Conventional crops are the test of GM prejudice

Sir — Millstone *et al.*, in their Commentary in last week's issue[1], claim that 'substantial equivalence', a rule governing toxicity testing of genetically modified (GM) crops, is a pseudo-scientific concept.

One of their arguments is that it is insufficient to test glyphosate-tolerant soybeans (GTSBs) for toxicity and health problems; beans must be tested specifically after glyphosate treatment when isoflavone levels are modified. Millstone *et al.* suppose that toxicity could result from unspecified interactions with the single gene incorporated in the GTSB. The GTSB (Roundup) technology actually requires glyphosate spraying only early in the season when soybean plants are small and weeds a strong competitor for soil and light resources. The beans themselves form months later when the effects of the biodegradable glyphosate sprays have disappeared.

As in all discussion about GM plants, it is important to ascertain the applicability of these arguments to conventionally bred crops, either to avoid, or to expose, simple prejudice against the technology itself. We are unable to think of any environmental stress condition in the quality or supply of light, in the supply of water, minerals or a host of pests and diseases which does not modify isoflavone levels and indeed the content of a host of potential carcinogens that are found in most plants[2].

Using the logic of Millstone *et al.*, every new crop seed variety would have to be separately tested for toxicity when it has been treated with every herbicide, every pesticide, fertilizer variations, attack by every individual predator, infection with every individual disease and grown in an astronomically large number of different environmental combinations. We would be drowning in toxicity tests. And all these tests would be simply to eliminate the remote possibility that a particular balance of carcinogenic chemicals inside the plant induced by a unique set of conditions might interact in some unexpected way with the many new genes that are combined by conventional plant breeding in the new seed variety.

If this phenomenon ever happens it is more likely to occur in conventional new-variety crops, because many new genes are present rather than the single well characterized *trans* gene and its protein product in a GM plant. Only two examples, to our knowledge, of the environmental induction of a toxic compound that was not detected during routine testing have ever emerged out of the many millions of conventional crop lines produced. Psoralen was found to accumulate in one line of insect-resistant non-GM celery in response to light, and to cause skin burns[3]. Cool weather-induced toxic accumulations of solanine caused the withdrawal of the non-GM Magnum Bonum potato line in Sweden[4].

The UK Health and Safety Executive concluded, after 25 years of intensive scrutiny, that GM food technology is one of the safest yet developed[5]. GM soya has been eaten for 3–4 years by hundreds of millions of people in the United States and Europe with no untoward effects. The type of ill-informed logic expressed by Millstone *et al.* obstructs the acceptance of a new and far safer technology, simply because the authors don't like it. Their arguments are a distraction from the task of developing a sustainable and environmentally friendly agriculture, which combines the best of conventional plant breeding approaches with the new technologies.

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Substantial equivalence is a useful tool

Sir — We would like to respond to last week's Commentary[1] in which Millstone *et al.* incorrectly assert that: "Substantial equivalence is a pseudo-scientific concept because it is a commercial and political judgement masquerading as if it were scientific. It is, moreover, inherently anti-scientific because it was created primarily to provide an excuse for not requiring biochemical or toxicological tests."

The concept of substantial equivalence was developed proactively before any new genetically modified (GM) foods came to the market. It was first described in an OECD (Organization for Economic Co-operation and Development) publication in 1993[2,3] produced by about 60 experts from 19 OECD countries, who spent more than two years discussing how to assess the safety of GM foods. Most of these experts, all nominated by governments, were regulatory scientists from government agencies and ministries responsible for consumer safety.

In 1996, participants at an expert World Health Organization/Food and Agriculture Organization consultation[4] recommended that "safety assessment based upon the concept of substantial equivalence be applied in establishing the safety of foods and food components derived from genetically modified organisms". This represented an endorsement by experts based on three years' experience in the safety assessment of various GM foods.

Substantial equivalence is not a substitute for a safety assessment. It is a guiding principle which is a useful tool for regulatory scientists engaged in safety assessments. It stresses that an assessment should show that a GM variety is as safe as its traditional counterparts. In this approach, differences may be identified for further scrutiny, which can involve nutritional, toxicological and immunological testing. The approach allows regulators to focus on the differences in a new variety and therefore on safety concerns of critical importance. Biochemical and toxicological tests are certainly not precluded.

Since the concept of substantial equivalence was first described, several new foods have been assessed and knowledge has accumulated on how to use the concept. In parallel, the OECD, its governments and others have continued to review its adequacy in food safety assessment and to develop supporting tools[5]. The OECD's task force on the safety of novel foods and feeds (chaired by P. M.), in particular, continues to focus on the application of the concept. This includes work on assessment methodologies when substantial equivalence cannot be applied, as well as efforts to identify the critical nutrients and toxicants found in major crop plants, as a focus for the demonstration of substantial equivalence.

More than a decade of work by the OECD and its member governments was recognized by the heads of state and government of the G8 countries when they met in June in Cologne and invited the OECD task force to undertake a study of the implications of biotechnology and other aspects of food safety. This additional challenge is certain to lead to further reflections on the concept of substantial equivalence.

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No GM conspiracy

Sir — Last week's Commentary by Millstone *et al.*[1] is misleading and inaccurate. The authors do not seem to be