VITAMIN D

Other names Alfacalcidol, calcifediol, calciferol, calcitriol, colecalciferol, ergocalciferol, vitamin D_2, vitamin D_3

Availability
Vitamin D is available without prescription in a variety of multivitamin and mineral preparations. Injections and some oral preparations are given only under medical supervision.

Actions on the body
Vitamin D (together with parathyroid hormone) helps regulate the balance of calcium and phosphate in the body. It aids in the absorption of calcium from the intestinal tract, and is essential for strong bones and teeth.

Dietary and other natural sources
Margarine (to which vitamin D is added by law), oily fish (tuna, sardines, herring, and salmon), liver, dairy products, and egg yolks are usually good sources of this vitamin. It is also formed by the action of ultraviolet rays in sunlight on chemicals naturally present in the skin. Sunlight is a major source of vitamin D for most people.

Normal daily requirement
The recommended daily amounts (RDA) for vitamin D are: 8.5mcg (birth–6 months); 7mcg (7 months–3 years); 10mcg (over 65 years, and women who are pregnant or breast-feeding). Most people outside these groups do not require dietary supplements of vitamin D. 1mcg of vitamin D equals 40 international units (IU).

When supplements are helpful
Vitamin D requirements are small and are usually met by dietary sources and normal exposure to sunlight. However, a poor diet and inadequate sunlight may lead to deficiency; dark-skinned people and night-shift workers are more at risk. In areas of moderate sunshine, supplements may be given to infants. Premature infants, strict vegetarians, vegans, and the elderly may benefit from supplements. Supplements are usually necessary on medical advice to prevent and treat vitamin D deficiency-related bone disorders, and for conditions in which absorption from the intestine is impaired, deficiency due to liver disease, certain kidney disorders, prolonged use of certain drugs, and genetic defects. They are also used in the treatment of hypoparathyroidism (inadequate secretion of parathyroid hormone). Supplements are recommended with other vitamins for pregnant women, children under 5 years, and nursing mothers, and with calcium to prevent or treat osteoporosis.

Symptoms of deficiency
Long-term deficiency leads to low blood levels of calcium (hypocalcaemia) and phosphate (hypophosphataemia), which results in softening of the bones. In children, this causes abnormal bone development (rickets) and, in adults, osteomalacia, causing backache, muscle weakness, bone pain, and fractures.

Dosage range for treating deficiency
In general, rickets caused by dietary deficiency is treated initially with 3,000–6,000 IU of vitamin D daily, depending on the age of the child, followed by a maintenance dose of 400 IU. Osteomalacia caused by deficiency of vitamin D is treated initially with 3,000–40,000 IU daily, followed by a daily maintenance dose of 400 IU. Deficiency caused by impaired intestinal absorption or liver disease is treated with 40,000 IU daily (adults) and 10,000–25,000 IU daily (children). Hypocalcaemia due to hypoparathyroidism is treated with doses of up to 100,000 IU. Simple deficiency is usually treated with oral supplements of 400 IU.

Symptoms and risks of excessive intake
Doses of over 400 IU are not beneficial in most people (unless they have a poor diet or limited exposure to sunlight, when 800 IU per day may be needed) and may increase the risk of adverse effects. Prolonged excessive use disrupts the balance of calcium and phosphate and may lead to abnormal calcium deposits in the soft tissues, blood vessel walls, and kidneys, and retarded growth in children. Excess calcium may lead to symptoms such as weakness, increased urination, thirst, gastrointestinal disturbances, and depression.

VITAMIN E

Other names Alpha tocopherol, alpha tocopheryl acetate, tocopherol, tocopherols

Availability
Vitamin E is available without prescription in many single-ingredient and multivitamin and mineral preparations. It is also included in skin creams. Alpha tocopherol is the most powerful form.

Actions on the body
Vitamin E, a potent anti-oxidant, is vital for healthy cell structure, for slowing the effects of the ageing process on cells, and for maintaining the activities of certain enzymes. Vitamin E protects the lungs and other tissues from damage caused by pollutants, and protects red blood cells against destruction by poisons in the bloodstream. It also helps to maintain healthy red blood cells, and is involved in the production of energy in the heart and muscles.

Dietary and other natural sources
Some vegetable oils are good sources. Other sources rich in this vitamin include leafy green vegetables, wholemeal cereals, and wheat germ.

Normal daily requirement
Vitamin E is measured in milligrams of alpha-tocopherol equivalents (mg alpha-TE). Approximately 3–15mg daily are recommended. However, no UK recommendations have been made as vitamin E requirement depends on intake of polyunsaturated fatty acid, which varies widely. Recommended daily allowances (RDA) in the USA are: 3mg alpha-TE (birth–6 months); 4mg alpha-TE (7–12 months); 6mg alpha-TE (1–3 years); 7mg alpha-TE (4–10 years); 10mg alpha–TE (males aged 11 and over); 8mg alpha-TE (females aged 11 and over); 10mg alpha-TE (pregnancy); 12mg alpha-TE (first 6 months of breast-feeding); and 11mg alpha-TE (second 6 months of breast-feeding).

When supplements are helpful
A normal diet supplies adequate amounts of vitamin E, and supplements are rarely necessary. However, people who consume large amounts of polyunsaturated fats in vegetable oils, especially if used in cooking at high temperatures, may need supplements. Supplements of vitamin E are also recommended for premature infants and people with impaired intestinal absorption, liver disease in children, or cystic fibrosis.

Symptoms of deficiency
Vitamin E deficiency leads to destruction of red blood cells (haemolysis) and eventually anaemia (abnormally low levels of red blood cells), symptoms of which may include pallor, fatigue, shortness of breath, and palpitations. In infants, deficiency may cause irritability and fluid retention.

Dosage range for treating deficiency
Doses are generally four to five times the RDA in adults and children, for the relevant sex and age group.

Symptoms and risks of excessive intake
Harmful effects are rare, but there is a risk of diarrhoea and abdominal pain with doses of more than 1g per day. Prolonged use of over 250mg daily may lead to nausea, abdominal pain, vomiting, and diarrhoea. Long-term use of over 400mg daily has been linked to an increased risk of certain types of cancer.