Multivitamins: Be Aware

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My elder daughter won a place at Bristol University to read English. She decided, (as you do) a few weeks before the start of term, that this was a mistake. She proposed not matriculating at all, but after a little parental counselling which involved whips, thumb screws and slow fire, she converted to a degree in German and Spanish. Part of the course involved a year abroad, with six months' practice in each language. It proved surprisingly difficult to arrange a placement in Germany. I broke my unvarying rule and used influence, negotiating a work placement with a very reputable drug firm with whose owner I had had close contact over many years in connection with research.

When her German colleagues learned how she had got the post they told her that the colloquial term for this privileged arrangement was that she had the benefit of "vitamin B". Over-manning was endemic in the country, and there was amused acceptance of another supernumerary.

When I heard this it made me think about what vitamin B really is. The answer is legion, and not nearly as easy as you might think, though there is general agreement that they are water soluble micro-nutrients which are essential components of the diet. Vitamins importantly run through the alphabet from A to D, with a question mark over E, serious doubt over F to J, and downright scepticism after K. When advertisements promote products as being rich in vitamins Q, X and Z you know you are in the hands of charlatans.

The best B vitamins have their own names as well as a number. B1 is thiamine, lack of which is one of the most clinically significant deficiencies. This is often combined with lack of other vitamins, but treatment with thiamine alone can be spectacularly effective in appropriate cases. Poor diet, especially in alcoholics and those whose diet is largely polished rice, is generally the cause. It says in the textbooks that you can prove the diagnosis by means of red cell transketolase activity. Biochemists agree, but won't do the test. Thiamine deficiency causes two distinct problems. Wet beri-beri is heart failure and can respond with a dramatic diuresis to intravenous thiamine. Dry beri-beri is peripheral neuropathy, whose resolution on therapy is often incomplete.

Pharmacological doses of thiamine are also useful in the autosomal recessive disorder Roger's syndrome (diabetes insipidus, diabetes mellitus, optic atrophy, deafness and megaloblastic anaemia - DIDMOAD).

B2 is riboflavin, as it tells you on the cornflakes packet. Deficiency is blamed for stomatitis and mental changes, but does not seem to occur frequently alone.

B3 is an informal name sometimes used for nicotinic acid. Lack of this leads to a very distinct syndrome with light sensitive pigmented dermatitis of the hands, diarrhoea, and dementia.

B5 is pantothenic acid and B7 is biotin: their relevance to humans is shadowy. B4, B8 to 11 do not make it into medical textbooks, but B6 is pyridoxine. As well as dietary insufficiency the use of isoniazid in TB can cause problems with its metabolism and lead to peripheral neuropathy. Not only has pyridoxine replacement been used to treat patients, larger

doses were given for the nausea of pregnancy. This was always a dubious indication, and was abandoned when questions of theoretical adverse effects were raised. The maternity pharmacopoeia manages quite well without it. Very large doses are helpful in some forms of sideroblastic anaemia and peri-menstrual symptoms, but needs to be used cautiously as prolonged use can actually cause peripheral neuropathy.

B12 is cyanocobalamin, and deficiency is treated with synthetic hydroxocobalamin. Untreated deficiencies are very serious diseases leading to severe megaloblastic anaemia and profound damage to the spinal cord and peripheral nerves (sub-acute combined degeneration). Also tobacco users are reported to develop poor vision through interference with B12 metabolism.

Considering how important this vitamin is it is astonishing what difficulties are placed in the way of the body obtaining a supply. It is only found in animal foods such as meat and dairy products, emphasising that mankind is naturally carnivorous. Strict vegans have to take B12 supplements to avoid deficiency which would otherwise inevitably occur. Vegetarians, however, would be freely supplied from milk, butter and cheese.

B12 in the diet is complexed with R protein and cannot be assimilated in that state. It can only be absorbed in the terminal ileum after complexes are formed with intrinsic factor, which is itself only manufactured in the stomach. Absorption can only occur after the B12-R protein complex has been cleaved by pancreatic protease in the proximal small intestine. Therefore, normal food and a healthy stomach, pancreas and terminal ileum are each essential to the process of B12 absorption. Fortunately the liver has a large store of B12, so that when patients develop the auto-immune gastritis of pernicious anaemia (PA) their health is protected for years and doctors have a reasonable chance of diagnosis and treatment.

It is important to get it right, because the reason it is called PA is that patients used to die of it before therapy was discovered. The first management was to eat large quantities of raw liver so that huge amounts of B12 would swamp the system and lead to sufficient absorption to cure problems. Parenteral therapy with liver extract injections came next, and then extracted B12 from animal sources, and currently synthetic hydroxocobalamin in milligram quantities are used. If deficiency is dietary in vegans microgram quantities in the diet should work, though PA and sub-acute combined degeneration are such devastating illnesses that doctors prefer to use parenteral therapy to be sure of an effect.

Folic acid is another B group vitamin, which is confusingly sometimes referred to as vitamin M. It is important for growth and blood formation, and can cause a macrocytic anaemia which can be confounded with pernicious anaemia, so that B12 estimation is prudent before starting therapy with folate. Deficiency may occur in those who avoid green vegetables and is seen in coeliac disease and pregnancy. Routine supplements are given in pregnancy which are known to reduce the likelihood of neural tube defects in the fetus, and also the likelihood of low birth weight.

Vitamin abuse is also seen. "B17" is laetrile, found in apricot stones. It had an undeserved reputation in cancer therapy. Because the Food and Drugs Administration would not allow its promotion in the United States, clinics were set up just over the border in Mexico, to

which sad and desperate patients would travel. Happily this seems now to have been discredited, though I don't doubt that it is available somewhere via the internet.

More frequent, and not necessarily harmful, is routine supplementation of diet with multi-vitamins "to protect health". This is a nonsense in adults who eat a normal mixed diet, and is an unnecessary expense and complication in life, as my thrifty Yorkshire biochemist brother-in-law observes. It is, however, common in the United Kingdom and seems to be universal practice in the US, where those who do not follow the trend are thought to be peculiar. Not using multi vitamin tablets is ranked with smoking, high egg diets, and drunk driving in a scale of self-destructive behaviour!

More seriously multi-vitamin and thiamine use is often thought to have magical protective powers. Alcoholics and their doctors are often persuaded to use the therapy as a substitute for abstaining and eating properly. Though high dose parenteral B vitamin therapy may have a role in acute alcoholic brain disease, generally the best plan is to obtain energy from other sources than ethanol in the diet, and the problem will correct itself.

Readers - next week the mega dose vitamin C for cold prevention, catastrophe; and the fat-soluble vitamin anecdotes, featuring polar bear liver, sunshine, and rat fertility!