Dr Charles J Forsyth MBBS FFHom
North Cottage 11 Dovers Green Road Reigate Surrey RH2 8BU Tel: 01737 226338

VITAMIN D

A few remarkable facts to consider - all derived from recent published research:

- If you totally avoid the sun, you need about 4,000 units of vitamin D a day!
- You can't get enough vitamin D from milk (unless you drink 40 glasses a day) or from a multivitamin (unless you take about 5 or more tablets a day - most contain 200iu), neither of which is recommended.
- Most of us make about 10,000 units of vitamin D after *whole body summer sun* exposure of about 20 - 30 minutes. This is about 50 times more vitamin D than current government recommended daily intake (200iu).
- Tropical outdoor workers have blood levels of vitamin D between 100 - 235 nmol/l. Compare this to the usual so called "normal range" in the UK of around 20 - 110 nmol/L - which now is regarded as set far too low.
- Everyone who lives more than 35 degrees latitude north or south of the equator is at risk of vitamin D deficiency in the winter months (1) - for us in Europe the 35° north parallel runs through the southern coast of Spain and the middle of the Mediterranean. It may seem unfair, but in order to produce vitamin D we need to be out in the direct sun in the middle of the day on the right part of the earth at the right time of year.
- Current research shows that vitamin D deficiency is endemic, and that is using the present reference ranges: an estimated one billion people around the world have vitamin D deficiency. The rates of deficiency are especially high in the elderly in industrialized countries.
- According to several studies, 40 to 100% of U.S. and European men and women over 65 are deficient in vitamin D.
- One authority estimates that lack of sunshine - and the consequent reduced production of vitamin D - leads to nearly one million deaths per year around the world, 600,000 of those deaths from cancer alone.
- Approximately 33% of women 60 to 70 years of age and 66% of those 80 years of age or older have osteoporosis. It is estimated that 47% of women and 22% of men 50 years of age or older will sustain an osteoporotic fracture in their remaining lifetime. Chapuy et al. reported that among 3270 elderly French women given 1200 mg of calcium and 800 IU of vitamin D3 daily for 3 years, the risk of hip fracture was reduced by 43%, and the risk of nonvertebral fracture by 32%. A 58% reduction in non-vertebral fractures was observed in 389 men and women over the age of 65 years who were receiving 700 IU of vitamin D3 and 500 mg of calcium per day. (1)
- In a randomized controlled trial conducted over a 5-month period, nursing home residents receiving 800 IU of vitamin D2 per day plus calcium had a 72% reduction in the risk of falls as compared with the placebo group. (1)
- Post-menopausal women who increase their vitamin D intake by 1,100 IU per day reduce their relative risk of cancer by 60 to 77%! (1)
- People living at higher latitudes are at increased risk for:
  - Hodgkin's lymphoma as well as colon, pancreatic, prostate, ovarian, breast, and other cancers and are more likely to die from these cancers, as compared with people living at lower latitudes. (1)
  - Type 1 diabetes, multiple sclerosis, Crohn's disease, hypertension, cardiovascular disease. (1)
- Pooled data for 980 women showed that the highest vitamin D intake, as compared with the lowest, correlated with a 50% lower risk of breast cancer. (1)
- Children and young adults who are exposed to the most sunlight have a 40% reduced risk of non-Hodgkin's lymphoma and a reduced risk of death from malignant melanoma once it develops, as compared with those who have the least exposure to sun- light. (1)
- Living below 35 degrees latitude for the first 10 years of life reduces the risk of multiple sclerosis by approximately 50%. (1)
- Women who ingested more than 400 IU of vitamin D per day had a 42% reduced risk of developing multiple sclerosis. (1) Similar observations have been made for rheumatoid arthritis and osteoarthritis. (1)
- For 10,366 children in Finland who were given 2000 IU of vitamin D3 per day during their first year of life and were followed for 31 years, the risk of type 1 diabetes was reduced by approximately 80%. (1)

Biolab Medical Unit The Stone House 9 Weymouth Street London W1N 3FF
Mobile phone: 07802 293006 Home phone: 01737 248605 E-mail: office@dr-forsyth.com
GMC No: 2372909 www.dr-forsyth.com Partner: G M Forsyth

- One study showed that a combined daily intake of 1200 mg of calcium and 800 IU of vitamin D lowered the risk of type 2 diabetes by 33% as compared with a daily intake of less than 600 mg of calcium and less than 400 IU of vitamin D. (1)
- Vitamin D's metabolic product, calcitriol, is actually a secosteroid hormone that targets over 2000 genes (about 10% of the human genome) in the human body.
- The present UK RDA is 200 iu (5 mcg) and the US RDA 400 iu (10 mcg) - these are now considered very inadequate by those in the forefront of vitamin D research.
- If you are not getting vitamin D the way nature intended, from plenty of sunshine, which try as you might but is impossible in the UK between November and February, you need to take vitamin D supplements.
- Optimal daily intake for adults appears to be between 1,000 - 4,000 iu and often more for those with diseases now known to be associated with vitamin D deficiency (see below).

VITAMIN D DEFICIENCY FEATURES

These are the well recognised features:

- Rickets & osteomalacia
- Joint pain or stiffness, backache, osteoarthritis
- Osteoporosis
- Muscle weakness, twitching or spasms
- Nervousness, insomnia
- Burning mouth and throat
- Excessive sweating of scalp
- Diarrhoea
- Myopia (short sight)
- Dental caries (tooth decay), periodontal disease
- Alopecia (hair loss)

Plenty of research now indicates that vitamin D deficiency is also a risk factor for the following:

- Poor immune function:
  - Susceptibility to infections
  - Allergies
  - Autoimmune diseases: systemic lupus erythematosus (SLE), rheumatoid arthritis, multiple sclerosis, Crohn's disease
  - Cancers, at least 17 varieties, including: breast, prostate, colon, multiple myeloma, ovarian, Hodgkins lymphoma, some brain tumours
- Vascular diseases:
  - Ischaemic heart disease & atherosclerosis (heart attacks, angina, strokes, etc.)
  - Hypertension (high blood pressure)
  - Hypercholesterolaemia (high cholesterol)
- Diabetes types I & II, thyroid & other hormonal problems
- Depression, including seasonal affective disorder (SAD), schizophrenia

Vitamin D also appears to increase the absorption of other minerals, esp. magnesium, iron and zinc.

TOXICITY

Toxic levels of vitamin D are far more difficult to achieve than is generally thought. In 1999, Vieth indirectly asked the medical community to produce any evidence 10,000 units of vitamin D a day was toxic, saying "Throughout my preparation of this review, I was amazed at the lack of evidence supporting statements about the toxicity of moderate doses of vitamin D." He added: "If there is published evidence of toxicity in adults from an intake of 250 ug (10,000 IU) per day, and that is verified by the 25(OH)D concentration, I have yet to find it." He reports human toxicity probably begins to occur after chronic daily consumption of approximately 40,000 IU/day.
Features: Hypercalcaemia (high blood calcium), Bone pains, Headaches.
Those more at risk: infants, women over 65 years, reduced kidney function.

If there is any concern about toxicity, have your vitamin D and serum calcium levels checked either by your NHS GP or privately very easily (and inexpensively).

VITAMIN D SOURCES

- Sunlight, sunlight, sunlight! Body stores last for just under 3 months - but you need to achieve decent levels to start with. It is the UV-B radiation that produces it - so the use of sunscreens reduces vitamin D production in the skin.
- Dietary sources: negligible and not sufficient alone to achieve or maintain adequate vitamin D levels - oily fish, brewer's yeast, mushrooms, wheat bran, eggs, milk products, green leafy vegetables

FACTORS INCREASING YOUR VITAMIN D REQUIREMENTS

The actual amount of vitamin D that needs to be taken to achieve an optimal blood level varies considerably from person to person - for a wide variety of reasons, here are some:

- **Aging** - reduced efficiency of vitamin D production in the skin.
- **Obesity** - sequestration of vitamin D in body fat.
- **Breast feeding babies** - there will be a low level of vitamin D in the mother's milk, unless she is taking decent amounts of vitamin D.
- **Genetic factors** - recent research has shown that there is genetic variation in requirements.
- **Skin pigmentation** - the darker your skin colour, the more sunlight is required to make vitamin D - this only applies if you are obtaining all or most of your vitamin D from sunshine.
- **Malabsorption**: including coeliac disease, food allergies, dysbiosis (yeast or bacterial), etc.
- Certain **drugs**:
  - Steroids - impair vitamin D metabolism, contributing to bone loss and development of osteoporosis.
  - Cholesterol-lowering drugs: Xenical, alli, Questran, LoCholest, Prevalite - reduce vitamin D absorption.
  - The anticonvulsant Dilantin (phenytoin) - increases hepatic metabolism of vitamin D to inactive compounds.
  - Barbiturates, AIDS treatment, Anti-rejection drugs.
- **Liver failure & chronic kidney disease**
- **Pesticides** - most are fat soluble and steroid hormone disruptors (vitamin D is a steroid hormone).

PRECAUTIONS

People with the following conditions should only take vitamin D with the guidance of a knowledgeable physician:

- **Primary hyperparathyroidism**
- **Sarcoidosis**
- **Granulomatous TB**
- **Some cancers**

Those with primary hyperparathyroidism should only use vitamin D when under the care of a knowledgeable endocrinologist.

VITAMIN D BLOOD TESTS

- The serum concentration of 25-hydroxy vitamin D3 is the most sensitive and useful index of vitamin D status. At last reliable and accurate vitamin D testing is not so expensive - Biolab introduced a chromatographic test in 2008 that measures and reports both 25-hydroxy vitamin D3 and D2 (ergocalciferol - present in many supplements) and costs £42.
- For healthy people with no medical condition and normal sun exposure the serum reference range for 25-hydroxy vitamin D is 75 - 200 nmol/l (30 - 80 ug/l).
- For people with medical conditions that may be associated with vitamin D deficiency, the target range should be 125 - 150 nmol/l (50 - 60 ug/l).
- Other investigations that may be abnormal, especially as vitamin D deficiency becomes more severe, include: plasma levels of: calcium (low), phosphate (low), alkaline phosphatase (high), parathyroid hormone (high).

- ***It is important to retest vitamin D levels after a few months on supplements*** - especially if any of the factors increasing requirements, as listed above, apply:
  1. That one has achieved an optimal blood level
  2. That one has not gone way above the reference range (unusual)

SUPPLEMENT DOSAGE

EVERYONE IN THE UK SHOULD TAKE EXTRA VITAMIN D.

See the superb website Vitamin D Council, esp. www.vitamindcouncil.org/about-vitamin-d/how-to-get-your-vitamin-d/vitamin-d-supplementation, which recommends the following amounts of supplemental vitamin D3 per day in the absence of proper sun exposure:

- Healthy children under the age of 1 years – 1,000 iu.
- Healthy children over the age of 1 years – 1,000 iu per every 25 lbs of body weight.
- Healthy adults and adolescents – at least 5,000 iu.
- Pregnant and lactating mothers - at least 6,000 iu.
- Additionally, children and adults with chronic health conditions such as autism, MS, cancer, heart disease, or obesity may need as much as double these amounts.

Due to the variable response discussed above, these can only be estimated amounts.
Higher doses may also be required initially where there has been prolonged deficiency.
"Proper sun exposure" means exposing the skin of your arms, legs and face, without suncreams, to direct sunshine for at least an hour or so everyday all year round - which is totally impossible for most of us.

However, in practice, I find that for most of my patients taking around 2000iu daily long term (and sometimes 3000 - 4000iu) is usually enough to obtain optimal blood levels.

BUT ONE CANNOT ASSUME THIS IS CORRECT - I have the occasional patient where this is definitely not enough and they benefit from higher doses - and also the converse - a very few patients where they have a vitamin D sensitivity and require smaller doses - therefore I always recommend rechecking blood vitamin D levels after several months of continuous supplementation.

Here are some of the most convenient and cost-effective vitamin D3 supplements I am aware of - but there are more and more products coming on the market:

- **Vitamin D3 1000 iu (25 mcg) tablets** (Solgar 3310) as 90 tabs (about £6.40), 180 tabs (about £10.50)
- **Vitamin D3 2200 iu (55 mcg) capsules** (Solgar) 50 caps (about £8)
- **Liquid Vitamin D3** (Solgar) 5000 iu/ml
- **D3 Drops 1000** (Nutri 3400; 1000 iu/drop; 28ml; 1000 drops per bottle, self life 2 years) about £9.75
- **D3 5000** (Nutri 3450; 5000iu (125mcg); 60 tablets
- **Vitamin D3 5000 iu** (Nature's Plus) 60 softgels
- **Liquid Sunshine Vitamin D3** (Nature's Plus) 2500 iu/drop, 10 ml
- **BioMulsion D** (Biocare 75615) 1000 iu/drop, 15 ml (300 drops, 6 month shelf life), about £9.32

- You must obtain vitamin ***D3*** (not vitamin D2).
- On the whole I prefer capsules to tablets as they tend to contain less excipients.
- If you are obtaining a product not on this list, check the ingredients label - you want as few excipients as possible, and no colourings or unnatural preservatives, etc.
- The liquid preparations above can be taken subligually (held and circulated in the mouth for as long as possible) so that as much as possible is absorbed through the mouth mucous membranes - to maximise absorption when their is a possibility of poor intestinal absorption.

VITAMIN D'S CO-FACTORS

Vitamin D has co-factors that the body needs in order to utilize vitamin D properly. They are:

- **Magnesium** - the fourth most abundant body mineral, involved in over 300 different biochemical reactions and required by all the enzymes that metabolise vitamin D. See my information sheet "Magnesium Deficiency".

- **Zinc** - required in over 300 different biochemical roles, including the vitamin D receptor itself. See my information sheet "Zinc Deficiency".
- **Vitamin K2** - essential for proper bone calcification and the prevention of soft tissue calcification. See my information sheet "Vitamin K".
- **Boron** - involved in the rapid, non-genomic action of Vitamin D on the cell wall. See my information sheet "Boron".
- A tiny amount of **vitamin A** - an intake of over 3000 iu daily blocks vitamin D's effect, and the higher the intake, the more the blocking.

Magnesium is the most important of these co-factors. In fact, it is quite common that improving vitamin D levels exacerbates an underlying magnesium deficiency. If you start experiencing or notice a worsening in cramps, spasms, tension, increasing pain or anxiety, all of which can be caused or worsened by magnesium deficiency, you almost certainly need to take a magnesium supplement. For more information about the relationship between vitamin D and magnesium, see: www.vitamindcouncil.org/newsletter/more-vitamin-d-questions-and-answers.shtml. Excellent dietary sources of magnesium are seeds and leafy green vegetables. If you want to be as healthy as possible you must do as much of the "basics" as possible: optimal diet, regular exercise, optimal stress management & meeting sleep requirements, avoidance of environmental toxins, etc. - see "Ecological Medicine".

RESOURCES & REFERENCES

1. **Vitamin D Deficiency -** Holick MF. New England Journal of Medicine. 357:266-81. 2007 - this is a ground breaking review paper, from which I have taken much of the information above.

2. **www.cholecalciferol-council.com** - this site is excellent - it is very readable and highly referenced - look under "Research" for the list of diseases and conditions being researched in relation to vitamin D, then within each is listed most of the research papers with links the actual papers.

3. Information sheets from the office (see my website for complete list):
   - Nutritional Supplements - Recommendations for Adults
   - Ecological Medicine
   - General Dietary Advice
   - Exercise for Health
   - Stress Management - Relaxation Essentials
   - Management of Gastrointestinal Problems
   - Management of Osteoarthritis
   - Management of Osteoporosis
   - Management of Ischaemic Heart Disease
   - Management of Hyperlipidaemia
   - Hypothyroidism
   - Calcium Deficiency
   - Magnesium Deficiency
   - Zinc Deficiency
   - Iodine
   - Boron
   - Strontium

4. Supplement Sources:
   - Solgar products are stocked by many health food shops
   - Other makes are available from larger specialist stockists such as:
     - The Nutri Centre 0845 602 6744 www.nutricentre.com
     - The Vitamin Service 0800 652 7855 www.thevitaminservice.com
     - The Natural Dispensary Ltd 01453 757792 http://naturaldispensary.co.uk
     - Nutri 0800 212742 www.nutri-online1.co.uk