

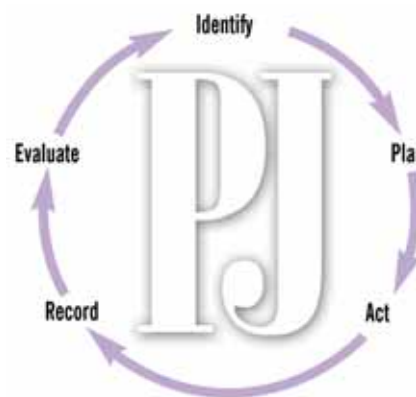
BNF multivitamin preparations

Pamela Mason looks at the seven multivitamin products listed in the British National Formulary

The multivitamin section in the current British National Formulary (section 9.6.7) contains just seven products compared with 23 in BNF 6 (1983). Vitamins were one of the categories affected by the introduction of a limited prescribing list in 1985 and fewer products were included on the “white list”. Sejal Amin, staff editor on the BNF, comments: “The reason that only seven multivitamin preparations appear in the BNF is because they are not blacklisted and are commonly prescribed. There are many multivitamin preparations available over the counter, however the BNF does not include details of products sold OTC and promoted to the public. Moreover, the BNF takes the view that vitamin supplementation is rarely necessary and that, in deficiency, a specific vitamin can be prescribed as needed but attention should probably focus on diet.”



Vitamins capsules contain six vitamins



Identify knowledge gaps

1. How do Forceval capsules compare with OTC multivitamin and mineral products?
2. Could you explain to a patient or customer what inositol and biotin are?
3. What are the Department of Health recommendations for vitamin supplementation?

Before reading on, think about how this article may help you to do your job better. The Royal Pharmaceutical Society’s areas of competence for pharmacists are listed in “Plan and record”, (available at: www.rpsgb.org/education). This article relates to “health education and promotion” (see appendix 4 of “Plan and record”).

Products

BNF 53 lists three general multivitamin products (Vitamins capsules, Abidec and Dalivit) and four products for use as supplements and adjuncts to synthetic diets (Forceval, Forceval Junior, Ketovite tablets and Ketovite liquid). The term “synthetic diet” covers tube feeds, sip feeds and oral energy supplements. The vitamin and mineral content of these products is shown in the Table. Some contain fewer vitamins and minerals than many OTC

Contents of multivitamin preparations listed in the British National Formulary

Vitamin/mineral	Vitamins capsules	Abidec drops	Dalivit drops	Forceval capsules	Forceval Junior	Ketovite tablets	Ketovite liquid
Vitamin A (µg)	800	400	1,500	750	375	-	750
Thiamine (mg)	1	0.4	1	1.2	1.5	1	-
Riboflavin (mg)	0.5	0.8	0.4	1.6	1	1	-
Nicotinamide (mg)	7.5	8	5	18	7.5	3.3	-
Folic acid (µg)	-	-	-	400	100	250	-
Pyridoxine (mg)	-	0.8	0.5	2	1	0.33	-
Cyanocobalamin (µg)	-	-	-	3	2	-	12.5
Pantothenic acid (mg)	-	-	-	4	2	1.16	-
Biotin (µg)	-	-	-	100	50	170	-
Inositol (mg)	-	-	-	-	-	50	-
Choline (mg)	-	-	-	-	-	-	150
Vitamin C (mg)	15	40	50	60	25	16.6	-
Vitamin D (µg)	7.5	10	10	10	5	-	10
Vitamin E (mg)	-	-	-	10	5	5	-
Vitamin K (µg)	-	-	-	-	25	500	-
Calcium (mg)	-	-	-	100	-	-	-
Chromium (µg)	-	-	-	200	50	-	-
Copper (mg)	-	-	-	2	1	-	-
Iodine (µg)	-	-	-	140	75	-	-
Iron (mg)	-	-	-	12	5	-	-
Magnesium (mg)	-	-	-	30	1	-	-
Manganese (mg)	-	-	-	3	1.25	-	-
Molybdenum (µg)	-	-	-	250	50	-	-
Phosphorus (mg)	-	-	-	77	-	-	-
Potassium (mg)	-	-	-	4	-	-	-
Selenium (µg)	-	-	-	50	25	-	-
Zinc (mg)	-	-	-	15	5	-	-

Panel 1: Functions of vitamins in multivitamin products listed in the BNF

Vitamin A This vitamin is required for normal development and differentiation of tissues. In the retina, it serves as the light gathering part of the visual pigments. Vitamin A can be obtained from two forms: retinol (preformed vitamin A) and carotenoids (eg, beta-carotene), which can be cleaved in the body to give retinol.

Retinol is found mainly in liver, but also in whole milk, butter, cheese, egg yolks and fish liver oils. In the UK, up to a third of dietary vitamin A is derived from carotenoids, mainly from fruits and vegetables. Vitamin A deficiency is common in some developing countries, particularly in young children. The most obvious signs of deficiency are dryness of the conjunctiva and cornea. An early sign of deficiency is night blindness.

B group vitamins

Thiamine (vitamin B₁) is an essential cofactor in carbohydrate, fat and alcohol metabolism. Good sources are breakfast cereals, grains and pork. People with diets high in carbohydrate require more thiamine than those with diets high in fat. Deficiency disease (beri-beri) is found in people whose dietary energy is derived mainly from carbohydrate and in people with chronic alcoholism who consume almost no food.

Riboflavin (vitamin B₂) plays an essential role in all the oxidative processes in the body. Good sources are offal, dairy produce and green vegetables. Deficiency can result in fissuring at the corners of the mouth, a red, inflamed tongue, seborrhoeic skin lesions, surface lesions of the genitalia and vascularisation of the cornea.

Niacin is the generic name for two chemicals, nicotinic acid and nicotinamide, which function as the reactive parts of nicotinamide dinucleotide (NAD) and nicotinamide adenine dinucleotide phosphate (NADP), needed in reduction and oxidation reactions. Niacin is of central importance in releasing energy from food components. It can be found in many foods, including meat, fish and wholegrain cereals. It can also be synthesised from tryptophan (found in eggs and cheese). Niacin deficiency (pellagra) is rare and found in people who eat only maize (eg, in parts of Africa). Classic features are dermatitis, diarrhoea and dementia.

Folic acid is the parent molecule for a large number of derivatives collectively known as folates. These are involved in a number of single carbon transfer reactions, especially in the synthesis of purines, pyrimidines, glycine and methionine. The characteristic sign of folate deficiency is megaloblastic anaemia. In adults, other rapidly regenerating tissues (eg, intestinal mucosa) are affected, while in babies and young children, growth can be

affected. Good food sources are liver, yeast extract and green leafy vegetables. The Food Standards Agency has recommended that bread or flour is fortified with folic acid to ensure an adequate intake in women during their reproductive years.

Pyridoxine (the main form of vitamin B₆) acts as a cofactor for a large number of enzymes important in protein metabolism. It is widely found in plant and animal foodstuffs and dietary deficiency is rare. Some drugs (eg, isoniazid, hydralazine and penicillamine) can cause vitamin B₆ deficiency.

Vitamin B₁₂ (cyanocobalamin) is involved in the recycling of folate coenzymes through involvement in methionine synthesis and degradation of valine. Deficiency results in megaloblastic anaemia. Vitamin B₁₂ is also needed for nerve myelination, and prolonged deficiency leads to irreversible neurological damage. Food sources include almost all animal products and some seaweeds. Green plants do not contain vitamin B₁₂. Some cereals are fortified with the vitamin.

Pantothenic acid is a part of the coenzyme A molecule that is essential in the production of energy from food. It is widely distributed in plant and animal foods and deficiency in humans has not been reported.

Biotin (once known as vitamin H) is involved in a number of carboxylase reactions. It occurs in many foodstuffs. Deficiency is rare but has been reported in patients receiving long-term parenteral nutrition.

Vitamin C This vitamin is a powerful antioxidant, its main role being to control the redox potential within cells. It is involved in the hydroxylation of proline to hydroxyproline, which is necessary for the formation of collagen. It helps in wound healing and deficiency results in scurvy. It also helps in the absorption of iron from plants. The best food sources are citrus fruits, soft fruits, vegetables and potatoes.

Vitamin D This vitamin is involved in calcium homeostasis and it also appears to have a direct effect on bone. There are two main forms of vitamin D: ergocalciferol (vitamin D₂) and colecalciferol (vitamin D₃). The active form of vitamin D is 1,25-dihydroxyvitamin D, which is formed in the kidneys (see *PJ*, 19 August 2006, pp227–30). Deficiency of vitamin D causes rickets in children, cases of which appear in the UK in children in poor urban areas and with dark skins. In adults, deficiency presents as osteomalacia. Low vitamin D levels are increasingly linked with a range of diseases, such as heart disease, diabetes, some cancers and multiple sclerosis. There are few dietary sources of vitamin D except oily fish and eggs. Some foods are fortified with the vitamin.

Vitamin E This vitamin is an antioxidant. Deficiency is rare. There are two series of compounds with vitamin E activity. (The most important are the tocopherols while the tocotrienols are less potent.) Good food sources include nuts, seeds, oils, wheatgerm and wholegrains. Deficiency has been implicated in cardiovascular disease, cancer and Alzheimer's disease. Studies have shown that vitamin E prevents atherosclerosis and oxidation of low density lipoprotein cholesterol, but there is no convincing evidence that supplementation can prevent cardiovascular disease.

Vitamin K This vitamin is essential for the formation of prothrombin and other coagulation factors. It is also essential for the formation of proteins that bind calcium and function in bone formation. Deficiency leads to delayed blood clotting time and haemorrhagic tendency. Vitamin K is found mainly in green vegetables and is synthesised in the intestine by bacteria. Infants are susceptible to vitamin K deficiency because of small prenatal stores and inadequate intestinal flora for synthesis. In adults, deficiency is rare but it may occur in fat malabsorption, biliary obstruction, liver dysfunction and in prolonged treatment with broad spectrum antibiotics or anticoagulants.

Inositol and choline

Inositol and choline are not classified as vitamins. Inositol is a component of phospholipids but no demonstrable requirement has been shown in humans. Inositol is found in foods but it can also be synthesised in the body. It is involved in cell membrane function, lipid transport and neurological function. Supplementation has been reported to be beneficial in Alzheimer's disease and depression, but further research is needed.

Choline is a component of phosphatidylcholine and a constituent of dietary lecithin. It is an essential nutrient for several animals, but there is no agreement over its importance for humans. In the US, dietary reference intakes have been set (550mg/day for men and 425mg/day for women). Good food sources are brewer's yeast, egg yolk, liver, wheatgerm, oats, soya beans and kidney. Choline is also a component of acetylcholine, lecithin, sphingomyelin, cell membranes, plasma lipoproteins and platelet activating factor. Lecithin and sphingomyelin participate in signal transduction, an essential process for cell growth, regulation and function.

products. A summary of the functions of the vitamins found in the seven products, and their dietary sources, is given in Panel 1.

Vitamins capsules Vitamins capsules contain six vitamins: vitamin A, thiamine, riboflavin, nicotinamide, vitamin C and vitamin D. The most recent National Diet and Nutrition Survey in British adults, published in 2003, found that some adults did not achieve the reference nutrient intake (RNI) for all six of these vitamins. However, poor nutritional intakes were also found for minerals and trace elements, particularly in young women, so a person at risk of deficiency of the six vitamins is also likely to need supplementation with minerals and trace elements.

Abidec Abidec drops contain A, C, D and B vitamins and are suitable for infants and young children. Until January 2007, as well as being prescribed they were distributed under the Government's Healthy Start Initiative (previously the Welfare Food Scheme). However, under this initiative, Abidec drops have now been replaced by an NHS-branded product Healthy Start Children's Vitamin Drops (see Panel 2), although they are still prescribable.

Abidec drops contain refined arachis oil. The summary of product characteristics contraindicates their use in people who are allergic to peanuts and, because there is a possible link between peanut allergy and allergy to soya, those who are allergic to soya should also avoid Abidec. There have been concerns over whether Abidec can increase the risk of a child developing peanut allergy but the Committee on Safety of Medicines has advised that there is currently insufficient evidence to conclude that exposure to products containing refined arachis oil leads to sensitisation to peanut protein.

Dalivit Dalivit liquid contains more vitamin A (1,666µg per 0.6ml dose) than Abidec (444µg per 0.6ml). It was initially developed for pre-term babies, but it is also suitable for elderly people and, according to the manufacturer, for anyone who requires nutritional support, particularly if they have difficulty swallowing. Fiona Seal, spokeswoman for manufacturer LPC, says that Dalivit tends to be prescribed by paediatricians, and doctors who care for the elderly and those in intensive care.

Dalivit does not contain arachis oil, but the amount of vitamin A in a dose exceeds the RNI for infants (7–12 months old; 350µg) and children (1–6 years old; 400µg). Dalivit is, therefore, not suitable for term infants or young children unless they have increased vitamin A requirements (eg, those with cystic fibrosis or malabsorption syndromes).

Forceval Forceval contains a wide range of vitamins and minerals. It is indicated as a therapeutic nutritional adjunct where the intake

Panel 2: Healthy Start vitamin supplements

The Department of Health has introduced Healthy Start vitamins to support its recommendations on supplements for women and young children. These are provided free to beneficiaries of the Healthy Start Scheme (ie, low-income pregnant women, new mothers and children). Two products are available: Healthy Start Children's Vitamin Drops and Healthy Start Vitamins for Women

Healthy Start Children's Vitamin Drops contain vitamins A and D, which the DoH recommends for infants and children. They also contain vitamin C, which is important in enhancing iron absorption in young children. (Families in low-income groups tend to have less vitamin C in their diets and up to 12 per cent of UK toddlers have iron-deficiency anaemia.) NHS trusts and health boards are responsible for making the supplement available, both free and for sale, for example, through health clinics and children's centres, direct from health care professionals or through an arrangement with an agent (eg, a local pharmacy).

Healthy Start Vitamins for Women offer 10µg of vitamin D together with 400µg of folic acid for pregnancy. It is also suitable for breast-feeding women. Seven drops of the children's vitamin drops (instead of the five-drop dose recommended for children) would also provide housebound older people with a cheap source of vitamin D. Healthy Start Vitamins for Women are not suitable for older people because the folic acid could mask anaemia due to vitamin B₁₂ deficiency.

or absorption of vitamins and minerals is sub-optimal (eg, anorexia, cancer cachexia), in convalescence from illness or surgery and in patients on special or restricted diets (eg, renal diets, exclusion diets for food intolerance) or synthetic diets (eg, in phenylketonuria, galactosaemia or ketogenic diets). Forceval Junior capsules contain smaller quantities of vitamins and minerals. They contain vitamin K but no calcium, phosphorus or potassium.

According to John Barber, director of scientific affairs at Alliance, Forceval is also prescribed for autistic children, the frail elderly, stroke patients, those suffering from dementia, patients with pressure sores, large wounds or ulcers, people who are going to have surgery and patients undergoing radiotherapy or chemotherapy, or both.

Ketovite Ketovite is intended for use in the prevention of vitamin deficiency in disorders of carbohydrate or amino acid metabolism as well as an adjunct in restricted or synthetic diets. The tablets and liquid contain different vitamins and are intended to be used in conjunction if complete vitamin supplementation is required.

BNF listed products versus OTC products

The only indication for multivitamin preparations on NHS prescription is to prevent or treat deficiency disease and the net cost of the 1.2 million NHS multivitamin prescriptions dispensed in 2005 was £2.5 million. By contrast, sales of multivitamins for general health in pharmacies and shops in the same year totalled £72 million.

The multivitamins in the BNF are licensed medicines, regulated by the Medicines and Healthcare products Regulatory Agency. OTC multivitamins are usually controlled instead by UK food law and EU legislation. Because supplements classed as foods do not require marketing authorisations, they do not have to go through such rigorous clinical trials and are, therefore, cheaper to put on the

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market than medicines. The retail price of Forceval is 23p per daily dose while the price of various OTC products with many of the same vitamins and minerals (eg, Centrum, Sanatogen and Multibionta) is about 13p per daily dose.

OTC supplements in the UK have traditionally not been controlled by the same strict conditions of dosage, labelling, purity criteria and precision in levels of ingredients as medicines. Past reports from consumers association Which? have found some UK vitamin products varying in ingredient content from their labelled declarations.

The UK Health Food Manufacturers' Association developed guidelines for good manufacturing practice for producing food supplements in 1997 but adherence to these is voluntary.

The pharmacist's role

When asked about multivitamin supplements, pharmacists should first emphasise the importance of a diet based on healthy eating guidelines. This means a diet rich in starchy, fibrous carbohydrates (possibly limiting those with a high glycaemic index), and including plenty of fruit and vegetables. The diet should also be low in saturated and trans fat with moderate amounts of monounsaturates and polyunsaturates (including those of the omega-3 series). Consumption of sugar and salt should be minimised.

A multivitamin can help to bridge a nutritional gap in a diet that is lacking in vitamins, but supplements do not convert a poor diet into a good one. The Department of Health recommends non-prescription vitamin supplementation in the following circumstances:

- Vitamin A and D supplementation for breast-fed babies from the age of six months (or from one month if the mother's vitamin status is doubtful) until the age of five years
- Vitamin A and D supplementation for babies drinking infant formula from the age of six months when formula intake falls to below 500ml daily
- Folic acid supplementation (400µg daily) for any woman who could become pregnant, and until the 12th week of pregnancy
- Vitamin D supplementation (10µg daily) for pregnant and breast-feeding women, anyone over 65 years old and anyone who is housebound

Customers should also be made aware of the possibility of adverse effects if supplements are taken in excessive doses. The EU is to set maximum permitted levels of vitamins and minerals within the next two years. The UK Expert Vitamin and Mineral Group has published guidance on upper levels of intake for vitamins and minerals,¹ which can be used to guide people in their choice of supplements, particularly if they use more than one product (eg, a multivitamin, an antioxidant and fish liver oil).

Panel 3: Useful questions to ask customers

- Who is the supplement for? (Requirements for vitamins and minerals vary according to age, sex and physiological status, eg, pregnancy.)
- Why do you think you need a supplement? (The individual may have misconceptions about the need for and benefits of supplements that should be addressed.)
- What are your symptoms (if any) and how long have you had them? (The individual could have a serious underlying disorder that should be referred.)
- What do you eat? (A simple dietary assessment should be undertaken to give some indication as to whether vitamin and mineral deficiency is likely.)
- Is your diet restricted in any way? (Diets providing less than 1,500kcal/day, a recent change to vegetarianism or any type of restricted diet could increase the risk of vitamin and mineral deficiency.)
- Do you take any prescription or OTC medicines? (Consider possible drug-nutrient interactions.)
- Do you take other supplements or herbal medicines? (Consider the possibility of overdosage and interactions.)
- Do you suffer from any chronic illness? (Vitamin and mineral requirements may be higher in people with diabetes, coeliac disease, Crohn's disease or epilepsy) than in healthy people.)
- Are you pregnant or breast-feeding? (Vitamin and mineral requirements may be increased and it may be inadvisable to take some vitamins, eg, vitamin A, but advisable to take others, eg, folic acid.)
- Do you smoke? (Requirements for some vitamins, eg, vitamin C, may be increased.)
- How much alcohol do you drink? (Excessive alcohol consumption may lead to deficiency of B vitamins.)

Pharmacists should ask customers to be mindful of extravagantly worded claims and advertisements. The EU is currently working on the regulation of health claims for vitamins and minerals, but this will not apply to many products available on the internet.

In accordance with the Royal Pharmaceutical Society's Code of Ethics, pharmacists must take care not to give the impression that a vitamin supplement is efficacious when there is no evidence base. However, provided that a product is not harmful for an individual, freedom to use it should be respected. What is important is that people are able to make informed choices about the products they buy.

Panel 3 lists questions that pharmacists could ask to inform their recommendations about diet and supplement use. In making a recommendation, the following advice can also be given:

- In the absence of an indication for a specific nutrient, a balanced multivitamin or mineral product is normally preferable to one that contains one or two specific nutrients.
- Compare labels with recommended daily allowances (RDAs). Use a product that provides approximately 100 per cent of the RDA for as wide a range of vitamins and minerals as possible.
- Avoid high potency products. These increase the risk of toxicity.
- Claims such as "natural" and "organic" are not well regulated.

Action: practice points

Reading is only one way to undertake CPD and the Society will expect to see various approaches in a pharmacist's CPD portfolio.

1. Discuss with a colleague, which is the best multivitamin product.
2. Find out where Healthy Start vitamins are available in your area.
3. Make sure you know good food sources for each vitamin.

Evaluate

For your work to be presented as CPD, you need to evaluate your reading and any other activities. Answer the following questions: What have you learnt? How has it added value to your practice? (Have you applied this learning or had any feedback?) What will you do now and how will this be achieved?

References

1. Expert Vitamin and Mineral Group. Safe Upper Levels of Vitamins and Minerals. 2003.