

tion and eventually calcification.³ In addition, an underlying metabolic abnormality such as an inherent tendency to calcification has been postulated.^{1,5} The clinical presentation varies, from patients who are asymptomatic to those with symptoms and signs of raised intracranial pressure as well as seizures and mental retardation.^{1,3,5}

Surgical removal of the calcification is difficult.³ It should not be performed

routinely; instead, it should be reserved for patients who have progressive neurological abnormalities or evidence of increased intracranial pressure.

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HEALTH AND DRUG ALERTS

Too much of a good thing? Toxic effects of vitamin and mineral supplements

Reason for posting: Vitamin deficiency syndromes are uncommon in Western countries, but many patients consume over-the-counter vitamin and mineral supplements with the hope of improving their health and preventing disease.¹ Although the benefits of vitamin and mineral supplementation are commonly highlighted in both the professional and lay literature, their harmful effects often receive little attention. A recent review of 36 vitamins and minerals by the UK Food Standards Agency discussed the potential harms that can come from supplementation with some of these agents.²

The agents: For otherwise healthy individuals, daily consumption of a multivitamin is often recommended to round out a well-balanced diet.³⁻⁵ Although some specific supplements are routinely recommended for disease prevention (e.g., folic acid for women of child-bearing age to prevent neural

tube defects),⁶ it is beyond the scope of this column to review the potential benefits of vitamin and mineral supplementation.

Scientific bodies around the world regularly review and recommend the daily vitamin and mineral intake levels (now expressed as Dietary Reference Intakes), taking into account age, sex,

physiologic status (e.g., pregnancy) and concurrent disease states. Recommended intake levels are summarized in the purple pages of the *Compendium of Pharmaceuticals and Specialties*.⁷ Consumption of doses at or near the recommended levels (as is often, but not necessarily, the case for multivitamins⁸) is unlikely to cause harm, and some vita-

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Table 1: Potential toxic effects associated with selected vitamin supplements*

Vitamin†	Common food sources	Recommended intake for adults	Potential toxic effects associated with supplement
Vitamin A (retinol)	Liver, eggs, oily fish, fortified margarine and dairy products	900–1500 µg (3000–5000 IU)	Hepatotoxic effects, visual changes, hair and skin changes, teratogenic effects at intake > 10 000–15 000 IU/d; potential increased risk of hip fracture at intake > 5000 IU/d
Beta carotene (provitamin A)	Yellow and orange fruits and vegetables, green leafy vegetables	Not applicable	Risk of lung cancer among smokers and people with asbesthosis at intake > 33 000 IU/d; yellowing of skin, diarrhea and arthralgias
Vitamin C (ascorbic acid)	Citrus fruits, broccoli, kiwi, yams, strawberries, melons	60–90 mg	Diarrhea, gastric upset at intake > 2000 mg
Vitamin D	Liver, eggs, oily fish, fortified margarine and dairy products	10–25 µg (400–1000 IU)	Soft-tissue calcification or hypercalcemia at intake > 2000 IU
Vitamin E	Plant oils (soya, corn, olive), nuts, seeds, wheat germ	15–20 mg (22–30 IU)	Nausea, vomiting, diarrhea, possible antiplatelet effects, headache, fatigue and blurred vision at intake > 800 IU/d
Vitamin B ₆ (pyridoxine)	Poultry, fish, meat, nuts, legumes, whole grains, potatoes	1.3–2 mg	Sensory neuropathy, ataxia if regular intake > 200 mg/d
Vitamin B ₁₂ (cyanocobalamin)	Fish, meat, eggs, milk, some algae and seaweed	2.4–6 µg	No upper limit known
Niacin (vitamin B ₃)	Meat, eggs, milk, flours	14–20 mg	Vasodilation, gastrointestinal upset, hyperglycemia; potential interactions with statins, antihypertensive drugs; hepatotoxic effects may occur at intake > 3000 mg/d

*Compiled from information in references 1, 2, 3, 7 and 9.

†Vitamin K, which has an anticoagulant effect, is not available in Canadian multivitamin preparations and thus is not included in the table.

mins, such as thiamine and riboflavin, are relatively benign even at doses several times their recommended levels. However, high doses of some vitamins, especially when taken regularly, can be toxic (Table 1).

Minerals taken as supplements can also be toxic. For example, magnesium can cause diarrhea at doses above 400 mg/d; phosphorus can cause diarrhea at doses above 750 mg/d, and mild nausea and vomiting at lower doses; iron can cause constipation, nausea and vomiting, reduced zinc uptake, and iron overload in hemochromatosis; zinc can cause nausea and vomiting, immunosuppression and impaired copper uptake; and selenium at doses above 0.91 mg/d can cause brittle hair and nails, peripheral neuropathies and gastrointestinal upset.^{1,2}

What to do: Regular screening enquiries about the use and dose of vitamin and mineral supplements may help to optimize a patient's nutrient intake and avoid potential harm from inappropriate use of supplements (e.g., intake of beta carotene by smokers may increase the risk of lung cancer¹). The European Union recently moved to adopt strict labelling standards for vitamin and mineral supplements, including having manufacturers list the percentage of a person's daily intake that is represented by one dose of the product, as well as toxicity warnings when they are appropriate.¹⁰ It is unknown whether Canada will adopt similar standards.

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