would have on the girls at risk as a result of the publicity the decision was bound to receive. Furthermore, the least that might have been expected in these circumstances was clear and unambiguous new guidance. What we have got is a confused and muddled statement which reads more like an abstract ethical pronouncement than a principle which is likely to have important consequences to public health. Even those who agree with the decision must admit that it is "woolly." Those less charitably inclined will suspect the GMC of obfuscation.

The Children's Legal Centre has already written to the General Medical Council pointing out that the new guidance "displays a dangerous misunderstanding of what the Lords decided" and that "the publicity which it has received will already have done damage in a very sensitive area." The Brooke Advisory Centre has issued a statement that its clinics will not inform the parents, and it follows that girls at risk will be even less likely to consult their own family doctors, who are in the best position to deal with the problem.

The change is said to be based on legal advice, yet there is nothing in the House of Lords' decision on the Gillick case which supports it.[3] Indeed, Lord Fraser, whose judgment expressed the majority view, may have been too optimistic when he stated that "The medical profession have in modern times come to be entrusted with very wide discretionary powers going beyond the strict limits of clinical judgment, and, in my opinion there is nothing strange about entrusting them with this further responsibility, which they alone are in a position to discharge satisfactorily."[3]

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Secretary, BMA

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Regular Review

Toxicity of vitamins: complications of a health movement

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"Orthomolecular medicine"[1] has developed from the concept of orthomolecular psychiatry made respectable by Linus Pauling and defined by him as "the treatment of mental disease by the provision of the optimum molecular environment for the mind, especially the optimum concentrations of substances normally present in the human body."[2]

Such treatment is contrasted by its supporters with orthodox or "toximolecular" medicine—the addition of small quantities of highly potent chemicals not normally occurring in the body. When expressed in this way the approach has great popular appeal, and its advocates selectively emphasise its successes: for instance, Pauling cites the dietary treament of phenylketonuria as a triumph of orthomolecular medicine.

Megavitamin treatment is an offshoot of orthomolecular medicine in which symptoms are treated with massive doses of vitamins. The starting point was the argument that schizophrenia resembled the psychoses seen in pellagra (severe nicotinamide deficiency).[3] In an influential paper Pauling claimed that many psychiatric illnesses would turn out to be the products of specific biochemical abnormalities which could be corrected by massive supplementation of the diet. The treatment of pernicious anaemia with large doses of vitamin B_{12} is a non-psychiatric example of this pathological process and treatment; a specific deficiency can be shown in an uptake pathway, and the resulting illness can be treated with large doses of the naturally occurring vitamin so as to bypass the defect. It certainly represents a triumph of medicine—whether orthomolecular or otherwise.

Orthomolecular psychiatry is linked with the names of Pauling, Hoffer, and Osmond, who popularised its concepts in the later 1950s.[4,5] In 1975, however, a "task force on vitamin therapy in psychiatry" convened by the American Psychiatric Association published a thorough and damning report.[6] It noted that this approach to treatment had been broadened to include the use of neuroleptics, barbiturates, vitamins others than nicotinamide, other dietary supplements, and electroconvulsive therapy; it also noted that the proponents of the theory had not encouraged large, well designed controlled trials of such treatment. When trials of nicotinamide and NAD (its cofactor) had been conducted the results had been negative and, more worryingly, "not without hazard."

In reality megavitamin treatment is currently definitely justifiable for only a few conditions (see appendix I). By contrast, injudicious self medication with large doses of vitamins may cause severe toxic complications (see appendix II), including (most recently) sensory neuropathies in people taking pyridoxine (vitamin B_6), typically for premenstrual symptoms.[7] One study reported a 14 year old boy with possible autism who had been taking 3 g of vitamin B_6 a day.[6] Another report described severe sensory neuropathy in a 34 year old woman taking just over 500 mg a day.[8] Serious toxic effects of megavitamin treatment have been reported in substantial numbers in the United States both in adults treating themselves[9-12] and in children given treatment by presumably well intentioned adults.[13]

Nevertheless, ever more trials of megavitamin treatment in other conditions, such as learning difficulties in children,[14] continue to be reported; and debates about orthomolecular medicine continue to appear in medical publications in the United States and in Australia[15-17]—but rarely in Britain. These treatments have become popular in Britain, and their devotees take little note of worrying aspects of the American experience.

We visited two health food shops in London and found

many pamphlets and books recommending megavitamin self medication with minimal medical caution or disclaimers. One book recommended safe doses but suggested that vitamins should be kept on the table "next to the cereals" rather than in a medicine cupboard; it made no attempt to suggest specific symptoms that would respond to specific vitamins, describing only severe clinical deficiency syndromes. Another recommended vitamin A in doses of 50 000-250 000 IU for "allergies, chills, colds, cystitis, diabetes, eczema, hair problems, heart disease . . . varicose veins" and said that the toxic dose had not been determined. None made any reference to the toxicity of vitamin B_6 first reported in 1982.

Clinicians should be aware that patients may take abnormal doses of vitamins as a pathological feature of a psychiatric illness (perhaps typically an eating disorder) or that they may take them with insight in a misguided attempt to treat a psychiatric illness. In either case the toxicity of the vitamin may exacerbate the psychiatric disorder and introduce new features. Muenter *et al* reported that six of 17 patients with chronic vitamin A intoxication showed evidence of psychiatric complications.[12] They commented: "Psychiatric manifestations have been prominent in several cases and may lead to social isolation of the patient; in mild cases they presented as depression or irritability." They described symptoms developing with daily doses ranging from 41 000 IU for eight years to 200 000 IU for two months. We recently saw a patient who had taken 1 000 000 IU of vitamin A a day for several weeks after earlier daily doses of around 80 000 IU for a month. This self medication appeared to have exacerbated his depression and malaise and to have led to confusion, rapid weight gain, and distorted thinking. These features remitted on discontinuing self medication.

Physicians and psychiatrists should familiarise themselves with the protean complications that may result from megavitamin treatment (appendix II). Many patients would probably not regard vitamins as "medicines" and may not volunteer that they are taking them on routine questioning. Specific questions should be asked about vitamins whenever complications of vitamin overdosage might be a possible diagnosis.

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APPENDIX I—*Conditions for which treatment with megadoses of vitamins appears well supported*

	Conditions for which megavitamin treatment justified
Vitamin B_6 (pyridoxine)	Pyridoxine dependency (an enzymatic deficit) Infantile convulsive disorders Sideroblastic anaemia Urinary oxalate stones Homocystinuria Cystathioninuria
Folic acid	Congenital megaloblastic anaemia Homocystinuria and homothioninuria Formiminotransferase deficiency Malabsorption with megaloblastic anaemia
Vitamin B_{12}	Juvenile pernicious anaemia Transcobalamin II deficiency Methylmalonic aciduria Homocystinuria, hypomethioninaemia
Vitamins A, D, E, K	Definite fat malabsorption syndromes
Vitamin K	Coagulopathies of liver disease after parturition

APPENDIX II—*Toxic effects of vitamin overdoses modified from Davidson*[9]

	Toxic effects
Vitamin A	Raised intracranial pressure ("pseudotumour cerebri") Chronic liver disease Skin changes, including dryness, maculopapular rash, fissures, depigmentation, pruritus Hair loss Ingrowing toenails resistant to treatment Tenderness of bones Psychiatric symptoms (?)
Vitamin B_3 (Niacin, nicotinamide)	Peptic ulcer Alopecia Pruritus Hepatotoxicity Arrhythmias Hypotension
Vitamin B_6 (pyridoxine)	Dependency Peripheral sensory neuropathy and ataxia Decrease in therapeutic effect of levodopa
Vitamin C (ascorbic acid, ascorbates)	Oxalate stones in predisposed individuals Possible teratogenesis and carcinogenesis in very high doses Multiplicity of minor idiosyncratic symptoms
Vitamin D	Hypercalcaemia Hypertension Renal calcinosis Metastatic calcification
Vitamin E	Increased anticoagulant action of warfarin
Vitamin K	Haemolytic anaemia Neonatal jaundice

Correction

Getting the balance right

We regret that an error occurred in this leading article by Dr Stephen Lock (15 February, p 428). The second quotation from the *Drug and Therapeutic Bulletin*'s notes for authors should have read: "in general, trials should be included only if they are scientifically acceptable. . . ."