
ARTICLE

The GMO Panel: Applications of WTO Law to Trade in Agricultural Biotech Products

GILBERT R. WINHAM

Department of Political Science and Faculty of Law, Dalhousie University, Halifax, Canada

ABSTRACT One of the most important, and certainly the hardest fought, of World Trade Organization (WTO) dispute settlement cases was ‘EC-measures affecting the approval and marketing of biotech products’. Released in September 2006 after a legal process of more than three years, the ‘GMO Panel’ arguably found against aspects of the EC’s legal regime for trading and marketing of genetically modified organisms (GMO) products. This paper examines the implications of three legal questions that flow from the GMO case, and concludes by looking at the political situation the case presents for the EC and the complainants, namely, Argentina, Canada and the USA. First, the paper explains why the Panel relied on the Sanitary and Phytosanitary (SPS) Agreement as opposed to other WTO agreements that might have been more favourable to the EC. Secondly, the limited role of the Precautionary Principle in the Panel’s analysis is examined. Thirdly, the paper explores the Panel’s view of the meaning and importance of scientific risk assessment in trade policy actions on GMOs. Finally, the paper reviews the political alternatives that face the EC, the complainants and the WTO if compliance with the Panel’s recommendation is not achieved.

KEY WORDS: Genetically modified organism (GMO), World Trade Organization (WTO), Sanitary and Phytosanitary (SPS) Agreement, precautionary principle, scientific risk assessment

Introduction

The past two decades have witnessed a growing conflict between Europe and the Americas over the development and commercializing of some of agricultural products. Beginning with the controversy over North American use of growth hormones in beef, the conflict quickly spread to the rapidly growing field of agricultural biotechnology, or the production of genetically modified

Correspondence Address: Gilbert R. Winham, Department of Political Science, Dalhousie University, Halifax, NS, B3H 4H6, Canada. E-mail: Gilbert.Winham@dal.ca

organisms — GMO products. In this conflict, the USA led its hemispheric partners in a liberal and welcoming approach to the use of recombinant DNA technology in agricultural production, while the reception in Europe to this technology was much more guarded and restrictive. Without trade, there would have been less conflict over these different approaches. But with trade and, more importantly, with the trade regime established by the World Trade Organization (WTO) agreements in 1995, the differences between Europe and the Americas over agricultural biotechnology created a conflict of systemic proportions in the international trade regime.

It was almost inevitable that this conflict would be played out in the dispute settlement machinery of the WTO. Thus, in May, 2003, Canada, the USA and Argentina requested dispute settlement consultations in the WTO with the European Communities (EC) concerning both a ‘moratorium’ in the EC’s procedures for approving biotech products and certain measures taken by EC member states to restrict the marketing of GMO products.¹ Consultations quickly led to the formation of a Panel and formal legal dispute settlement procedures.

After many delays, the Panel finally released a confidential interim report to the parties on 7 February, 2006, which in turn was leaked and published on the Web by two civil society groups. The final Report of 1,087 pages (plus Appendices) was released on 29 September, 2006, after which the parties had sixty days in which to file an appeal to the WTO’s Appellate Body. The Panel Report found certain of the EC’s measures to be not in compliance with the WTO agreements and, in this sense, the EC could be said to have lost the case. Failing any further appeal, WTO rules require the EC to bring its policy measures into conformity with the WTO agreements.

On 29 November, 2006, in a surprising action, the European Union declined to appeal the Report of the GMO Panel. This was the last act in a legal decision-making process that had lasted over three years. The length of time for this Panel process was simply extraordinary, certainly when compared to the proposed timetable of thirty-four weeks stipulated in the WTO’s Dispute Settlement Understanding that mandates procedures and timelines for WTO Panels. The temporal length of the GMO Panel and the paper-length of its judgment were consistent with the enormity of the issue of agricultural biotechnology in international economic relations.

The purpose of this paper is to review and draw implications from the main legal and policy issues that were at play in the GMO case. The main elements of this case will be reviewed, making clear the basis on which the Panel reached its decision. This was the first time the WTO’s dispute settlement mechanism has ruled on a GMO issue. Therefore, the paper will explore the approach taken by the Panel and examine the implications this case might have for future trade policy or law involving GMO products. Particular attention will be given to three matters: (i) WTO rules the Panel chose to apply to this case; (ii) the role of the precautionary principle in agricultural trade; and (iii) the impact of scientific risk assessment procedures in the regulations on trade in GMO products. Finally, the paper will conclude with some comment about the politics of initiating this controversial case, as

well as the difficulties the EC may have in implementing the judgment of the GMO Panel.

Background

The GMO case is a product of the different agricultural development vectors of Europe and (largely) the Americas. After years of laboratory and field tests in the USA, GMO field crops were released in 1996 for commercial use in that country. In 1996, the global area of GMO crops (mainly, soybeans, corn, cotton and canola) was 1.7 million hectares (James 2002). This figure grew by thirty-fold between 1996 and 2001 and, by 2006, the total global area of biotech crops was 102 million hectares. In 2001, GMO crops were grown in thirteen countries, with the acreage of the leading countries being: USA, 68 per cent; Argentina, 22 per cent; Canada, 6 per cent; and China, 3 per cent. By 2006, these figures had changed to twenty-two countries, with the acreages of the leading countries at: USA, 56 per cent; Argentina, 18 per cent; Brazil, 11 per cent; Canada, 6 per cent; India, 4 per cent; and China, 3 per cent (James 2006). Overall, the last decade has seen rapid and continuous growth in the use of GMO technology, both in terms of acreage planted and number of countries deploying the technology.

By contrast, in Europe, GMO technology was integrated into a climate of public opinion that was deeply suspicious of the use of scientific technology in food production. This climate was endemic in Europe, and was reflected in the long-standing trade dispute between the EC and the USA over the use of growth hormones in beef. Adding to this climate was the mad cow crisis at the turn of the century, in which European populations felt they had been deliberately misled by their governments and the scientific community.² In this context, the EC commenced approvals for the use of GMO commercial food products in 1990, but resistance from European consumers prevented the use from becoming widespread. In June 1998, in response to public demands for a ban on commercial imports and domestic use of GMOs, the EC slowed and then ceased approvals of new GMO products pending the development of new legislation designed to control and regulate commerce in these products. This action, known as the moratorium, resulted in a drop of about 50 per cent of US soybean and corn exports to the EC, for a loss of nearly \$US1 billion in sales (Zarrilli 2000, 6–7). These figures indicate clearly the substantial stakes that the USA and other agricultural exporters have in legal questions about food safety.

In July, 2001, the EC adopted proposals on labelling and tracing of GMO agricultural products designed to end the moratorium on GMO approvals, but which would set some of the world's strictest rules on GMO foods and animal feed. Two years later the European Parliament passed two pieces of legislation that would require, among other things, supermarkets to label all products containing as little as 0.9 per cent biotech material, and as well would require producers to trace GMOs at all stages of production. These regulations were implemented by the European Commission on 18 April, 2004.³ These new regulations will further threaten the remaining exports of

the USA and other countries of GMO products to Europe. It is likely that the labelling requirements will make it difficult to market GMO products in Europe, given the prevailing public attitudes toward these products. In addition, the costs of the GMO traceability system are likely to be high and are to be borne by the exporter.

With the regulatory changes on GMO imports underway in Europe, there were official discussions in the capitals of exporting countries on whether to initiate a WTO dispute settlement action against the EC on the GMO issue. Such an action would be directed particularly against the moratorium, which was inconsistent with the EC's own regulations for the screening of new GMO products. The arguments against a WTO case were twofold: first, there was concern that such an action would have a negative impact on public attitudes in Europe toward GMO products; and, secondly, it was believed that a victory from a WTO Panel would be unlikely to alter the behaviour of the EC, thereby damaging relations and ending in a punishing and fruitless round of trade retaliations similar to what occurred in the Beef Hormones case. Despite these concerns, the three exporting countries decided to initiate an action that challenged the WTO conformity of the GMO moratorium as well as various individual member-state marketing bans against GMO products. The main reasons for this action were, first, the concern that the biotech industry and its agricultural products were becoming wrongfully stigmatized in world markets, not only in Europe but elsewhere and, secondly, a belief that the evolving EC regulatory system on agricultural biotechnology was illegitimate under WTO trade rules and that it was better to challenge that system than to acquiesce in the loss of the rules through a failure to implement them.

Summary Analysis of the Panel Report on Biotech Products

The complainants each initiated a separate action against the EC, which because of their similarities were dealt with by a single WTO Panel in a single report (World Trade Organization 2006). First, the complainants did not attempt to challenge EC regulations on the approval of biotech products or on the traceability and labelling of GMO products. Instead, they argued that from 1998 the EC had maintained a moratorium on the approval of biotech products, and that this trade policy measure was inconsistent with its obligations under the Sanitary and Phytosanitary (SPS) Agreement of the WTO agreements. By 'moratorium', the complainants meant that: 'the moratorium consists of concerted acts and omissions of the European Communities and its member States to stall decision-making with respect to biotech product applications at key stages of the approval process' (World Trade Organization 2006, 41). In response, the EC denied the existence of the moratorium as described by the complainants, and further argued that if it existed, it was informal and could not constitute a trade measure as understood in the WTO agreements.

Secondly, with regard to twenty-seven specific products, the complainants argued that the EC failed to consider requests for applications for approval,

resulting in the failure of these products to access EC markets. Again, the EC replied that the failure to process applications in a particular period did not constitute a trade measure under the WTO, but rather only dealt with the application of a measure. Thirdly, the complainants challenged restrictions by six member states on the grounds the measures were not based on scientific evidence and therefore not compliant with WTO rules. These restrictions were invoked under the EC's legislation on Safeguard Measures that permitted member states to restrict the marketing, and also the importing, of certain GMO products previously approved by the EC. The EC argued these measures were compliant with the WTO because of their provisional status.

In its decision, the Panel noted some issues that surrounded this case which it did *not* address (World Trade Organization 2006, 1067). First, it did not deal with whether biotech products are safe or not. This question was not asked of the Panel and, in any case, it is unlikely it could be answered by jurists. Secondly, although this was raised by the complainants, it did not decide whether GMO products are 'like' their conventional counterparts for the purpose of trade law; the Panel was able to avoid this thorny issue on the basis of judicial economy.⁴ Thirdly, it did not touch two issues not raised by complainants: whether the EC's legislation on labelling and traceability (see footnote 10 and accompanying text) were consistent with WTO agreements. Finally, although the Panel did engage a number of scientific experts to assess elements of the evidence presented before it, this material was not necessary for its decision and was therefore not examined in its Report.

The first of the three issues brought by the complainants was the moratorium. On the factual question, the Panel concluded that the EC 'applied a general *de facto* moratorium on the approval of biotech products between June 1999 and August 2003, which is when this Panel was established' (World Trade Organization 2006, 1070). This decision went for the complainants, although the dating is important as the complainants argued the moratorium had not been lifted. On the legal question of whether the moratorium was inconsistent with WTO law (particularly the SPS agreement), the Panel made a distinction between the procedural and substantive obligations of that law.⁵ This distinction allowed the Panel to find that the EC had acted inconsistently with the Annex C(1)(a) of the SPS agreement that called for approval procedures to be completed 'without undue delay', but not inconsistently with the substantive portions of the same agreement. As a result of this distinction, the Panel dismissed the key arguments mounted by the complainants that during the moratorium EC decisions on approvals were not based on the scientific criteria required by the SPS agreement.

As for the approval procedures for the twenty-seven identified biotech products, the Panel followed the same line of argument used in the case of the moratorium. The Panel decided that in the case of twenty-four products, the EC approval procedures had not been completed 'without undue delay', but that on other matters the EC had acted not inconsistently with its obligations under WTO agreements.

On the third issue before the Panel, namely the Safeguard Measures taken by Austria, France, Germany, Greece, Italy and Luxembourg, the Panel

found that these measures were inconsistent with Articles 5.1 and 2.2 of the SPS agreement, which required a scientific risk assessment prior to restricting trade in the product under review. The Panel further found that the Safeguard Measures in these EC member states were not saved by Article 5.7 of the SPS agreement that permitted measures provisionally adopted 'on the basis of available pertinent information'. These SPS articles are discussed further later.

On the matter of which party(ies) won or lost the GMO Panel, the first point is that on the three issues that formed the basis of the complainants' case, the EC was found to have acted inconsistently with WTO agreements on all three and was, therefore, called upon by the WTO to bring its measures into compliance with those agreements. On this basis many observers would agree with a commentary in the *Bridges Monthly Review* that: 'Broadly speaking, the Panel sided with the US, Argentina and Canada on all three counts' (Baumullier and Apea 2006, 13). On the other hand, the Panel did side with the EC on the question of when the moratorium had ended, which allowed the EC to claim that: 'Where the judgment goes against the EU, namely in relation to the system that operated prior to 2004, the impact of that judgment is entirely of historical interest ... The current approval system works, as evidenced by the approval of 10 authorizations since the (WTO dispute) panel was established. More authorizations are in the pipeline' (Benitah 2006). On this basis the EC could and did make the argument that the GMO Panel decision was hypothetical and of no contemporary policy relevance.

Further supporting the Commission's position is the third issue of members' Safeguard Measures, which on its face appears to be a flat rejection of EC approvals procedures. However, this aspect of the Panel's decision targets EC member states more than the Commission, and effectively directs member states to conform to the Commission's policy that had supported and not blocked approvals of the biotech products in question (Pauwelyn 2006). Therefore, given the immediate policy implications of the Panel's conclusions on the three issues, it is understandable how the EC might reach the pragmatic decision not to appeal the Panel's Report in spite of several legal interpretations that the EC might not have liked.

Implications of the Panel's Report

Much of the GMO Panel dealt with issues that were situation specific and that arose at a time of legislative transition for the EC. The moratorium that was the focus of the case was in all likelihood a unique event and, therefore, not likely to be of great future relevance in policy terms. Certainly, the EC tried to make light of the case in its unusual decision not to appeal the Panel's report. However, from the standpoint of trade law and the management of agricultural trade relations, the GMO Panel cannot be dismissed so easily. Although the analyses and recommendations of WTO Panels have limited legal effects, there were important questions arising in this case about trade in GMOs in the future.⁶ These questions include: (i) What WTO agreement(s)

are applicable to GMOs?; (ii) What is the role of the precautionary principle in the trade of GMOs?; (iii) What is the role of science and scientific uncertainty in the commercial management of GMOs? The GMO Panel answered these questions, and its decision will likely have some bearing on how future disputes might be decided in the WTO.

What WTO Agreement(s) are Applicable to GMOs?

The WTO is a contract, and issues that come to formal dispute settlement arise because one Party alleges another Party has not observed provision(s) of the contract. It is the complainant's task to identify the provisions that are not observed by the respondent, and to bring forward evidence of the non-compliance. It is the respondent's task to argue that the provisions of the contract do not apply to the respondent as alleged, and/or to demonstrate that the evidence of non-compliance is wrong or inadequate. In this exchange of legal positions, the applicability of provisions of the contract is a preliminary question that must be resolved before the evidence can be weighed. In the GMO case, the Panel devoted some eighty-four pages to the applicability question, and its answer has been one of the most criticized elements of its decision.

The complainants in the GMO Panel argued mainly that the EC's actions violated the Sanitary and Phytosanitary (SPS) Agreement of the WTO. This agreement gives WTO members a right — based on a scientific risk analysis — to take measures to protect human, animal or plant safety or health that might directly or indirectly affect international trade. All three complainants argued strongly the central purpose of the EC's legislation on GMOs was to protect against the risks that were covered by the SPS agreement and itemized in the lengthy list of definitions included in Annex A to the agreement.

The EC responded that the complainants' arguments based on the SPS agreement presented the issue much too narrowly. GMOs, argued the EC, represent a scientific, social, economic, legal and even moral challenge to society that is more profound than the technical issues of pests, disease or contaminants addressed by the SPS agreement. The question of what protective measures are permissible in the case of GMOs can be complex, and may require reference to other international treaties and, particularly, other WTO agreements, such as the Agreement on Technical Barriers to Trade (TBT), or even the GATT 1994 itself. For example, the TBT agreement permits the use of trade-restrictive technical regulations for objectives such as 'protection of human health or safety, animal or plant life or health, or the environment', and the main constraint is that such regulations 'shall not be more trade restrictive than necessary to fulfill a legitimate objective, taking account of the risks non-fulfilment would create'.⁷ The EC argued strongly that the TBT agreement was more suited to the circumstances of GMO regulations than the SPS agreement, since the agreement spoke of restrictions as having a 'legitimate objective' and did not require regulations to be conducted through a technical 'scientific risk assessment'.

The Panel commenced the task of deciding applicability by agreeing with the EC that a specific measure, or law, could have more than one purpose and, therefore, might not be categorized wholly as an SPS, TBT or other measure. It then reviewed the definition of SPS measures in SPS Annex A(1),⁸ and took note especially of Article 1.5 of the TBT agreement which states that: ‘The provisions of this Agreement do not apply to sanitary and phytosanitary measures as defined in Annex A of the Agreement on the Application of Sanitary and Phytosanitary Measures’. The Panel then proceeded to compare the objectives of various pieces of EC legislation to various provisions from the SPS and other WTO agreements.

One of the problems the Panel faced was that the SPS agreement was drafted in the early 1990s without specific reference to GMOs and, on its face, the applicability to GMO products could appear questionable. On the one hand, the connection between the SPS focus on human, animal or plant life and health and EC GMO regulations may seem clear enough, but, on the other hand, the references in the SPS agreement to pests, diseases, additives or toxins are simply inconsistent with scientific definitions of GMOs.⁹ The Panel thus faced a problem not uncommon in legal analysis, namely, the task of discovering the intent of the law when the words contained in the law do not apply precisely to the factual situation at hand. The methodology chosen by the Panel was to ‘consider one by one the definitional elements of the term “SPS measure” and then ... [to] draw appropriate conclusions on whether EC approval procedures are SPS measures, and if so, on whether they are SPS measures only’ (World Trade Organization 2006, 361).

The Panel commenced its analysis with EC Directive 90/220 and its successor 2001/18, both titled ‘On the deliberate release into the environment of genetically modified organisms’. The Panel noted that Directive 90/220 indicated that a central purpose of the directive was ‘to protect human health and the environment ... when placing on the market products containing, or consisting of, genetically modified organisms ...’ (World Trade Organization 2006, 364). Over the succeeding pages, the Panel examined various ‘definitional elements’ of the SPS agreement and compared them to the treatment of the ‘elements’ in EC GMO approval legislation. At the outset, the Panel found the statement of the purpose ‘to protect human health’ in Directive 90/220 bore an obvious comparison to Annex A(1) of the SPS agreement. Less obvious was the term ‘disease’, which figures prominently in SPS Annex A (1), but which, on its face, does not bear resemblance to common definitions of GMOs. The Panel stated:

We note that we do not need to determine in the abstract whether GMOs are diseases, disease-carrying organisms, etc. Rather, we need to determine whether the adverse effects which might arise from the deliberate release of GMOs into the environment and which Directives 90/220 and 2001/18 seek to avoid are covered by Annex A(1). In this regard, we note that Directive 2001/18 specifies that the potential adverse effects of GMOs include disease to animals and plants ... Directives 90/220 and

2001/18 thus seek to prevent GM plants from introducing or spreading diseases. (World Trade Organization 2006, 389)

On the basis of this analysis, the Panel concluded that to the extent that EC measures sought to protect humans, animals and plants from the various harms included in the SPS agreement, these EC measures were SPS measures and, therefore, were obligated to meet the requirements of the SPS agreement. A similar analysis was applied to other definitional elements of the SPS agreement, such as ‘additives’, ‘toxins’, ‘pests’ and so forth.

With regard to the environment, it will be recalled that the stated purpose of EC Directive 90/220 was to ‘protect human health and the environment’. The EC argued strongly that this legislation, and Directive 2001/18, were aimed at environmental protection as well as human health, and that the SPS agreement was not applicable to the portion that dealt with environment. The EC held that the term environment referred broadly to the protection of living space or of biodiversity, not to the life or health of specific animals or plants, and it was possible for damage to occur to the environment without a negative effect on particular wild flora or fauna. Instead of the SPS agreement, the EC contended that applicable law would be found in the TBT agreement which made a direct reference to the ‘environment’ in Article 2.2.

The Panel made relatively short work of the EC’s argument on environment. Proceeding from its analysis of EC legislation, the Panel stated: ‘It is clear from the Directives that as part of the purpose of protecting the “environment” they address the protection of the health of animals or plants’ (World Trade Organization 2006, 370). The Panel thus found a close relationship existed between references in the Directives that applied to the environment, or to environmental risk assessment, and references that applied to human, plant or animal life or health — the latter, of course, being covered under the SPS agreement. This reading led the Panel toward its conclusion that the SPS agreement constituted applicable law on matters of environmental protection. Further supporting this position was the Panel’s judgment that the reference to ‘environment’ in the TBT agreement was not probative and, in any case, should not take precedence over the reference to ‘other damage’ in SPS Annex A(1)(d), which could itself apply to environmental damage beyond that covered in references to human, animal and plant life or health.

The Panel’s decision on the applicability of the SPS agreement, including the reference to the environment, was likely the most far-reaching element of the GMO Report. It was heavily criticized as an unjustified expansive interpretation of the SPS agreement, and felt by some to warrant an appeal to the WTO Appellate Body (Palmer 2006). Since there was no appeal, this issue will have to wait for another day.

One problem for those who might wish to set aside the Panel’s decision is that the ‘expansive’ interpretation of the SPS agreement may be due less to the Panel’s interpretation than to the ‘expansive’ manner in which the Agreement itself is written. The SPS agreement contains definitions that are both wide-sweeping and precise, and hence it covers a lot of ground. The Agreement

trumps the TBT agreement on SPS matters through the operation of Article 1.5 of the TBT agreement. The agreement is relatively tightly written and its rules are clear cut, with the result that it is not easy to evade the obligations contained in its text. With regard to environmental issues, the SPS agreement is likely to be applicable to domestic regulatory legislation on GMOs simply because, in many instances, what that legislation seeks to regulate is very similar to what the SPS agreement seeks to regulate. This was the case with EC's Directives 90/220 and 2001/18, and it is likely to be the case with similar domestic environmental legislation in the future. The result is that at many points where legal interpretation is problematic, jurists may find it difficult to ignore provisions of the SPS agreement and to rely instead for authority on less precise or relevant provisions from other WTO agreements.

What is the Role of the Precautionary Principle in the Trade of GMOs?

In its arguments before the GMO Panel, the EC sought to defend its policies on biotech products by reference to the precautionary principle, either in connection with the application of general principles of international law, or through the use of SPS Article 5.7. The Panel was not sympathetic to this argument.

The precautionary principle originated in the domestic politics of West Germany in the 1960s and 1970s, and was introduced into legislation dealing with various forms of pollution control. The essential idea of the principle is that policy makers are obliged to act in situations where irreversible damage is possible but scientific certainty is lacking. The precautionary principle spread from Germany to the national legislation of many countries. For example, the principle is invoked in Canada's Agreement on Internal Trade, where Article 1502.3 permits precaution as a basis for taking environmental measures that affect trade.

International environmental treaties also endorse the precautionary principle. A clear statement of this principle can be found in Principle 15 of the Rio Declaration on Environment and Development, 1992, which states in part: 'the precautionary principle *shall* [emphasis added] be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'.

The precautionary principle became directly involved with the trade regime with the advent of the Cartagena Protocol on Biosafety of 2000, which entered into force in 2003. The purpose of the Biosafety Protocol was to ensure the safe transfer, handling and use of living (genetically) modified organisms (LMOs), which simply are GMOs that are alive, such as seeds used for seeding, feed or further processing. The Protocol specified a number of requirements of exporters of LMOs, such as a risk assessment, labelling and the obligation to obtain an Advanced Informed Agreement from the importer prior to shipment. Article 1 of the Protocol referred specifically to the language of the precautionary principle in the Rio Declaration, and the principle was referred to frequently in the remainder of the text.

Despite its frequent appearance in legal texts, there were complaints the precautionary principle was not defined precisely in an operational sense.¹⁰ In February, 2000, the EC produced a Communication outlining its interpretation of this principle (Commission of the European Communities 2000). The Communication acknowledged the principle was not defined precisely, but argued that 'it is for the decision-makers and ultimately the courts to flesh out the principle', and that 'it would be wrong to conclude that the absence of a definition has to lead to legal uncertainty' (Commission of the European Communities 2000, 9). The Communication indicated the principle would be used when a potential risk was identified, when a scientific evaluation had been conducted, and when scientific uncertainty still existed. The triggering factors for action in this situation would be a population that could be jeopardized, concern for consequences of inaction and especially a belief that the absence of scientific proof should not be used to justify inaction.

The Communication clearly conveyed the great importance the EC invested in the precautionary principle, despite the criticism it sustained. The main fear of the EC's trading partners was that political concerns rather than scientific would be used in making the various judgments implicit in an environmental (or food safety) precautionary action. The fact that the Communication mentioned 'pressure from public opinion' heightened those fears.¹¹ This difference was not resolved, but rather continued in the positions the EC and the complainants brought to the WTO GMO Panel.

The precautionary principle came before the WTO Panel in two forms. First, there was the broader question of whether other treaties or rules of international law (of which the precautionary principle is an example) would be relevant to the interpretation of WTO agreements. In international legal theory, there is a strong argument that international treaties (like the WTO agreements) are integrated into an already existing system of international law and that, even regarding trade matters, WTO rules do not necessarily take priority over relevant rules that might be found in other non-WTO international agreements (Pauwelyn 2001). The WTO Appellate Body itself has supported this view in stating that: 'the General Agreement [GATT] is not to be read in clinical isolation from public international law' (World Trade Organization 1996, 17). The EC embraced this approach to international trade law and found support for this view in Article 31(3)(c) of the Vienna Convention on the Law of the Treaties that calls upon jurists to take account of 'any relevant rules of international law applicable in the relations between the parties'. This language led the EC to insist that the Panel was obliged to give effect to the precautionary principle and to the problem of scientific uncertainty in its decision.

The argument about the precautionary principle led to a number of subordinate issues, including the following: (i) Was the precautionary principle an accepted principle or rule of international law? The USA strongly contested this point; (ii) Could treaties or rules to which a complainant was not a party be binding or influential on that complainant? For example, the USA was not a party to the Biosafety Protocol; and (iii) What impact could another treaty

have on the Panel's decision in the GMO case? For example, could the precautionary principle be grounds to set aside a clear obligation of the SPS agreement to conduct a scientific risk assessment?

The Panel's decision generally went against the EC on the broader question of the relationship of other international treaties to the WTO agreements. First, on the question of whether the precautionary principle was a principle of customary international law, the Panel declined to take a position on the matter, consistent with actions taken previously by the Appellate Body in other cases. Secondly, since not all parties to the GMO case were also parties to the Biosafety Protocol or other agreements, the Panel felt it could not find provisions in those agreements to be rules 'applicable in the relations between the parties', in the language of Article 31 (3)(c) cited above. To do otherwise would be to apply a treaty to a sovereign state that it had not signed or ratified. Finally, regarding the impact of another treaty on a WTO dispute settlement decision, the Panel determined that the disputants had not sufficiently clarified what effect introducing provisions from non-WTO law would have on the rights and obligations of the members under WTO agreements. Consequently the Panel had little further to say on this matter.

The second form taken by the precautionary principle came in the argument by the EC that: 'Article 5.7 of the SPS Agreement is of course one expression of the precautionary principle ...' (World Trade Organization 2006, 97).¹² This position was entirely plausible, since the Article permits a member to take SPS measures in the context of an insufficiency of scientific evidence, which is consistent with the definition of the precautionary principle in the Rio Declaration of 1992, cited earlier. The EC further argued that: 'Article 5.7 of the SPS Agreement contains specific rules regarding provisional measures, and it is by reference to these rules, not the rules [on scientific risk assessment] in Article 5.1, that the member State measures must be assessed' (World Trade Organization 2006, 73).

In its decision the Panel did not contest the characterization of Article 5.7 as an expression of the precautionary principle, but simply dealt with the issue on another basis. The Panel found that the operational feature of Article 5.7 was the insufficiency of scientific evidence and not 'provisionality', and it did not agree there was insufficient science for member states when the EC had previously completed a risk assessment on the relevant GMO products. Article 5.7 is discussed further later.

Overall, the efforts of the EC to promote the precautionary principle in WTO dispute settlement were not advanced by the GMO case. It would seem less likely, after this case, that a future Panel or the Appellate Body would accept other treaties, such as the Biosafety Protocol, as having direct relevance for the interpretation of WTO agreements, especially if so doing would substantially alter the rights and obligations of WTO members under those WTO agreements. Even though non-WTO international treaties may be applied by WTO Panels and the Appellate Body, Pauwelyn (2001, 573) has noted that: 'within the process of treaty interpretation, non-WTO rules cannot add meaning to WTO rules that goes [sic] either beyond or against the "clear meaning of the terms" of WTO covered agreements'. The Panel

likely gave little weight to non-WTO law because it found the facts of the GMO case within the clear meaning of the WTO agreements, essentially the SPS agreement. Unless another Panel or the Appellate Body were to reach a different interpretation of the SPS agreement, it is unlikely that non-WTO law will be found to be persuasive.

The GMO Panel did not diminish *per se* the precautionary principle in international law.¹³ However, it will reduce the possibility that the EC and other countries can use that principle to avoid the application of commitments in the trade regime, especially where those commitments are clearly enunciated. In the case of SPS Article 5.7, the GMO Panel will likely lessen the perception that this provision can act as a general 'safe haven' from the application of scientific risk assessments in dealing with imports of GMO products.¹⁴ If anything, the Panel's Report may have strengthened Article 5.7 by finding it to be a 'qualified right and not an exception', but that right (i.e. to take provisional SPS measures 'where relevant scientific evidence is insufficient') will likely only be effective within the context of risk assessment procedures spelled out in the SPS agreement.

What is the Role of Science and Scientific Uncertainty in the Commercial Management of GMOs?

Since its origin in 1947, the GATT system has attempted to strike a balance between trade liberalization and regulations dealing with health. The original GATT included Article XX(b) (General Exceptions), which states that subject to a measure not being applied in a manner to create arbitrary or unjustifiable discrimination, nothing in the GATT would prevent a signatory from taking measures 'necessary to protect human, animal or plant life or health'. In the negotiation of the SPS agreement during the Uruguay Round, countries sought to modernize GATT law by providing more precise legal guidance on the procedures for taking protective measures. This action was consistent with strong efforts to liberalize agricultural trade in the Uruguay Round, and it was supported by the major countries in that negotiation, namely the EU and the USA.

As noted earlier, the SPS agreement applies generally to health and it ensures the right of WTO members to take SPS measures, including restraints on trade and marketing, consistent with the procedures outlined in the agreement. The greatest change from the old GATT provision is the obligation in Article 2.2 to ensure that measures taken are 'necessary' to protect health, are based on 'scientific principles' and are supported by 'sufficient scientific evidence'.¹⁵ The procedures for putting scientific principles into practice in the context of SPS measures are elaborated in Article 5. In Article 5.1, members are obliged to base SPS measures on an assessment of the risks to human, animal or plant life or health, and to take account of risk assessment techniques developed in relevant international organizations.¹⁶ In Article 5.2, members are instructed to take account of various forms of scientific evidence, such as relevant inspection or testing methods. Elsewhere in Annex C, the procedures for control, inspection and approval are spelled out in

greater detail. Overall, one can see from these provisions that the framers of this agreement intended that trade-restrictive SPS measures should be available to members, but that they should be based as much as possible on objective considerations and not left to the whims of public pressures.

The issue of science, or scientific risk assessment, was invoked mainly with respect to the member-state safeguard measures. The Panel examined the argument by the complainants that these measures — although permitted under EC law — were taken without Article 5.1 risk assessments as required by the SPS agreement. Following its investigation, the Panel concluded that: ‘Although some of the member States did provide scientific studies, in no case did they provide an assessment of the risks to human health and/or the environment meeting the requirements of the SPS Agreement’ (World Trade Organization 2006, 1069). What the Panel would have been looking for was an assessment of the potential for adverse effects on human health of alleged harmful substances traded products, i.e. an assessment that is spelled out in the SPS agreement, Annex A (Definitions), #4 (Risk Assessments).¹⁷ This concept is reasonably clear in administrative terms, while nevertheless leaving considerable leeway to scientific practitioners. Finding that the six member states had conducted no risk assessments to justify their SPS measures against imported GMO products, the Panel ruled these measures were inconsistent with the EC’s obligations under Article 5.1 of the SPS agreement.

The Panel encountered a strong alternative argument from the EC that Article 5.1, with its obligation to conduct a risk assessment, did not apply to the member states’ safeguard measures because those measures were provisional under EC law. The EC argued that Article 5.7 contained specific rules dealing with provisional measures, therefore it was under this article the safeguard measures should be assessed.¹⁸ Furthermore, the EC argued that Article 5.7 constituted an ‘autonomous right’ of the parties, and was not a mere exception to Articles 2.2 and 5.1 as it might appear to be. For its part, the Panel agreed that Article 5.7 was not an exception but rather a ‘qualified right’. By this the Panel meant that as long as a member maintained a challenged SPS measure consistent with the four requirements of Article 5.7, it would be relieved of the obligation in Articles 5.1 and 2.2 to perform a scientific risk analysis (World Trade Organization 2006, 955).¹⁹ However, the Panel disagreed that ‘provisionality’ was what distinguished Article 5.1 from 5.7. Instead, the Panel noted that Article 5.7 starts with the phrase: ‘In cases where relevant scientific evidence is insufficient ...’, and it further noted that the application of Article 5.7 was initiated by the absence of sufficient scientific evidence (World Trade Organization 2006, 940).

To sum up, the Panel was able to find against the EC on two points. One was Article 5.1, where the member states were found not to have completed scientific risk assessments. The second was Article 5.7, where the member states took what were claimed to be provisional measures to restrict GMO products that the EC Commission had already approved in its risk assessment procedures. The Panel concluded that sufficient scientific evidence could not be lacking if the EC was able to complete a risk assessment;

therefore, the condition needed for the member states to initiate Article 5.7 was unavailable.

This conclusion was strongly criticized for its finding that EC member states' risk assessments did not meet the requirements of SPS agreement A(4), and for not taking into account the level of protection required by individual member states (Franken and Burchardi 2007). However, the Panel did accept that scientific evidence might change over time, thus allowing for some flexibility in meeting the requirements of Article 5.7 (World Trade Organization 2006, 962–3).²⁰

The GMO Panel thus confirmed the role of scientific procedures in trade policies involving health and environment. This was done first through the Panel's reliance on the SPS agreement, in lieu of other agreements (such as the Technical Barriers to Trade — TBT) in which the requirement for restrictive measures to be backed up with scientific procedures is not present. Secondly, scientific procedures were reaffirmed in the Panel's decisions supporting risk assessments as the basis for initiating restrictive SPS measures. The results of this Panel confirm a direction taken in other WTO dispute settlement cases dealing with the SPS agreement during the past decade, most notably the Beef Hormones case between the EC and the USA and Canada (World Trade Organization 1998).

The Panel's decision on scientific risk assessment has important implications for the EC and for third parties, especially developing countries. For the latter, the decision suggests that if WTO members are going to apply restrictive SPS measures on trade, they must be prepared to implement the risk assessment procedures outlined in the SPS agreement or face a possible dispute settlement action (Oliva and Zarrilli 2007). The fact that it may not be commercially (or politically) worthwhile for an exporting country to bring a case does not change the formal obligations of the importer. For the EC, the recent legislation on labelling and traceability was not at issue in this case, but it could be the subject of future WTO dispute settlement. Arguably, both labelling and traceability could be defined as SPS measures, following the interpretation given to Annex A (Definitions) by the GMO Panel. Furthermore, both labelling and traceability procedures may be onerous enough that they could effectively close the EC market to exporters of GMO products, and if so the importing member could be obliged to provide a scientific risk assessment to justify the restriction. This reasoning is speculative at present, but the support given by the GMO Panel to scientific risk assessment likely increases the exposure of the EC legislation to an adverse decision by a future WTO Panel.

Conclusion

The legal action of the WTO GMO Panel is now completed, but the broader political conflict that has been underway since the GATT/WTO Beef Hormones case will continue.²¹ Implementation of WTO cases is often not a straightforward matter and, for the EC, it involves a difficult two-fronted

negotiation between the complainant countries on the one hand, and certain EU member states on the other.

Under formal WTO procedures,²² the EC is obliged to bring the trade measures identified in the GMO case into compliance with the WTO SPS agreement, and it is given a period of time to do this. If there is a dispute over whether the actions taken to comply have actually achieved that outcome, a Panel will be struck (preferably the original Panel) to decide the dispute, following which the complainants can be authorized to undertake retaliatory measures if compliance has not been achieved. Experience has shown (e.g. the EC Bananas case) that the compliance process can become legally unclear where the issues are important and the parties' interests differ sharply.

The EC measures that must be brought into compliance in the GMO case include the moratorium and product specific measures (which were already in compliance by the time of the Panel's Report) and the member states' safeguard measures. Regarding the safeguard measures, compliance for the EC obliges the member states either to drop their bans on the products previously approved at the EC level, or to conduct a scientific risk assessment consistent with SPS Article 5.1 on which they could base their restrictions. Of these two possible actions, the first involves a publicly visible *volte face* for the member states, while the second entails a defeat on the issue of whether a scientific assessment mandated by an international organization can trump the precautionary action of a sovereign government responding to strongly held public opinion. This question is politically problematic in the EC and could become a broader issue of member states' rights against the EC.

The EC agreed with the complainant countries — following protracted negotiations — to set a date of 21 November, 2007, for compliance with the Panel's GMO Report. Of the six EC member states that maintained safeguard measures, four had either come into compliance (such as Italy) or maintained bans on GMO products that were withdrawn by their producers and not marketed in the EU. However, Austria and Greece maintained a ban on a corn product that was currently traded: MON 810 maize produced by the US company Monsanto. Austria also maintained a ban on T25 maize made by the German company Bayer. In June, 2007, the Greek government announced it was extending its ban on MON 810 maize for an additional two years. Meanwhile Hungary, not involved in the GMO case, also banned MON 810, and was reported to be preparing 'to adopt the strongest, most vociferous anti-GMO legislation in all of Europe'.²³

The EC Commission previously tried on two occasions to remove the member state safeguard measures. In June 2005, the Commission proposed lifting the bans at a meeting of the EC Council of Environment Ministers, but twenty-two of twenty-five countries opposed the proposal and it was withdrawn.²⁴ Again, in December 2006, after the release of the GMO Panel Report, a large majority of EC member states refused to support a Commission proposal to require Austria to remove its bans on two GMO maize varieties. In the absence of some action by Austria, there appeared little the EC Commission could do to implement the WTO GMO Panel short of initiating

judicial action against Austria within the EC.²⁵ As noted by Professor Arcuri (2007, 21): ‘Even if the option (of initiating judicial action) is legally conceivable, in practice it would be highly controversial ... politically it would be highly inappropriate ...’.

Negotiations between the complainants and the EC succeeded in advancing the deadline for compliance to mid-January, 2008, but again the EC was unable to comply. Concurrently, the French government announced it would ban the cultivation of the GMO maize,²⁶ and the USA stepped up pressure in the WTO for compensation from the EC. For its part, the EC Commission requested a ruling from the European Food Safety Authority (EFSA) on whether Austria and Greece had discovered new scientific evidence that could justify a continual ban on the use and sale of GMO products. The negative response from the EFSA cleared the way for a legal challenge to Austria’s restrictions from the Commission (Nuthall 2008).

At the time of writing (July 2008), Austria lifted its ban on the importing and processing of GMO maize, but continued its ban on cultivation, the latter action being controversial among Austrian farmers (Klapper 2008). Meanwhile, the USA, which had argued the moratorium had not ended, received assurances from EC officials that ‘the (GMO) issue is heavily debated in a number of venues ...’,²⁷ which undoubtedly is an exercise in understatement. The concern presently for the USA is less the bans by the EU member states, but rather the apparent slowing of product approvals after the findings by the EFSA that the products in question are safe. Similar actions by the EC in the late 1990s are what initiated the dispute in the first place.

It is not possible to predict how the GMO case will be resolved. One thing that appears likely is that, as observed in 2002: ‘A WTO case would play into the hands of European environmental organizations, consumer groups and politicians who portray the US as the world’s fast-food superpower trying to force an unwelcome technology down European throats. It also would be a setback for European scientists and leaders working for a more reasoned public debate over biotechnology’ (Moore and Winham 2002). The case will likely continue to cause political conflict within Europe, possible further legal conflict in the WTO and, finally, economic conflict if the complainants in the GMO case seek to apply retaliatory measures against an EC that may not be politically able to comply with this adverse WTO decision over biotechnology. All this might support the argument that it was better not to bring the case in the first place.

On the other hand, it is probable that the GMO case has taken an important first step in clarifying and implementing international trade law on agricultural biotechnology. This is the main reason the case was pursued, and it will clarify the policy situation for third parties, and especially developing countries. Then, too, the case resulted in as balanced an outcome as an agricultural biotech dispute is likely to produce. While the European Commission is left with a serious political problem from this case, its policies were nevertheless supported on all three of the issues brought by complainants to the Panel. Agricultural biotech is not a subject the WTO will be able to avoid

in the future. The GMO case may have been the gentlest introduction to the conflict produced by this technology as the trade regime was likely to produce.

Acknowledgement

The author wishes to thank Grace Skogstad, University of Toronto, and Gretchen Stanton, WTO, for helpful comments on earlier versions of this article. The usual disclaimer applies.

Notes

1. The term European Communities has been used by the WTO in this dispute.
2. A noted authority, Jasanoff (2005, 122), made the following observation regarding the UK:

The BSE inquiry ... found that British health and safety experts had acted as a narrow and secretive community: they were complacent about empirically unverifiable risks yet unwilling to commission new research to improve on available knowledge, and profoundly reluctant to display any uncertainty to a public they saw as irrational and prone to panic. These revelations shook people's faith in a decision-making system founded on the premises that governmental experts know best — indeed they raised doubts whether, at moments of crisis, appropriate experts are available to cater to urgent public needs.

3. 'Biotechnology', Foreign Agricultural Service, US Mission to the European Union (last updated August 3, 2007), <http://useu.usmission.gov/agri/GMOs.html>. These regulations are: 'Genetically modified food and feed' (European Parliament and Council Regulation 1829/2003) and 'Traceability and labelling of food and feed products produced from genetically modified organisms' (European Parliament and Council Regulation 1830/2003).
4. Judicial economy refers to the tendency of a court not to decide subordinate claims raised in a case when its decision on another claim is sufficient to resolve the case.
5. World Trade Organization (2006, 639): 'we confirm the view and conclusion ... that the European Commission's decision to apply a general moratorium on approvals should be characterized as a procedural decision to delay final substantive decisions. The decision was procedural in nature insofar as it was a decision relating to the application, or operation, of the existing EC approval procedures'.
6. Panels are established to examine a complaint by one or more WTO members that another member maintains a measure inconsistent with the WTO agreements. The recommendation of a Panel (if accepted by the WTO Dispute Settlement Board) is authoritative for the parties to the case, but it is not binding on future Panels. Therefore, the implications of any Panel's recommendation are a function of whether a future Panel, given similar circumstances, would find an earlier Panel's analysis to be intrinsically persuasive. In the case of an appeal, a recommendation of the WTO Appellate Body (AB) is authoritative for the parties to the case, and the AB's legal reasoning will carry greater weight for future dispute settlement actions than a Panel's recommendation.
7. TBT agreement, Article 2.2.
8. Annex A reads as follows:

Annex A: Definitions

1. Sanitary and phytosanitary measure — Any measure applied:
 - to protect animal or plant life or health within the territory of the Member from risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms;
 - to protect human or animal life or health within the territory of the Member from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs;

to protect human life or health within the territory of the Member from risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment or spread of pests; or
to prevent or limit other damage within the territory of the Member from the entry, establishment or spread of pests.

Sanitary or phytosanitary measures include all relevant laws, decrees, regulations, requirements and procedures including, *inter alia*, end product criteria, processes and production methods, testing, inspection, certification and approval procedures, quarantine treatments including relevant requirements associated with the transport of animals or plants, or with the materials necessary for their survival during transport; provisions on relevant statistical methods, sampling procedures and methods of risk assessment; and packaging and labelling requirements *directly related to food safety* [emphasis added].

NB For the purpose of these definitions, 'animal' includes fish and wild fauna; 'plant' includes forests and wild flora; 'pests' includes weeds; and 'contaminants' include pesticide and veterinary drug residues and extraneous matter.

9. Generally, GMO refers to living systems, or products processed from same, that result from recombinant DNA technology. See McHughen (2000, 10).
10. For example, Mootal (2005, 484) notes: 'while the advocates of the precautionary principle are numerous, they do not agree on a common definition of the term'.
11. Commission of the European Communities (2000, section 5.2.1). The introduction to the Communication, while speaking about the perception of risk in public opinion, states: 'Decision-makers have to take account of the fears generated by these perceptions and to put in place preventive measures to eliminate the risk or at least reduce it to the minimum acceptable level'.
12. Article 5.7 reads:

In cases where relevant scientific evidence is insufficient, a Member may provisionally adopt sanitary or phytosanitary measures on the basis of available pertinent information, including that from the relevant international organizations as well as from the sanitary and phytosanitary measures applied by other Members. In such circumstances, Members shall seek to obtain the additional information necessary for a more objective assessment of risk and review the sanitary or phytosanitary measure accordingly within a reasonable period of time.

13. The precautionary principle appears to be gaining influence in international and domestic law. For example, one of the complainants — Canada — explicitly promotes the precautionary principle. See 'A Canadian perspective on the precautionary approach/principle' at http://www.ec.gc.ca/econom/pamphlet_e.htm.
14. Winickoff et al. (2005, 81) have argued in favour of making Article 5.7 a safe harbour in the case of GMOs.
15. Article 2.2 reads: 'Members shall ensure that any sanitary or phytosanitary measure is applied only to the extent necessary to protect human, animal or plant life or health, is based on scientific principles and is not maintained without sufficient scientific evidence, except as provided for in paragraph 7 of Article 5'.
16. Article 5.1 reads: 'Members shall ensure that their sanitary or phytosanitary measures are based on an assessment, as appropriate to the circumstances, of the risks to human, animal or plant life or health, taking into account risk assessment techniques developed by the relevant international organizations'.
17. Annex A #4 reads in part: 'Risk Assessment — The evaluation of the likelihood of entry, establishment or spread of a pest or disease within the territory of an importing Member according to the sanitary or phytosanitary measures which might be applied, and of the associated potential biological and economic consequences ...'.
18. The text of Article 5.7 is reproduced in note 12.
19. The four requirements of Article 5.7 are: insufficiency of scientific evidence, availability of pertinent information; search for additional information needed for a more objective assessment of risk, and the review of measures within a reasonable period of time. These requirements are cumulative, and the fourth requirement underscores the provisionality of Article 5.7 SPS measures.
20. For further analysis of this point, including observations contained in an (unusual) interpretative letter from the Panel to the parties, see Poli (2007, 721).

21. This conflict extends beyond the parties to the immediate case. See Winham (2003).
22. WTO, Dispute Settlement Understanding, Articles 21 and 22.
23. Interview with Lawrence Kogan 'Precautionary principle will "run in place" in 2007, trade expert predicts'. *Pesticide.Net* 4:2, 30 January, 2007.
24. 'Greenpeace dismisses WTO ruling and predicts Europe will stay closed to GMOs', Common Dreams Progressive Newswire, <http://www.commondreams.org/cgi-bin/newsprint.cgi?file=/news/2006/2007-10.htm>.
25. EU member states back Austrian ban on biotech products. *Bridges Trade BioRes* 7:1, 19 January, 2007, <http://www.ictsd.org/biores/07-01-19/inbrief.htm>.
26. 'On January 11 — the day that the EU missed its compliance deadline with the WTO biotech case — France announced that it would ban the growing of MON810 nationally'. See GM Roundup: Dispute Update. *Bridges Trade BioRes* 8:1, 25 January, 2008, <http://www.ictsd.org/biores/08-01-25/story4.htm>.
27. US mulling retaliation in EU GMO case after lack of progress. *Inside U.S. Trade* 26, 27 June, 2008.

References

- Arcuri, A. 2007. Compliance is a hard nut to crack in the biotech dispute. *Bridges Comment* 6 (October), www.ictsd.org.
- Baumullier, H., and Y. Apea. 2006. A preliminary analysis of the WTO biotech ruling. *Bridges Monthly Review* 10, no. 7: 13, www.ictsd.org.
- Benitah, M. 2006. International economic law and policy blog, comment posted 4 December, 2006, http://worldtradelaw.typepad.com/ielpblog/2006/12/unappealing_bio.html.
- Commission of the European Communities. 2000. Communication from the Commission on the Precautionary Principle. Brussels: CEC.
- Franken, L., and J. Burchardi. 2007. Beyond biosafety — an analysis of the EC-biotech panel report. *Aussenwirtschaft* 62: 77–106.
- James, C. 2002. Global review of commercialized transgenic crops: 2001. International Service for the Acquisition of Agri-biotech Acquisitions, ISAAA Brief #24.
- James, C. 2006. Global status of commercialized biotech/GM crops: 2006. International Service for the Acquisition of Agri-biotech Acquisitions, ISAAA Brief #35.
- Jasanoff, S. 2005. *Designs on nature: science and democracy in Europe and the United States*. Princeton, NJ: Princeton Univ. Press.
- Klapper, B.S. 2008. EU says Austria ends ban on biotech corn. Associated Press, www.forbes.com/feeds/ap/2008/06/24/ap5148492.html, 24 June.
- McHughen, A. 2000. *Pandora's picnic basket: the potential and hazards of genetically modified foods*. Oxford: Oxford Univ. Press.
- Moore, J., and G. Winham. 2002. Let's not escalate the 'Frankenfood' war. *Christian Science Monitor*, 20 December.
- Motaal, D.A. 2005. Is the World Trade Organization anti-precaution?. *Journal of World Trade* 39, no. 3: 483–501.
- Nuthall, K. 2008. Austria, Greece may face legal challenges against GM bans, www.checkbiotech.org, 1 June.
- Oliva, M.J., and S. Zarrilli. 2007. WTO panel report on the 'EC-biotech' case: considerations for trade and development. UNCTAD (TD/B/COM.1?CRP.4) 26 February.
- Palmer, A. 2006. The WTO GMO dispute: implications for developing countries and the need for an appeal. Paper prepared for GeneWatch UK, the RSBP, Forum for Biotechnology and Food Security and the GM Freeze, November.
- Pauwelyn, J. 2001. The role of public international law in the WTO: how far can we go?. *American Journal of International Law* 95: 535–78.
- Pauwelyn, J. 2006. International economic law and policy blog, comment posted 24 February, 2006, http://worldtradelaw.typepad.com/ielpblog/2006/02/so_lets_talk_st.html.
- Poli, S. 2007. The EC's implementation of the WTO ruling in the biotech dispute. *European Law Review* 32: 705–26.
- Winham, G.R. 2003. International regime conflict in trade and environment: the biosafety protocol and the WTO. *World Trade Review* 2, no. 2: 131–55.

- Winickoff, D., S. Jasanoff, L. Busch, R. Grove-White, and B. Wynne. 2005. Adjudicating the GM food wars: science, risk, and democracy in world trade law. *The Yale Journal of International Law* 30: 81–123.
- World Trade Organization. 1996. United States — standards for reformulated and conventional gasoline. WTO Doc. WT/DS2/AB/R, 20 March.
- World Trade Organization. 1998. EC measures concerning meat and meat products (hormones): Report of the Appellate Body. WTO doc. WT/DS26/AB/R, 16 January.
- World Trade Organization. 2006. European Communities — measures affecting the approval and marketing of biotech products: Reports of the panel. WT/DS291/R, 292/R, 293/R, 29 September.
- Zarilli, S. 2000. International trade in genetically modified organisms and multilateral negotiations: a new dilemma for developing countries. UNCTAD/DITC/TNCD/1. Geneva: UNCTAD, 5 July.

Copyright of Journal of European Integration is the property of Routledge and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.

Copyright of Journal of European Integration is the property of Routledge and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.