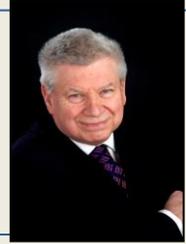


Medicine for Managers

Dr Paul Lambden BSc MB BS BDS FDSRCS MRCS LRCP DRCOG MHSM



Do I really need Vitamins?

Watch the television any week and there are advertisements for vitamins and minerals. Young, healthy, fit looking men and women parade themselves and attribute their physique and stamina to the bottles of vitamins they take daily to keep themselves in peak condition. But is it true? Without these tablets are we doomed to gradual decline and deterioration?

So what are vitamins? They are:

- Organic compounds
- Required in small amounts
- Cannot be manufactured in the body
- Different vitamins have different functions, e.g.
 - May act as hormones
 - May regulate a bodily function
 - May promote tissue growth

The ancient Egyptians were aware of the actions of vitamins and knew, for instance, that raw liver would treat night-blindness. In 1747 James Lind discovered that citrus fruits (e.g. limes) prevented scurvy in sailors (hence British sailors being called '*Limeys*').

During the eighteenth and nineteenth centuries the existence of vitamins was inferred by the recognition of diseases which occurred in the absence of particular agents. In 1910 the first vitamin complex was identified by Suzuki in Japan and in 1912 Funk prepared the first

'*vitamine*', the name for which he derived from the words 'vital amine'. The last 'e' was subsequently dropped. Most vitamins known today were discovered between 1915 and 1940.

Vitamins can be classified into two types, those which are water soluble and those which are fat soluble. The distinction is significant.

Water soluble vitamins are not stored in the body and therefore must be eaten regularly. They are found in vegetables, some types of grain and fruit. Consumption of raw fruit and vegetables is a good source because cooking and soaking may cause the vitamins to be lost. In general there is no disease of overdose with the water soluble vitamins because, if the body takes too much, it is passed out in the urine. The water soluble vitamins are ***B complex and C***

Fat soluble vitamins can be stored in the body, often in sufficient quantities to last a long time. These vitamins are found in fatty foods such as vegetable oil, butter, lard, other dairy products,

liver and oily fish. Although they can be stored, if present in too great quantities, they may cause diseases of excess. The fat soluble vitamins are A, D, E and K.

The Fat Soluble Vitamins:

Vitamin A

Vitamin A is associated with keeping the skin and mucous membranes healthy. It also helps vision in dim light and it improves the immune response. In the eye, the vitamin in the form of retinal is involved in the formation of a light sensitive molecule required for low light and colour vision. It is found in the orange pigment beta-carotene in carrots, hence the recommendation for Battle of Britain pilots to eat carrots for night vision during the war. The effect of vitamin A in maintaining normal healthy skin is not fully understood but it seems to control oil production and reduce infection.

Deficiency results in visual impairment and increase in skin infections. Excess can cause hypervitaminosis A, a condition associated with nausea, blurred vision, headache, hair loss, dry skin, bone fractures and fatigue. Famously, arctic explorers became severely ill after eating polar bear liver and antarctic explorers Mawson and Mertz were poisoned when they ate the livers of their sled dogs.

Good sources of Vitamin A include cheese and eggs, fortified spreads and yoghourts.

The recommended daily intake is 0.6 mg for women and 0.7 mg for men.

Care should be taken not to take too much vitamin A supplement and it should be avoided

during pregnancy because it can harm an unborn baby.

Vitamin D

Vitamin D is manufactured in the skin when exposed to sunlight. It is also found in some food stuffs such as eggs, fortified fat spreads and oily fish such as salmon and mackerel. Most people are not deficient in vitamin D if they enjoy the summer sun and eat a balanced diet.

Therefore those people who are at risk of vitamin D deficiency include the elderly (with a poor diet), those people whose dress covers the body from head to toe, those people with dark skin (e.g. Afro-Caribbean) and babies.

Vitamin D supplements are available for those groups which are at risk of deficiency. Excess vitamin D causes hypervitaminosis D which results in weakness, irritability, constipation, general feelings of being unwell together with, in prolonged cases, hypertension, overcalcification of bones, soft tissues, heart and kidneys.

The condition results from too much supplementation rather than by exposure to sun.

Vitamin E

The importance of vitamin E has been established in detail in the last thirty years. It maintains cell structure by protecting cell membranes.

It is present in foods such as nuts and seeds, cereals and soya, corn and olive oil. Vitamin E may be taken as a supplement and has been

found to be helpful in treating pre-menstrual syndrome in some women, marketed as oil of evening primrose. It is a fat soluble vitamin but there is scant evidence to know whether, if any, disease of excess exists.

Vitamin K

Vitamin K is a component of the blood clotting mechanism and may also be involved in bone formation.

This vitamin is the argument for encouraging children to eat their greens because it is found in green vegetables including cabbage, broccoli and spinach as well as vegetable oils and cereals.

Therefore deficiency is very unlikely with a balanced diet. Furthermore, if excess vitamin K is consumed it is stored in the liver. Details of the disease of excess are not clearly understood.

The Water Soluble Vitamins

The B complex of vitamins and vitamin C are the water soluble vitamins.

Deficiency of many of them results in often serious diseases but diseases of excess are not generally known. Some vitamins have been reclassified as part of the B group and so:

Vitamin G Riboflavin reclassified as Vitamin B₂

Vitamin H Biotin reclassified as Vitamin B₇

Vitamin J reclassified as Vitamin B₂

Vitamin M Folic Acid reclassified as Vitamin B₉

Vitamin PP Niacin reclassified as Vitamin B₃

Vitamin B₁

Also known as **thiamine**, the vitamin has a central role in the production of energy in response to demand, in metabolism, in nerve conduction and in the production of nucleic acids (RNA and DNA). It is found in a host of fresh foods including vegetables, eggs, fruit, wholemeal bread and cereals and liver. Normally all bodily requirements are obtained from the diet.

Deficiency of thiamine causes **beri beri** which is a disease of the nervous system, with weight loss, emotional disturbances, weakness, heart failure and ultimately death. Chronic deficiency, seen in alcoholics, may cause Korsakoff's syndrome which consists of dementia (amnesia and confabulation).

Vitamin B₂

Also known as **riboflavin**, is important in energy production, the citric acid cycle (for those who still remember A level chemistry) and the breakdown of fatty acids. It is found in milk, eggs and rice and fortified breakfast cereals.

Deficiency of riboflavin results in glossitis (inflammation of the tongue) and cheilitis (inflammation of the angles of the mouth), dermatitis and sore throat (pharyngitis). Riboflavin is not stored in the body so it is required in the diet on a daily basis.

Vitamin B₃

Also known as **niacin**, it is composed of nicotinic acid and nicotinamide. In combination with another molecule the vitamin is involved in the metabolism of glucose, fat and alcohol. It also joins in the citric acid cycle (you may have to

look this up!). It is found in meat, fish, flour, eggs and milk. In combination with the amino acid tryptophan deficiency of niacin causes **pellagra**, which is associated with insomnia, weakness, mental confusion, dermatitis, diarrhoea and, in advanced cases, dementia and death (the four 'd's). However, there should be sufficient niacin in the daily diet without any need for supplementation. It is reported that chronic overdose of niacin may lead to facial flushing and possibly liver damage.

Vitamin B₅

Vitamin B₅ is **panthothenic acid** which is involved in oxidation processes in the synthesis of amino acids, fatty acids, ketones, cholesterol, steroid hormones and antibodies. It is widely available in foods including chicken, eggs, tomatoes and broccoli, beef and potatoes. It would be very unusual to become deficient. Deficiency symptoms are therefore rare but present as acne and paraesthesia (tingling in the limbs).

Vitamin B₆

Pyridoxine has a number of key functions. It serves as a co-factor in many enzyme reactions including energy storage of protein and carbohydrate and amino acid synthesis. It is also a factor in the formation of haemoglobin and biosynthesis of neuro-transmitters. It is found in poultry and fish, bread and cereals, some meats including pork, some nuts and vegetables, eggs milk and potatoes.

It is plentiful in a normal well-balanced diet. In the UK deficiency is usually only seen in the elderly, alcoholics and sometimes in those with liver disease, rheumatoid arthritis and infection

with HIV. Deficiency may produce a clinical picture not unlike that of ribflavin deficiency with glossitis, angular cheilitis, dermatitis, conjunctivitis and neuritis. Patients may also become anaemic.

Treatment, as with other vitamin B deficiencies, is by pyridoxine replacement.

Vitamin B₇

This vitamin, also called **biotin**, is crucial in metabolism of fats, proteins and carbohydrates and also in their synthesis. It appears to have no harmful effects or disease of deficiency in adults but it can cause impaired growth and neurological disorders in infants.

It is to be found in all the usual places; vegetables such as broccoli, cabbage, cauliflower, fruits such as bananas, strawberries, raspberries and watermelon, nuts and grains such as almonds, peanuts and walnuts, meat and fish especially liver but also beef, chicken and salmon, sardines, haddock and tuna, and also eggs and dairy products.

Deficiency of this vitamin is most unlikely

Vitamin B₉

Vitamin B₉ is better known as **folic acid** or **folate** and will be well-known to pregnant mothers, not because it is involved in single-carbon units in metabolism of nucleic acids, but simply because they know their developing infant needs it for normal cell division.

Folate is also valuable in red blood cell production. It is found naturally in a variety of green vegetables, brown rice and fortified

breakfast cereals. Deficiency of folic acid in pregnant women can result in birth defects, which is why supplementation is often recommended.

It can also lead to the development of macrocytic anaemia (a condition where red blood cells are abnormally large but contain less haemoglobin resulting in anaemia).

If taken in excess the vitamin may mask the damaging effects of vitamin B12 deficiency resulting in the development of nerve damage.

Vitamin B₁₂

This is another vitamin which may be better known by its other name, used when prescribed, of ***cyanocobalamin***.

It is very important being essential for the production of blood cells in bone marrow, for nerve sheaths and proteins and in the metabolism of carbohydrates, proteins and lipids.

It is found in meat, fish, eggs cheese and the ubiquitous fortified breakfast cereals. Deficiency results in macrocytic anaemia, nerve damage, memory loss (especially in the elderly), mania and psychosis. In rare cases even paralysis may occur. In overdose, the worst that appears to happen is the development of an acne-like rash.

Vitamin C

Often known as ***ascorbic acid***, vitamin C has a range of important functions. It is essential in the human diet and vitamin C is a powerful anti-oxidant. It is vital for the formation of collagen

and neurotransmitters. It enables the production of a host of enzymes involved in many activities throughout the body. It also has an effect on hormones such as noradrenaline and peptide hormone.

Apart from its absence having consequential effects on the functions above, there is some evidence that it might protect to some extent against lung cancer and stroke. Research into the effect of the vitamin has resulted in conflicting findings in respect of its benefits in rheumatoid arthritis, cancer and even the common cold.

Deficiency of vitamin C results in scurvy, where manufactured collagen (the strong fibres which are found in ligaments, tendons, and even holding the teeth in their sockets) is too unstable to perform its function.

The result is weakening of tendons, deterioration of the skin, spongy gums, loss of teeth and bleeding from soft tissues (mucous membranes) resulting in pallor, depression and immobility, together with suppurating wounds and, unless treated, ultimately death.

Vitamin C is also found in immune cells and tissue levels drop quickly during infection. Its mode of action is obscure but it is thought to be involved with the activities of phagocytes (engulfing white cells), the production of lymphocytes and the number of cell adhesions in monocytes.

Those people with a normal balanced diet will ingest plenty of vitamin C and it is found in a

wide range of fresh fruit and vegetables. The required daily intake is about 40 mg. Taking excess Vitamin C will result in flatulence, diarrhoea and abdominal pain.

The symptoms do disappear when the intake of ascorbic acid is reduced.

So, their quantities are small in terms of daily intake. Yet their contribution to bodily function and wellbeing is considerable.

In addition the body needs a selection of minerals and trace elements for optimal function.

These requirements will be considered in a future *Medicine for Managers*.

paullambden@compuserve.com