

## Coping with toxic pulses

SIR — In their recent Commentary article, Tate and Enneking<sup>1</sup> rightly draw attention to the potential hazard of supplying varieties of vetch seeds (*Vicia sativa*) for human consumption as a substitute for red lentils (*Lens culinaris*). Whereas the article focused on the presence in *Vicia* seeds of the toxic amino acid  $\beta$ -cyanoalanine and its  $\gamma$ -glutamyl derivative, there is an even more serious problem associated with the relatively high content of the pyrimidine glucoside vicine in these seeds.

Vicine has been recognized for years as the causative dietary factor in the disease favism, which is characterized by a potentially fatal haemolytic anaemia<sup>2</sup>. Although it is now known to be present in most species of *Vicia*, it was from vetch seeds (*V. sativa*) that vicine was first isolated, a yield of 0.35 per cent being obtained<sup>3,4</sup>. Favism occurs only in genetically predisposed individuals deficient in erythrocyte glucose-6-phosphate dehydrogenase and, although bouts can be induced by a variety of drugs, they most commonly follow ingestion of broad beans (*V. faba*). In the geographical areas where favism is prevalent, for example the Mediterranean countries, North Africa and the Middle East, sufferers quickly learn to avoid *Vicia* species. Passing off split seeds of *V. sativa* as red lentils in these areas would be particularly unfortunate.

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SIR — The consumers of the Middle East and India have thousands of years of experience in the preparation of food-stuffs, much of which, if consumed untreated, would be toxic<sup>1</sup>. Consumers throughout the Middle East can certainly distinguish between lentils and vetch. The differences in shape (lens versus spherical), taste (vetch is favoured in some markets for its bean taste), texture and cooking time are natural inbuilt safety factors against substitution.

The latest Australian Bureau of Agricultural and Resource Economics (ABARE) production estimate of *Vicia sativa* for 1992–93 is 75,000 tonnes. It is expected that approximately 60 per cent of this production will be of the cultivar blanche fleur. The rapid expansion of the vetch industry in Australia has meant that the industry has needed to act quickly to address concern about description and quality. This has resulted in the following action by the industry in conjunction with various government departments.

(1) Australian standards for receipt

and export of vetch have been adopted by the industry.

(2) *V. sativa* for export is correctly labelled after phytosanitary testing by the Australian Quarantine Inspection Service, the Australian government body responsible for export inspection services. It has to be labelled as either vetch, blanche fleur vetch or red split vetch.

(3) The Grains Council of Australia (representing all grain growers) has agreed to the introduction of a compulsory research levy on the production of vetch. This will be matched by the Australian government and administered by the Grains Research & Development Corporation (GRDC).

(4) The industry has commissioned research on the levels of neurotoxin in vetch at the Australian Academy of Grain Technology, which ascertained the levels of neurotoxins, and concluded that these levels are reduced by up to 90 per cent through soaking.

(5) The industry has commissioned further research at the academy, under the direction of academy director Dr R. B. H. Wills, on the rate of loss of toxins during soaking and cooking. The nature of breakdown products from the toxins will also be investigated.

The issue of the suitability of blanche fleur for human consumption has been clouded by statements and innuendo from various interest groups on consumption patterns, possible substitution for lentils and the extrapolation of historical data. The industry view is that the opportunity for substitution of vetch (*V. sativa*) for red lentils (*L. culinaris*) is minimal due to the Australian government requirements of appropriate labelling for export and the inherent characteristics of vetch. Differences in taste, texture and cooking time make the two readily discernible to consumers.

The Australian grain legume industry has not been able to identify any published example of human poisoning by *V. sativa*. While we accept there are problems in certain sectors of the livestock industry when excessive amounts of *V. sativa* are included in rations, to extrapolate these findings to humans would endanger the credibility of the proponents of such action.

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1. Tate, N. E. & Enneking, T. *Nature* **359**, 357–358 (1992).
2. Mager, J., Chevion, M. & Glaser, G. In *Toxic Constituents of Plant Foodstuffs* (ed. Liener, I. E.) 2nd edn 265–294 (Academic, New York, 1980).
3. Ritthausen, H. & Kreuzler, U. *J. prakt. Chem.* **2**, 833–840 (1870).
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## Test-ban treaty

SIR — Your leading article (*Nature* **359**, 465; 1992) correctly points out that the conclusion of a comprehensive test-ban treaty would improve the prospects (already quite good) for a successful outcome of the 1995 conference that will decide how long the Nuclear Non-Proliferation Treaty (NPT) will be extended. You make much of the point that France and China should join. In fact China acceded to the NPT in March this year and France followed suit some four months later.

You suggest that a comprehensive test-ban might be brought about by amending the NPT. As a former member of the staff of the IAEA (International Atomic Energy Agency), I should like to point out that it would be far simpler to conclude a separate treaty, replacing the existing partial test-ban treaty of 1963 (which France and China have not joined). Amending the NPT is almost impossible. Every party to the NPT that also happens to be a member of the governing body of the IAEA (there are usually about 28 NPT states on the IAEA governing body, from all parts of the world) can block an amendment by voting against it and again later by failing or forgetting to ratify an approved amendment. No other international arms control treaty places such a formidable barrier in the way of its amendment

and, unsurprisingly, none have been attempted.

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## Thinking physics

SIR — I endorse Sacks' description<sup>1</sup> of Edelman's theory of consciousness as having "great force and originality". Nevertheless, it is not a fully general or "transparent" theory in the sense alluded to by Gray<sup>2</sup>. Edelman<sup>3</sup> is concerned primarily with the evolution and neurology of human consciousness. This perspective cannot lead to general predictions about the existence of consciousness in other creatures or in artefacts, as Edelman concedes. The fundamental problem remains: to characterize those physical structures that are necessary and sufficient for the presence of consciousness wherever it might be found. What physics will be required to answer this question remains to be seen.

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2. Gray, J. *Nature* **358**, 277 (1992)
3. Edelman, G. *Bright Air, Brilliant Fire* (Penguin, London, 1992).