 to 2000 units to manage vitamin D deficiency during pregnancy. It may be appropriate to consider a daily dose of up to 4000 units in some cases of severe vitamin D deficiency that is symptomatic. A cumulative dose of 300,000 units is sufficient to correct vitamin D deficiency in adults. Using the given dosing range, it could take several months to correct deficiency.

When selecting a daily dose, consider the following factors:

- the extent of deficiency
- whether there are symptoms of deficiency (see Vitamin D testing indicators)
- advice of the specialist, if any
- the amount of vitamin D in supplements being taken

After vitamin D correction, provide advice on preventing recurrence of vitamin D deficiency.

The monitoring requirements would be the same as for non-pregnant patients. Adjusted plasma calcium levels should be checked 1 month after starting vitamin D in case primary hyperparathyroidism has been unmasked.

Vitamin D in breastfeeding women

It is also recommended that breastfeeding women take a daily supplement containing 10 micrograms (400 units) of vitamin D as routine supplementation to prevent vitamin D deficiency, either via **SELF-CARE** or through the NHS Healthy Start scheme if eligible.

For rapid treatment of vitamin D deficiency, vitamin D loading of up to a cumulative dose of 300,000 units divided into daily or weekly dosing, given over 6 to 10 weeks, can be used

during breastfeeding. Infant monitoring is advised when loading doses are required during breastfeeding; monitor for signs of hypercalcaemia as a precaution, including increased wet nappies, lethargy, gastro-intestinal disturbances, and changes in feeding. The infant should also be monitored for irritability and skin reactions.

Any loading dose regimens totalling more than a cumulative dose of 300,000 units need additional monitoring of the infant; this may include checking infant calcium levels. Infant calcium levels should be monitored if:

- hypercalcaemia is suspected due to infant symptoms
- loading doses above 300,000 units are required, which may include treatment courses longer than 10 weeks
- loading doses totalling 300,000 units are given in less than 6 weeks.

Maintenance doses of vitamin D of up to 4000 units daily are considered compatible with breastfeeding, with no specific infant monitoring necessary. The very extended half-life of vitamin D also needs to be considered, since the effects of vitamin D exposure for the infant could continue well beyond the maternal treatment period.

The recommendations provided here apply to full term, healthy infants only.

Safety considerations when using Vitamin D

Vitamin D requires hydroxylation by the kidney to its active form (alfacalcidol and calcitriol are active metabolites of vitamin D which do not require hydroxylation by the kidney). Considerations related to the individual's renal impairment will need to be made when choosing a vitamin D product. For information relating to use of a specific vitamin D product in renal or hepatic impairment, or any drug interactions, please refer to the BNF or the Summary of Product Characteristics.

There are upper limits for daily intake considered safe for most individuals which are detailed in the NHS Health A-Z document for Vitamin D. Doses higher than the recommended upper limit may be used in patients with vitamin D deficiency caused by intestinal malabsorption or chronic liver disease and in the treatment of hypocalcaemia or hypoparathyroidism.

Vitamin D toxicity

Vitamin D is the most likely of all vitamins to cause overt toxicity, although this is rare. Excessive intake leads to hypercalcaemia and its associated effects include apathy, anorexia, constipation, diarrhoea, dry mouth, headache, nausea, vomiting, thirst, polyuria, weakness, myalgia and skin reactions, as well as raised concentrations of calcium and phosphate in plasma and urine. Later symptoms are often associated with calcification of soft tissues and include bone pain, cardiac arrhythmia, hypertension, renal damage, psychosis (rare) and weight loss.

Treatment of toxicity requires stopping all intake of supplementary vitamin D and clinical assessment by an appropriate medical professional.

References and Further Resources

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