

# Whose Science is More Scientific? The Role of Science in WTO Trade Disputes\*

Inkyoung Kim\*\* and Steve Brazil

Bridgewater State University

## Abstract

This study examines the role of science in resolving trade disputes. After the Great East Japan Earthquake of 11 March 2011 that not only jeopardized the people of Japan, but also put the safety of an entire region at risk, the Republic of Korea (Korea) has imposed import bans as well as increased testing and certification requirements for radioactive material on Japanese food products. Japan has challenged these restrictions at the World Trade Organizations Dispute Settlement Body (DSB). This study aims to explain how international trade agreements and previous DSB rulings have dealt with different scientific viewpoints provided by confronting parties. In doing so, it will contrast the viewpoints espoused by Korean and Japanese representatives, and then analyzes the most similar case studies previously ruled on by the DSB, including the case of beef hormones and the case of genetically modified crops including biotech corn, both between the United States and the European Communities (EC). This study finds that science is largely subordinate to national interests in the case of state decision-making within the dispute settlement processes, and science has largely been relegated to a supportive role. Due to the ambiguity and lack of truly decisive decisions in the Appellate Body in science-based trade disputes, this study concludes that the Appellate Body avoids taking a firm scientific position in cases where science is still inconclusive in any capacity. Due to the panel's unwillingness to establish expert review boards as it has the power to do, instead favoring

---

\* This paper was presented at the annual conference of International Studies Association-Northeast on 3-4 November 2017 in Providence, RI, the United States of America. Authors appreciated fruitful comments by Dr. Mark Raymond at University of Oklahoma as well as three anonymous reviewers.

\*\* Institutional affiliation: Assistant Professor of Department of Political Science, Bridgewater State University, USA. Contact information: [ikim@bridgew.edu](mailto:ikim@bridgew.edu), 1-508-531-2316

an individual-based system so that all viewpoints can be heard, it has also developed a system with its own unique weaknesses. Similar to any court of law in which each opposing party defends its own interests, each side brings whatever scientific evidence it can to defend its position, incentivizing them to disregard scientific conclusions unfavorable to their position. With so many questions that can arise, combined with the problems of evolving science, questions of risk, and social concerns in democratic society, it is no wonder that the panel views scientific information provided by the experts as secondary to the legal and procedural issues. Despite being ruled against the EC on legal issues in two previous cases, the EC essentially won both times because the panel did not address whether its science was correct or not. This failure to conclusively resolve a debate over whose science is more scientific enabled the EC to simply fix the procedural issues, while continuing to enforce trade restrictions based on their scientific evidence. Based on the analysis of the two cases of disputes, Korea may also find itself guilty of imposing an unwarranted moratorium on Japan's fish exports, only to subsequently pass new restrictions on labelling and certification requirements because Japan may have much scientific evidence at its disposal. However, Korea might be able to create enough uncertainty in the panel to force them to rule exclusively on the legal issues of the case. This will then equip Korea, like the EC in the past, with a way of working around the ruling, by changing whatever legal procedure they need to while maintaining some, if not most, of its restrictions when the panel fails to address its case on scientific grounds.

**Keywords**

Dispute settlement, World Trade Organization, science, Korea, Japan

## I . Introduction

With no previous comprehensive body for the governance of trade, the International Trade Organization (ITO) was proposed at a conference held in Bretton Woods, New Hampshire in 1944. ITO was to serve as a general framework for trade rules as well as a venue for trade negotiations (Karns et al. 2015). The charter for this proposed ITO was to be approved in 1948 at the Havana Conference. However, the Havana Charter was never ratified, and the idea for ITO failed. As a temporary arrangement, twenty-three of the participants in the ITO negotiations developed the General Agreement on Tariffs and Trade (GATT). GATT had been the major venue for trade negotiations since 1949, until the World Trade Organization (WTO) became a meaningful and successful predecessor to GATT in 1995 as the “world’s comprehensive trade organization” (Karns et al. 2015, 99).

The many “birth defects” of the GATT and its role as a “relatively feeble institution” did not prevent its evolution into a “quite successful” trade mechanism in time (Jackson 2008, 441). This success resulted from the significant need for an international trade institution, due to the growing economic interdependence of the world. This global interconnection reduced the resistance of government leaders to allow for their freedom of action to be circumscribed for dealing with the impact of external, international economic factors on their national economies. This success of WTO is also attributed to the provision of infrastructure for dispute settlement among member countries, which “goes far beyond anything envisaged in the 1940s” (Karns et al. 2015, 99). The dispute settlement mechanism has

become one of the core activities of the WTO through its judicialisation that creates authority over the member states with binding third party enforcement (Watson 2013). John H. Jackson (2008) asserts that “there is broad agreement... that the WTO dispute settlement system is probably the most powerful and most significant international tribunal system in existence today” (p. 438). The rule-oriented WTO dispute settlement system brings “the modicum of predictability and stability” unlike the power-oriented procedures which focus on the “relative power status of the parties” (ibid.). This evolution of dispute settlement system is demonstrated by its dramatically increasing magnitude of employment. The only 300 disputes were settled over about 45 years of the GATT era, but about 500 disputes have been brought to the WTO’s dispute resolution mechanism for its first 20 years of existence.

Global governance values constant oscillation between decision makers and experts (Klabbers 2014). International decision-making processes have involved experts to deal with the increasing complexity and uncertainty of issues and to enhance their legitimacy. Scientific experts can improve the legitimacy of both political and legal decisions that international institutions take (Gruszczynski 2014). This study asks a question of how science plays a role for international decision-making processes, specifically how science is treated by international legal bodies when inconclusive knowledge prevails. Under the circumstances that the vast majority of dispute cases have invited experts to provide answers to questions to the panel, it is imperative to explore what particular roles science has played for international decision-making processes.

## II. The Role of Science in International Decision-Making Processes

The complex and uncertain nature of policy problems, such as environmental and economic governance, has increased the demand for expert knowledge, loosely defined as “the knowledge produced by academic research” (Boswell 2009, 23-24). However, the relationships between knowledge and policy decisions are not new to researchers. In particular, questions regarding the gap between the production and actual use of expertise were addressed by the knowledge utilization literature in the late 1970s and 1980s (Weiss 1979; Feldman and March 1981; Lindquist 1988). The knowledge utilization literature contends that expertise can be used in three different ways by regulators: instrumentally (to identify the best problem-solving solution); strategically (to support a position); and symbolically (to increase reputation and legitimacy of the agency) (Schrefler 2014).

The legal system of the WTO mandates recourse to science to assess the legality of member countries’ national measures that have an impact on international trade (Gruszczynski 2014), most relying on a symbolic tool of science. Scientific expertise has become a reliable source for legitimacy of WTO’s judicial processes, and “conformity with scientific norms is an explicit criterion of compliance with a number of WTO obligations” (Lawrence 2014, 176). The experts of the panel are to act in their own capacities without representing any government, which makes decision making processes de-politicized with greater neutrality and impartiality (Lawrence 2014). In addition to this input legitimacy through impartial and transparent governance, the participation of experts can

enhance output legitimacy of Dispute Settlement Body (DSB) in that the decision of DSB is more acceptable to the Member States when their reports refer to the universal logics of science, based on “best practices, empirical necessity, good sense, or consensus values” (Kennedy 2005, 11).

Even though an increasing role of experts results in more legitimacy based on better informed decisions, accountability can be questioned. As critics of globalization have pointed out, critics decry the democratic deficit of transnational regulatory agencies, such as the WTO and the World Bank, due to the lack of participation and transparency and consequently little accountability. Along this line, experts can take little responsibility for their input, as they are appointed, not elected in a public position, on the basis of their expertise (Klabbers 2014).

Despite the concerns over accountability of experts on decision making processes, most scholars who study WTO seem to agree that the participation of experts in legal, economic, scientific, and technical fields increases the legitimacy of WTO’s judicial decisions by making the decision making processes “more rational, better informed and more broadly representative” (Lawrence 2014, 180). For example, the Agreement on Technical Barriers to Trade notes that technical regulations must not be trade restrictive and should be within a necessary scope to achieve legitimate goals such as protection of human health and animal or plant life. Experts evaluate necessity in terms of scientific and technical demonstrability.

### **III. The WTO Dispute Settlement Procedures**

Analysis on the role of science throughout the WTO dispute settlement procedures would require a clear understanding of the dispute settlement procedures. The structure of the dispute settlement system can include four different steps: consultations; a panel composition; appeal to the Appellate Body; and implementation of recommendations and rulings. The first step is to request consultations by a complaining country to the defending country and the Chairperson of pursuant to Article 4 of the “Understanding on Rules and Procedures Governing the Settlement of Disputes” or “Dispute Settlement Understanding (DSU).” Article 23 of GATT provides that a member country may make representations or proposals to another contracting party on grounds of “nullification or impairment of any benefit otherwise to accrue under GATT.”

If consultations fail to settle a dispute within 60 days after the date of receipt of a written request for consultations, the second step is to request a panel. The complaining party may request the DSB to establish a panel according to Article 4.7 of DSU. Any member that has a substantial interest in the concerned matter can become a third party if it expresses such desire no later than 10 days after the panel is established. The WTO Secretariat proposes a list of nominees of the panel (paragraph 6, Article 8 of DSU). It is notable that nationals of the disputing and third parties may not serve on a panel unless the disputing parties agree otherwise (Article 8.3 of DSU). If parties do not agree on the panelists within 20 days after the date of the establishment of a panel, the Director-General shall determine the final panelists after consulting with the

disputing parties (Article 8.7 of DSU). The complainant submits a document to the panel, containing facts relating to the issue concerned and its claims after three to six weeks from the establishment of the panel, and the respondent submits its claims after the panel receives the complainant's statement. The panel issues an interim report to the disputing parties, and issues the final panel report within six months, from the date that the composition and terms of reference of the panel have been agreed upon until the date of the final report (Article 12.8 of DSU). The panel report delivers its judgement, and the DSB adopts the "recommendation and rulings" that are legally binding upon the disputed parties. The panel report is supposed to be adopted between 21 and 60 days after the date the panel report has been circulated to the Members (Article 16.1 and Article 16.4 of DSU).<sup>1)</sup>

If the disputing parties object to the panel report, the third step is for them to request the Appellate Body to examine the appropriateness of the legal interpretations of the panel (Article 17.4 of DSU). The Appellate Body is a standing group of seven experts appointed by the DSB, based on a consensus of all members at the DSB. After a written submission by the appellant (within 7 days after filing a notice of appeal), a written submission by the appellee (within 25 days after a notice of appeal is filed), and a meeting of the Appellate Body with all the parties (between 35 and 45 days after the date of the filing of a notice of appeal) (paragraphs 21, 22, 24, and 27 of Working Procedures for Appellate Review "WT/AB/WP/5"), the Appellate Body is to circulate its report to the Members within 60 days after the date of filing of a notice of appeal,

---

1) Appendix 3 of DSU presents the specific working procedures along with proposed timetable for panel work. See [https://www.wto.org/english/tratop\\_e/dispu\\_e/dsu\\_e.htm#appendix3](https://www.wto.org/english/tratop_e/dispu_e/dsu_e.htm#appendix3).

without exceeding 90 days in any case (Article 16.5). An Appellate Body report shall be “unconditionally accepted by the parties to the dispute unless the DSB decides by consensus not to adopt the Appellate Body report within 30 days following its circulation to the Members” (Article 17.14). As a general rule, nine months shall be the maximum duration for the panel to adopt its report or 12 months for Appellate Body from the date of establishment of the panel (Article 20 of DSU).

The last step for the dispute settlement system is to ensure prompt compliance with recommendations or rulings of the DSB. The Member concerned is required to inform the DSB of its intentions to comply with the recommendations and rulings within 30 days after the reports are adopted (Article 21.3 of DSU). If the party concerned cannot comply immediately with them, it is given “a reasonable period of time in which to do so,” along with a guideline provided by the arbitrator, who is usually one of the three Appellate Body members who reviewed the case (Article 21.3 of DSU).

#### **IV. Place for Science in SPS Agreement**

The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) appeared in the Final Act of the Uruguay Round of Multilateral Trade Negotiations signed on 15 April 1994, and entered into force on 1 January 1995 with the establishment of the WTO. It addresses two different sets of questions, such as how to ensure a country’s consumers are supplied with safe food but at the same time

how to ensure that health and safety regulations are not used as “disguised protectionism” (Johnson 2015, 1). To fulfill these goals, SPS Agreement sets out the basic rules for food safety as well as animal and plant health standards, allowing countries to set their own standards but requiring those regulations based on science.

The SPS Agreement is regarded as the “most elaborated framework” to demonstrate the significant contribution of science to the international decision making processes as it “openly designates science as a criterion for distinguishing between permitted and prohibited” measures (Gruszczynski 2014, 217). In fact, the role of experts for the WTO dispute settlement mechanism is stated in Article 13.2 of DSU. Panels are allowed to seek information and consultation from experts who can provide opinion on scientific or technical matters raised by a party to a dispute. An expert review group may be requested to submit a written advisory report. Article 3.8 of Annex 2 of DSU<sup>2)</sup> indicates that.

In cases where there is an infringement of the obligations assumed under a covered agreement, the action is considered *prima facie* to constitute a case of nullification or impairment. This means that there is normally a presumption that a breach of the rules has an adverse impact on other Members parties to that covered agreement, and in such cases, it shall be up to the Member against whom the complaint has been brought to rebut the charge.

Article 5.1 in the SPS Agreement presents a requirement for “risk assessment” that can quantify likelihoods and consequences for any measure

---

2) For the full document, [https://www.wto.org/english/docs\\_e/legal\\_e/28-dsu.pdf](https://www.wto.org/english/docs_e/legal_e/28-dsu.pdf)

restricting trade. In other words, without sufficient risk assessment for the disputed product, the regulatory measures would be regarded as a violation of free trade agreement. This “contains a highly stringent *procedural*” requirement for a scientific study (Mercurio and Shao 2010, 201). Article 5.7 recognizes potential precautionary measures, trade delays or bans, under scientific uncertainty.

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 sanitary or 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.

If no settlement can be reached between the arguing parties during preliminary meetings, the panel will immediately seek the guidance of international organizations which can guide them on the proper course of action. These organizations will generally include the Codex Alimentarius<sup>3)</sup> Commission, World Health Organization (WHO), and Food and Agriculture Organization (FAO) among others. These organizations will then recommend a list of potential experts with substantial knowledge in the fields in question, generally creating a list of about 30-50 individuals to consult. The two opposing parties at this time can also make their own suggestions

---

3) The Codex Alimentarius, meaning food code in Latin, sets international food standards, guidelines and codes of practice to ensure the safety, quality and fairness of exponentially growing international food trade. See <http://www.fao.org/fao-who-codexalimentarius/en/>

for experts to consult. Once the panel and both parties have agreed upon which experts are suitable (determining that none have a conflict of interest, etc.), the candidates will be narrowed down to about four to six experts. It is important to note that each party in this case could object to an expert from being consulted for any reason and the panel “simply accepted the parties’ demands for rejection without evaluating them” (Bonneuil and Levidow 2012, 85).

Once the experts have been finalized, both the panel and parties can then develop and submit in writing any questions they feel necessary for their case to the experts. During this time, each party may continue to gather as much research to support their case as possible. After the scientific experts have finished submitting their answers back to the panel, a subsequent meeting can be planned where they will meet with the panel and opposing parties to further discuss the issues raised. The information discussed in this meeting will become but one aspect of the panel’s eventual decision when they review the case. This study will seek to apply this understanding of the dispute resolution process to a current case being listened to by the panel.

## **V. DS 495 Korea – Import Bans, and Testing and Certification Requirements for Radionuclides**

The Great East Japan Earthquake of 11 March 2011 not only jeopardized the people of Japan, and its neighbors, but also led to economic disputes between Japan and its neighboring countries. One such dispute is between

the Republic of Korea (Korea hereafter) and Japan, as Korea has imposed import bans on fish from eight prefectures — Fukushima, Miyagi, Iwate, Aomori, Ibaraki, Tochigi, Gunman, and Chiba — as well as increased testing and certification requirements for radioactive material on Japanese food products since the Fukushima Daiichi nuclear disaster that happened as a result.

Japan has challenged these restrictions at the WTO’s DSB as case DS495. This case brought by Japan relies on the role of “sufficient scientific evidence” applied to the case as discussed in the SPS Agreement. Therefore, the next focus of this research is how international trade agreements and previous Appellate Body rulings interpret different scientific viewpoints presented to the DSB by two adversaries. It will begin with a discussion on the viewpoint and potential arguments of both sides in this case. Next, it will analyze the most similar case studies previously ruled on by the DSB, analyze them, and from them make conclusions as to the true nature of science in the disputes.

## **1. Legal Basis for Korean Claims**

Based on the Korean argument, we can find that their position is supported by the SPS Agreement Article 2 on “Basic Rights and Obligations” which states,

1. Members have the right to take sanitary and phytosanitary measures necessary for the protection of human, animal or plant life or health, provided that such measures are not inconsistent with the provisions of this Agreement.

2. 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. (WTO 2017)

The basis for Korea's claims in the dispute rests solely upon a view that there is a lack of information present to make an informed decision which would affect the health and safety of its citizens. Korea has thus put forth eleven new regulatory measures, including four legal acts, since the Fukushima Disaster in an effort to halt the importation of any food product which may have radionuclide contamination.

## **2. Argument of Korea**

Due to the lack of scientific knowledge in the area of long-term nuclear exposure through food products, Korea's evidence for maintaining its trade restrictions is based more on scientific uncertainty than any conclusive studies. This uncertainty is most noticeable among Korean consumers. Fears have spread that radioactivity has spread from the waters off Fukushima closer to home, and false labelling by producers (Associated Press 2013). In addition, many stalls in the fish markets of Seoul have seen a large decline in sales, with some going out of business and others being forced to provide radiation scanning machines to ease public fear.

This comes after Korea lowered the allowed level of radiation in fish products from 370 Bq (becquerels) to 100 Bq per kilogram, in line with Japan's own regulations. Director of Foreign Inspection Division at Korea's Ministry of Food and Drug Safety, Lee Soo-doo, says: "Since September 6th when the temporary special measure was implemented on Japanese

fish imports, if you compare the quantity of imported fish from Japan for a month period from September 9th to October 8th, there is a 24 percent decrease from 874 tons in 2012 to 668 tons in 2013” (Associated Press 2013).

### **3. Other Parties with Similar Policies**

Korea does not stand alone in its trade barriers against Japan in response to the Fukushima disaster; both China and Taiwan (referred to as “Chinese Taipei” in the dispute resolution process) have put forward similar restrictions. Of the eight types of food that Japan exports, China bans imports from ten prefectures around Fukushima that might be the source of that food. Taiwan bans imports of five prefectures around Fukushima, making them both the most restrictive by far. Korea bans fish from eight prefectures, tea from five prefectures, and has almost no restrictions outside of these. On the issue of fish in particular, China leads with bans from ten Japanese prefectures. Next is South Korea (8), Russia (7), Taiwan (5), Macau (1), and Singapore (1) (Food Industry Affairs Bureau Ministry of Agriculture, Forestry and Fisheries, Japan 2017).

Recent developments indicate that China’s strict ban will not end soon. China’s Foreign Ministry called upon the Japanese government to do a better job of disclosing information on the source of its exports, as a recent crackdown by Chinese authorities discovered that more than 13,000 online shops in China were selling products in violation of the import bans (Xiaodong 2017). Many supermarkets are also suspected of selling food in violation of the bans.

A similar situation transpired in Taiwan two years ago. Reports indicate

that thousands of mislabeled food products made their way into Taiwan in 2015, with Taiwanese authorities stating that the products were most likely mislabeled in Japan and not by Taiwanese retailers (Foust 2015). Rescinding the import bans is continuing to be controversial in Taiwan, as the opposition political party, the Kuomintang, has organized demonstrations whenever the current government has considered it. Their concern may be purely political, however the Taiwanese public remains wary following many food scares in recent years, including the most recent in 2014 when edible lard oil was discovered to be tainted with recycled waste oil.

#### **4. Legal Basis for Japanese Claims**

The relevant WTO provisions that apply to Japan's argument against Korea and that deal with the issue of scientific integrity are found in the SPS as well. Japan claims that under Article 4 of the SPS Agreement, Korea failed to provide an explanation of the objectives and rationale of the SPS measures referred to in the relevant trade restrictions; a clear identification of the risks they address; a risk assessment on which these same SPS measures are based and a relevant international standard. According to *SPS Article 4*,

Members shall accept the sanitary or phytosanitary measures of other Members as equivalent, even if these measures differ from their own or from those used by other Members trading in the same product, if the exporting Member objectively demonstrates to the importing Member that its measures achieve the importing Member's appropriate level of sanitary or phytosanitary protection. For this purpose, reasonable access

shall be given, upon request, to the importing Member for inspection, testing and other relevant procedures. (WTO 2017)

Furthermore, those trade restrictions are inconsistent with Articles 5.1 and 5.2 of the SPS Agreement because they are not based on a proper risk assessment. They are also inconsistent with Article 5.7 of the SPS Agreement because this is not a case where relevant scientific evidence is insufficient, not adopted provisionally, not based on available pertinent information, and not reviewed within a reasonable period of time. Japan also contends because they arbitrarily discriminate where similar conditions prevail, or because they constitute a disguised restriction on international trade. Finally, Japan cites Article 5.6 of the SPS Agreement, claiming the measures are more traderestrictive than required to a

## **5. Argument of Japan**

Japan has sought to augment its argument against Korea with as much relevant scientific data as is available to settle the dispute in its favor. Probably the most relevant and important group in disputes like this is the WHO, which has offered its scientific opinions on previous cases where scientific knowledge was uncertain. The WHO has declared that apart from the dozens of workers who worked to repair the Fukushima facility in the aftermath of the devastating tsunami, there are no increased risks of thyroid or other cancers for general members of the public and these risks are even lower among those from neighboring countries.<sup>4)</sup>

---

4) Reports from the WHO and UNSCEAR can be retrieved at [http://www.who.int/ionizing\\_radiation/a\\_e/fukushima/faqs-fukushima/en/](http://www.who.int/ionizing_radiation/a_e/fukushima/faqs-fukushima/en/) (Reich and Goto 2015)

Furthermore, while some Japanese foods with levels of radioactive iodine and cesium were detected shortly after the incident, intensive food monitoring by the Japanese Ministries of Health and Labor and Welfare of Japan in conjunction with the International Food Safety Authorities Network (IFSAN) of the FAO have implemented protective measures to prevent further sale of such products (Reich and Goto 2015). The main health impact felt by those in the Fukushima area are actually mental health problems and not radiation related, due to widespread housing relocation and confusion following the tsunami.

Other reports out of the scientific community echo those assessments. An ongoing survey conducted by Fukushima Medical University which has studied the effects of Fukushima radiation on residents of the area concluded in its most recent report that radiation doses of 99.8% of approximately 460,000 residents were <5 millisieverts (mSv) (Fukushima Medical University 2016). The report notes that no significant health effects have been reported by individuals at doses less than 100 mSv, stated by the United Nations Scientific Community on the Effects of Atomic Radiation (UNSCEAR) (UNSCEAR 2008). While the report out of Fukushima Medical University admittedly is based off of limited data given how recent the disaster was, it still states that the level of exposure in Fukushima was low and that cases of thyroid cancers are unlikely to change as a result. UNSCEAR also released its own report in 2013, adding that theoretical potential for slightly increased cancer risk in children in Fukushima, but that in general the risk of health effects was very low and that increased testing over the coming years would be essential (UNSCEAR 2014). The WHO's 2013 Health Risk Assessment can be seen as one of the most comprehensive analyses available and

concluded, “The present results suggest that the increases in the incidence of human disease attributable to the additional radiation exposure from the Fukushima Daiichi NPP accident are likely to remain below detectable levels” (WHO 2013, 92).

## **6. Status of Parties That Removed Trade Barriers**

The ongoing removal of trade barriers from countries all over the world bolster Japan’s case. While 55 countries initially put restrictions on Japanese food products in response to the disaster, only China, Taiwan, Hong Kong, Russia, Macau and Singapore retain any restrictions currently in addition to Korea. Those restrictions range from regular inspections, to requirements for certificates of production place or pre-export testing of radionuclides, to outright import bans.

## **VI. Analysis of Similar Case Studies**

Two cases can be examined to provide greater context for the current case between Japan and Korea. Those cases are presented here to best examine the implications that each one had on future trade disputes. Despite such a limited amount of case studies to examine, the procedures, decisions, and explanations for those decisions handed down by the DSB give researchers a better framework to draw conclusions on the current Korea-Japan Dispute.

## 1. The Case of Beef Hormones (DS26)

The United States brought a case against the European Communities (EC)<sup>5</sup> in 1996, known as DS26 - Measures Concerning Meat and Meat Products (Hormones) (WTO 1996). The EC's ban on U.S. beef containing growth hormones was made in spite of being deemed safe by the Joint WHO/FAO Expert Committee on Food Additives. Even the EC Scientific Committee for Animal Nutrition, the EC Scientific Committee for Food, and the EC Scientific Conference on Growth Promotion in Meat Production concluded that the beef hormones were acceptably safe.

However, the DSB ruled against the EC, not based on scientific reasons, but on procedural ones. The Appellate Body ruled that because the science presented by the EC was based on studies in the medical use of hormones in pharmaceutical products and that this was not relevant to the restrictions the EC established to protect consumers. This could be seen as setting a legal precedent within the dispute resolution process that mandated *relevant* risk assessment based on scientific inquiries in order for trade restrictions to be allowed. A “rational relationship” must be established for any and all trade restrictions implemented and the risk assessment they are based on (Millstone et al. 2004). Furthermore, scientific uncertainty can be used as a basis for a temporary, if not permanent, trade restriction.

The EC subsequently appealed the dispute panel's decision and attempted to remedy its lack of a relevant standard by commissioning a new series of scientific studies. One year later in 1998, the Appellate Body of the

---

5) Before 1 December 2009, European Communities was the official name in WTO, but since then, “European Union” has been the legally-official name.

WTO upheld the previous dispute panel's decision but with some important changes. The Appellate Body ruled that the previous EC ban did not constitute any illegal barrier to trade and also stated that countries would be allowed to adopt stricter measures provided they were supported with the adequate risk assessment mentioned earlier, although they had not proven a link between the growth hormones and cancer rates as they had claimed (Johnson 2015). Taking an initiative from this, Europe opted to conduct more research using the Scientific Committee on Veterinary Measures Relating to Public Health. When its findings supported their case, Europe chose not to implement the WTO's ruling to remove the ban and allow for a labeling system. This shows that the panel's inability to take a firm stance on the question of science in this case incentivized the EC to effectively continue its restrictions.

That science was provided to the panel by five scientific experts recommended on by the Codex Commission and International Agency for Research on Cancer and agreed upon by the parties (including one additional expert from the Codex Secretariat) (WTO 1997). The EC requested special requirements for the selection of experts by the panel in this particular case. First, the experts nominated should not be from countries of the opposing parties, although each side could still choose any expert of their choice. Second, every field in this scientific area was to be represented by an expert with proven expertise in the field and with no conflicts of interest.

With both parties as well as the panel allowed to question the experts in person, 35 questions in total were posed to them. It was noted that the panel chose to consult individual experts rather than forming an expert review board, presumably because the panel felt it would be detrimental

to form a group that may form a consensus opinion that would limit potential dissenting opinions. Perhaps one of the main reasons why the decision took about twenty months, rather than the maximum twelve-month period, between the establishment of the panel and the adopt of Appellate Body Report was because there was so little scientific consensus over the issue due to such a lack of information available. It was nearly impossible for the panel to come to any hard conclusions.

## **2. The Case of GM Crops including Bt Corn (DS291)**

The most recent science-based dispute once again involves the U.S. (in addition to separate legal disputes by Canada and Argentina) against the EC and is listed as DS291 — Measures Affecting the Approval and Marketing of Biotech Products (WTO 2003). The case involves genetically modified (GM) biotech (Bt) products, once used as a spray-based pesticide that has been grown directly in corn to prevent destruction of the crop by the European corn borer and cut down on environmentally damaging sprays. However, the EC claimed that the spray could develop an immunity in pests, thus being more damaging in the long term. Subsequently, the EC risk assessors again inspected for any potential damage caused by the new product, possibly finding a connection between Bt and damage to Monarch butterfly populations (Millstone et al. 2004). The U.S.- based assessment could be criticized for having a limited scope, focusing primarily on the potential for insect species to develop resistance to it. Heated debates continue to the present on potential risk associated with Bt.

While similar cases against the EC brought by Canada and Argentina were settled outside the Appellate Body, the battle between the U.S. and

the EC is amplified by the DSB's ambiguous ruling. The DSB ruled against the EC on the grounds that an individual member country's denial of approvals for GM crops did constitute a moratorium and that they had further violated the SPS Agreement by not accepting them without "undo delay." The DSB also dismissed U.S. claims that the procedures were not based on proper risk assessment or had unjustifiably discriminated against U.S. GM products (Hanrahan 2010). Therefore, the EC was guilty procedurally, rather than scientifically. This has led EC member countries to effectively maneuver around the DSB by accepting the decision to allow U.S. GM products into the market, but to use labeling and traceability regulations to discriminate against them and hurting U.S. exports (Hanrahan 2010).

As with the previous battle between these two parties, scientific consensus was not apparent. The panel again was given expert recommendations from Codex, WHO, FAO, and so on. Four experts were selected from the nearly 30 initially scouted, and the EC requested that at least two of them be competent in nearly 40 different scientific fields (WTO 2006, 287). As questions were being submitted, it became apparent that the panel required two additional experts to help discuss the relevant topics.

Proving to be more extensive than DS26 beef hormone case, these experts were asked a total of 114 questions, taking nearly two months for the experts to answer all of them and meet with the parties for a subsequent meeting. The panel noted that this case took much longer than usual due to the amount of necessary fact finding processes. It was further complicated by what some have termed "evolving science", which describes issues where enough research to pass sure judgements is impossible to find at the current time.

## VII. Analysis of the Role of Science in Disputes

The analyses of the two science-based trade disputes suggest that in order to be found in line with the SPS Agreement, a state utilizing trade restrictions based on scientific uncertainty must be found to be not imposing restrictions that are arbitrary or discriminatory, and have a risk assessment that either can be framed into an argument in its favor (to ensure a long-term ban) or demonstrate that scientific opinion is inconclusive to that point in time (to ensure short-term bans based on evolving science). In this regard, the evolution of how the dispute resolution process handles science is a reflection of science itself. Science is not absolute and is constantly changing. Since scientific consensus cannot be achieved in these disputes, it would not be fair to charge the panel with making firm decisions on issues that are still developing.

It has been demonstrated in both the DS26 (beef hormone case) and DS291 (GM corn) that the panel will not make rulings based on science if it does not have to. In fact, these cases allowed for the panel to make rulings based on procedural and legal issues rather than scientific ones, which were not the root cause of the cases. Even though in both rulings the EC did lose, the EC was allowed to keep *de facto* trade restrictions by simply changing their practices. The actual science that the EC uses to base their actions off of has still not been directly challenged. The panel is at the mercy of scientific consensus, whereby the more differing opinions and powerful social pressures on a particular case, the more likely they are to produce verdicts that, if not explicitly, still allow defendants to keep their restrictions.

While this is probably the safe route in that it allows sovereign states to provide protect themselves, it also produces a major issue at hand: the politicization of science. Science should be open, factual, and provide answers; instead, it is being used as a political tool. In the first case of beef hormones, the EC implemented trade restrictions against the U.S. beef even though it could not provide any evidence of a link between consuming beef with added hormones and consumer health at that time. Furthermore, in the case of GM corn, U.S. decision-makers overlooked not only the fact that long-term human consumption of their products had not been adequately tested, but also any evidence that may have supported a link between GM food and adverse health effects. A system has developed where arguing parties, driven by their own self-interest, will look for any evidence they can support their viewpoint while attempting to minimize evidence that works against them. Of course, this goes contrary to what science is, and the panel is now left at the mercy of this system. Arguing parties continue to debate who should carry the burden of proof scientifically, but defendants have shown that if they can make an issue carry enough unanswered questions, they can win.

## **VII. Possible Dispute Body Decision**

Korea seems to be repeating the mistakes it made when it was forced to settle the dispute before an Appellate Body decision was even made for DS391 — Mad Cow Disease (BSE) outbreaks. Korea was brought before the DSB in 2009 by Canada to respond to bans on beef products

stemming from widespread mad cow disease that spread across North America in 2003 (WTO 2012). At that time, Korea and several other countries banned bovine meat products as a precautionary response. However, even after the World Organization for Animal Health classified Canada as a zone with controlled BSE risk in 2007 and most countries had lifted their bans, Korea kept its original ones (International Centre for Trade and Sustainable Development 2012). Korea settled its dispute with Canada in 2012 before the Appellate Body delivered a decision. This was done for two main reasons. First, Korea had no genuine, scientific risk-assessment to enforce its regulations. Korean Minister of Agriculture, Chang Tae-pyong, reportedly summed up the situation by saying, “If the beef issue goes before the WTO, only hard scientific and objective proof involving existing data on mad cow disease will be examined, without domestic consumer sentiment or public opinion taken into consideration” (International Centre for Trade and Sustainable Development 2009). Secondly, the World Organization for Animal Health classified not only Canada but also the U.S. as a “controlled-risk” country, and Korea had already lifted its import ban on the U.S in 2008. For being in violation of the SPS Agreement’s terms on proper risk-assessment and equivalence provisions, it was not unexpected that Korea would settle without the Appellate Body’s decision. The real significance lies in the mindset being demonstrated by the Korean government in response to international trade issues that could affect public health. One example illustrates the responsiveness of Korean institutions to uphold food safety for concerned consumers. Kim Wan Sik, managing director of the food safety center at a Seoul-based company, called Maeil Dairies, has stated that the primary agent of the Korean food safety culture is not government

regulators, but Korean mothers (Flynn 2013).<sup>6)</sup> The company has done everything from opening a “Maeil Child Center” and “Mom School” to teach prospective mothers about nutrition and health risks in babies, even designating 70 of its farms as “Absolute Baby-Exclusive Milk Farms” (Flynn 2013).

Korea is not aided by the fact that it is largely dependent on foreign imports for food (Chung 2015). Korea therefore has a complex regulatory system, which can be problematic. Four levels exist to produce regulations: at the bottom are implementing guidelines cleared by an Agency Head, followed by rules made by Ministers, Decrees passed by Ministerial Meetings, and Acts passed by the National Assembly (Chung and Francom 2011).<sup>7)</sup> According to the United States Department of Agriculture, this results in some decisions seemingly developed, “in a vacuum,” which completely overlook the regulation’s effect on trade and sometimes causing problems (Chung and Francom 2011). In addition, the whole regulatory process is heavily influenced by public pressure (Chung and Francom 2011). This move to more intense public scrutiny of food products may be due to an increasing change by the Korean public moving away from a regulatory system once modelled after the U.S. to one modelled after the more stringent E.U. (Chung and Francom 2011).

Along with the lack of sufficient scientific evidences provided by Korea, Japan’s successful performance in the WTO dispute settlement system in two decades seems that the panel would make a decision favorable to

---

6) Full report can be obtained at: <http://www.foodsafetynews.com/2013/12/asian-milk-company-goes-above-and-beyond-for-korean-mothers/#.WQIWdNxw9LM>

7) Full diagram can be obtained at: [https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Food%20and%20Agricultural%20Import%20Regulations%20and%20Standards%20-%20Narrative\\_Seoul\\_Korea%20-%20Republic%20of\\_1-11-2011.pdf](https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Food%20and%20Agricultural%20Import%20Regulations%20and%20Standards%20-%20Narrative_Seoul_Korea%20-%20Republic%20of_1-11-2011.pdf)

Japan's claims. It is interesting to note that Japan has been involved with 23 cases in the WTO dispute resolution, and has had its claims upheld every time except once (Trade Policy Bureau 2017).

However, the analysis of data of the "Import Restrictions on Fishery Products from Japan" shows that the Japanese government itself calls into question the aims of its own trade dispute claims. China and Taiwan, not Korea, retain the most severe restrictions and are joined to a lesser degree by Hong Kong and Macau. Outside of restrictions on fish products, Korea only really retains restrictions in one other category, tea. In fact, China has more restrictions on fish products than Korea does. By synthesizing data on trade restrictions of several different food products including rice, tea, and fish products; it is possible to make a few assessments. First, the rate of initial restrictions, no matter what product, was generally split into three main groups. Approximately one third of countries imposed the least severe restrictions, which were regular inspections. About one third imposed certificates of some kind, and the last one third imposed outright bans with China and Taiwan possessing the most (Food Industry Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, Japan 2017). As of January of 2017, all countries have lifted restrictions to some degree.

Japan, for its part, may be responding to a loss of revenue resulting from declining Korean imports. Between 2010 and the Earthquake in 2011, Korean imports of Japanese fish decreased from \$223M to \$163M (Yoo 2012). To put that in perspective, Korean imports of fish from all other exporters increased that same year. Japanese fish exports to Korea had been on a steady decline since 2007, and after reaching a low in 2014, still have failed to reach 2011 levels (Trading Economics 2017b).

In contrast, China's imports also fell off harshly from 2010 to 2011, but have since exceeded 2010 levels reaching almost \$350M in 2016 from under \$200M before the Fukushima Disaster (Trading Economics 2017a). This reveals that China currently imports more than \$200M worth of fish from Japan compared to Korea, perhaps a factor in why Japan has not currently sought dispute resolution against China. China also remains Japan's second largest export market after the U.S. at \$116B, while Korea is a distant third at \$44.6B (Observatory of Economic Complexity 2017).

If science mattered for Japan, it should pursue similar cases against other countries, notably China and Taiwan. In terms of food exports, China not only bans fish from two additional prefectures than Korea does, but in terms of total prefecture bans for all Japanese exports China stands at 90 to Korea's 16 (Food Industry Affairs Bureau Ministry of Agriculture, Forestry and Fisheries, Japan 2017).

It should be noted that Japan has the support of WHO and the UNSCEAR data among potentially other assessments that rule in its favor. Compared to previous case studies, Japan seems to have more scientific data brought by a complainant against another state to the Appellate Body yet. However, this does not guarantee its complete success in the matter. Realistically, if Korea were able, like the EC in the previous milk hormones case, to frame an argument with enough scientific uncertainty regarding the long-term health effects of potential exposure to contaminated fish products, it would have a strong potential chance to keep a temporary ban. Building off the previous GM corn case in which the Appellate Body ruled in favor of the U.S. in spite of its scientific data, Korea may also find itself guilty of imposing an unwarranted moratorium on Japan's fish exports, only to subsequently pass new restrictions

on labelling and certification requirements if the Appellate Body again avoids the issue of science in its ruling.

In the end, it seems most likely that Japan will repeat what happened to the U.S. in earlier cases. Japan may have much scientific evidence at its disposal, but if the panel pursues this case as it has in the past by allowing for several scientific experts without any consensus, it is reasonable to assume that Korea will be able to create enough uncertainty in the panel to force them to rule exclusively on the legal issues of the case. This will then equip Korea, like the EC in the past, with a way of working around the ruling, by changing whatever legal procedure they need to while maintaining some, if not most, of its restrictions when the panel fails to address its case on scientific grounds.

## **IX. Conclusion**

In the WTO dispute settlement process, science is merely one aspect of each case that is “deeply framed by the WTO setting and a narrow interpretation of the SPS Agreement as the basis for judging the defendant’s regulatory practices” (Bonneuil and Levidow 2012, 89). Due to the sheer complexity of scientifically-based cases, the actual science in question is often left unchallenged where it is simply easier for the panel to make rulings based strictly on legal and procedural issues.

Furthermore, due to the panel’s unwillingness to establish expert review boards as it has the power to do, instead favoring an individual-based system so that all viewpoints can be heard, it has also developed a

system with its own unique weaknesses. Similar to any court of law in which each opposing party defends its own interests, each side brings whatever scientific evidence it can to defend its position, incentivizing them to disregard scientific conclusions unfavorable to their position. With so many questions that can arise, combined with the problems of evolving science, questions of risk, and social concerns in democratic society, it is no wonder that the panel views scientific information provided by the experts as secondary to the legal and procedural issues. Despite being ruled against on legal issues in two previous cases, the EC essentially won both times because the panel did not address whether its science was correct or not. This failure to conclusively resolve a debate over whose science is more scientific enabled the EC to simply fix the procedural issues, while continuing to enforce trade restrictions based on their scientific evidence.

Therefore, the panel's explanation did not resolve underlying scientific debates, leaving unanswered the question of whose science is more scientific. Perhaps avoiding the underlying scientific issues and their infinite complexity is the best course of action for the panel. In a world where we strive for democratic principles, it would be unwise for any institution to subvert a state's right to self-determination and ensuring the safety of its own citizens.

On 22 February 2018, the WTO panel ruled that Korea's continued blanket import ban on all 28 fishery products from eight prefectures of Japan is an "arbitrarily and unjustifiably" discriminatory measure. The panel states that the maintenance of the import ban is "inconsistent with Article 5.6 of the SPS Agreement<sup>8)</sup> because it is more trade-restrictive than required" as Japan's alternative measure would have achieved Korea's

appropriate level of protection when the measures were adopted (WTO 2018, 151). As the Ministry of Trade, Industry and Energy of Korea plans to appeal this ruling to safeguard public health and safety (Osaki 2018), the Korean government will take this case to the Appellate Body. The analysis of the previous two cases between the EC and the United States shows that it is more likely that the Appellate Body confirms the rulings of the panel against Korea. However, the Appellate Body is less likely to confirm either side of science if the Korean government provides enough supplementary scientific evidence to increase scientific uncertainty on this issue. As a result, Korea may continue to keep its existing restrictions through various venues such as labeling and certification requirements as the EC has imposed.

---

8) Article 5.6 of the SPS Agreement states that “when establishing or maintaining sanitary or phytosanitary measures to achieve the appropriate level of sanitary or phytosanitary protection, Members shall ensure that such measures are not more trade-restrictive than required to achieve their appropriate level of sanitary or phytosanitary protection, taking into account technical and economic feasibility.”

## References

- Associated Press. (2013). Fukushima fallout fears: South Koreans turn their backs on seafood. AP Archive. 1 November, 2013. <https://www.youtube.com/watch?v=ugR6Z5aH2NM>. (Accessed 17 April 2017).
- Bonneuil, C. and Levidow, L. (2012). How does the World Trade Organization know? The mobilization and staging of scientific expertise in the GMO trade dispute. *Social Studies of Science*, 42(1), 75-100.
- Boswell, C. (2009). *The political uses of expert knowledge: immigration policy and social research*. Cambridge University Press.
- Chung, S. A. (2015). Republic of Korea agricultural biotechnology USDA foreign agricultural service global agricultural information network. [https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Agricultural%20Biotechnology%20Annual\\_Seoul\\_Korea%20-%20Republic%20of\\_7-15-2015.pdf](https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Agricultural%20Biotechnology%20Annual_Seoul_Korea%20-%20Republic%20of_7-15-2015.pdf). (Assessed 17 April 2017).
- Chung, S. A. and Francom, M. (2011). Republic of Korea food and agricultural import regulations and standards-narrative FAIRS country report. USDA foreign agricultural service global agricultural information network. [https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Food%20and%20Agricultural%20Import%20Regulations%20and%20Standards%20-%20Narrative\\_Seoul\\_Korea%20-%20Republic%20of\\_1-11-2011.pdf](https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Food%20and%20Agricultural%20Import%20Regulations%20and%20Standards%20-%20Narrative_Seoul_Korea%20-%20Republic%20of_1-11-2011.pdf). (Accessed 17 April 2017).
- Feldman, M. S. and March, J. G. (1981). Information in organizations as signal and symbol. *Administrative Science Quarterly*, 26(2), 171-186.
- Flynn, D. (2013). *Seoul Dairy is All About Keeping Trust of South Korean Mothers*. "Food Safety News: Breaking news for everyone's consumption." Marler Clark. 12 December, 2013. [\[www.kci.go.kr\]\(http://www.kci.go.kr\)](http://www.foodsafety-</a></p></div><div data-bbox=)

- news.com/2013/12/asian-milk-company-goes-above-and-beyond-for-korean-mothers/#.WQIWdNxx9LM. (Accessed 17 April 2017).
- Food Industry Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, Japan. (2017). *Lifting and Relaxation of the Import Restrictions on Japanese Foods Following the Accident of Fukushima Daiichi Nuclear Power Plant (54 Countries and Regions)*. March, 2017. [http://www.maff.go.jp/j/export/e\\_info/pdf/kisei\\_jokyo\\_170303\\_english.pdf](http://www.maff.go.jp/j/export/e_info/pdf/kisei_jokyo_170303_english.pdf) Originally retrieved at: <http://www.maff.go.jp/e/index.html>. (Accessed 17 April 2017).
- Foust, N. (2015). Banned Japanese Fukushima foods mislabeled, sold in Taiwan. The Fukushima Project. <http://www.fukuleaks.org/web/?p=14621>. (Accessed 17 April 2017).
- Fukushima Medical University. (2016). Report of the Fukushima health management survey. [http://fmu-global.jp/download/report-of-the-fukushimahealthmanagement-survey-in-english\\_new-3/?wpdmdl=1856](http://fmu-global.jp/download/report-of-the-fukushimahealthmanagement-survey-in-english_new-3/?wpdmdl=1856). (Accessed 8 March 2018).
- Gruszczynski, L. (2014). The role of experts in environmental and health-related trade disputes in the WTO: deconstructing decision-making processes. In: Monika Ambrus, Karin Arts, Ellen Hey and Helena Raulus(eds) *The role of 'experts' in international and European decision-making processes: advisors, decision makers or irrelevant actors*. Cambridge, UK, Cambridge University Press, 216-237.
- Hanrahan, C. (2010). Agricultural biotechnology: the U.S.-EU Dispute. <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/RS21556.pdf>. (Accessed 7 February 2018).
- International Centre for Trade and Sustainable Development. (2009). Canada challenges Korean beef ban at the WTO. *Bridges*, 13(14).

- <http://www.ictsd.org/bridges-news/bridges/news/canada-challenges-korean-beef-ban-at-the-wto>. (Accessed 7 February 2018).
- International Centre for Trade and Sustainable Development. (2012). South Korea lifts ban on Canadian beef imports. *Bridges* 16(3). <http://www.ictsd.org/bridges-news/bridges/news/south-korea-lifts-ban-on-canadian-beef-imports>. (Accessed 7 February 2018).
- Jackson, J. H. (2008). The case of the World Trade Organization. *The Royal Institute of International Affairs*, 84(3), 437-454.
- Johnson, R. (2015). The U.S.-EU beef hormone dispute. *Congressional Research Service*.
- Karns, Margaret P., Mingst, K. A., and Stiles, K. W. (2015). *International organizations: the politics & processes of global governance*. Colorado, Lynne Rienner Publishers, Inc.
- Kennedy, D. (2005). Challenging expert rule: the politics of global governance. *Sydney Law Review*, 27, 5-28.
- Klabbers, J. (2014). The virtues of expertise. In: Monika Ambrus, Karin Arts, Ellen Hey and Helena Raulus(eds) *The role of 'experts' in international and European decision-making processes: advisors, decision makers or irrelevant actors*. Cambridge, UK, Cambridge University Press, 82-101.
- Lawrence, Jessica. (2014). The structural logic of expert participation in WTO decision-making processes. In: Monika Ambrus, Karin Arts, Ellen Hey and Helena Raulus (eds) *The role of 'experts' in international and European decision-making processes: advisors, decision makers or irrelevant actors*. Cambridge, UK, Cambridge University Press, 173-193.
- Lindquist, E. A. (1988). What do decision models tell us about

- information use? *Knowledge, Technology & Policy*, 1(2), 86-111.
- Mercurio, B., and Shao, D. (2010). A precautionary approach to decision making: the evolving jurisprudence on article 5.7 of the SPS Agreement. *Trade, Law and Development* 2(2), 195-223.
- Millstone, E., van Zwanenberg, P., Marris, C., Levidow, L., & Torgersen, H. (2004). Science in trade disputes related to potential risks: comparative case studies. <http://ftp.jrc.es/EURdoc/eur21301en.pdf>. (Accessed 7 February 2018).
- Observatory of Economic Complexity. (2017). OEC. <http://atlas.media.mit.edu/en/profile/country/jpn/>. (Accessed 4 April 2017).
- Osaki, T. (2018, February 23). WTO backs Japan complaint against South Korea's Fukushima import ban. *The Japan Times*. <https://www.japantimes.co.jp/news/2018/02/23/national/wto-backs-japan-complaint-south-koreas-fukushima-import-ban/#.WqBFhpM-dPM>. (Accessed 6 March 2018).
- Reich, M. and Goto, A. (2015). Towards long-term responses in Fukushima. *Lancet*, 386(9992), 498-500.
- Schrefler, L. (2014). Reflections on the different roles of expertise in regulatory policy making. In: Monika Ambrus, Karin Arts, Ellen Hey and Helena Raulus(eds) *The role of 'experts' in international and European decision-making processes: advisors, decision makers or irrelevant actors*. Cambridge, UK, Cambridge University Press, 63-81.
- Trade Policy Bureau of Ministry of Economy, Trade and Ministry. (2017). 2017 report on compliance by major trading partners with trade agreements — WTO, EPA/FTA, and IIA-and METI priorities based on the 2017 report. <http://www.meti.go.jp/english/report/data/2017WTO/>

- pdf/0623\_01a.pdf. (Accessed 7 February 2018).
- Trading Economics. (2017a). Japan exports to China of fish, crustaceans, molluscs, aquatics invertebrates. <http://www.tradingeconomics.com/japan/exports/china/fish-crustaceans-molluscs-aquatics-invertebrates>. (Accessed 7 February 2018).
- Trading Economics. (2017b). Japan exports to South Korea of fish, crustaceans, molluscs, aquatics invertebrates. <https://tradingeconomics.com/japan/exports/southkorea/fish-crustaceans-molluscs->. (Accessed 7 February 2018).
- UNSCEAR. (2008). Sources and effects of ionizing radiation. [http://www.unscear.org/unscear/en/publications/2008\\_1.html](http://www.unscear.org/unscear/en/publications/2008_1.html). (Accessed 7 February 2018).
- UNSCEAR. (2014). Sources, effects, and risks of ionizing radiation UNSCEAR 2013 report-levels and effects of radiation exposure due to the nuclear accident after the 2011 great east-Japan earthquake and tsunami. [http://www.unscear.org/docs/reports/2013/13-85418\\_Report\\_2013\\_Annex\\_A.pdf](http://www.unscear.org/docs/reports/2013/13-85418_Report_2013_Annex_A.pdf). (Accessed 7 February 2018).
- Watson, J. K. R. (2013). *The WTO and the environment: development of competence beyond trade*. New York: Routledge.
- Weiss, C. H. (1979). The many meanings of research utilization. *Public Administration Review*, 39(5), 426-431.
- WHO. (2013). Health risk assessment from the nuclear accident after the 2011 Great East Japan Earthquake and Tsunami. [http://apps.who.int/iris/bitstream/10665/78218/1/9789241505130\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/78218/1/9789241505130_eng.pdf). (Accessed 7 February 2018).
- WTO. (1996). DS26: European Communities — measures concerning meat and meat products (ormones). [https://www.wto.org/english/tratop\\_e/](https://www.wto.org/english/tratop_e/)

- dispu\_e/cases\_e/ds26\_e.htm. (Accessed 7 February 2018).
- WTO. (1997). EC measures concerning meat and meat products (hormones) complaint by the United States report of the panel. [https://docs.wto.org/dol2fe/Pages/FE\\_Search/FE\\_S\\_S006.aspx?Query=\(%40Symbol%3d+wt%2fds26%2f\\*\)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChanged=true](https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=(%40Symbol%3d+wt%2fds26%2f*)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChanged=true). (Accessed 7 February 2018).
- WTO. (2003). DS291: European Communities — measures affecting the approval and marketing of biotech products. [https://www.wto.org/english/tratop\\_e/dispu\\_e/cases\\_e/ds291\\_e.htm](https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds291_e.htm). (Accessed 7 February 2018).
- WTO. (2006). European Communities-measures affecting the approval and marketing of biotech products report of the panel. [https://docs.wto.org/dol2fe/Pages/FE\\_Search/FE\\_S\\_S006.aspx?Query=\(%40Symbol%3d+wt%2fds291%2fr\\*+not+rw\\*\)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChanged=true](https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=(%40Symbol%3d+wt%2fds291%2fr*+not+rw*)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChanged=true). (Accessed 7 February 2018).
- WTO. (2012). DS391: Korea — measures affecting the importation of bovine meat and meat products from Canada. [https://www.wto.org/english/tratop\\_e/dispu\\_e/cases\\_e/ds391\\_e.htm](https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds391_e.htm). (Accessed 7 February 2018).
- WTO. (2017). The WTO agreement on the application of sanitary and phytosanitary measures (SPS Agreement). [https://www.wto.org/english/tratop\\_e/sps\\_e/spsagr\\_e.htm](https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm). (Accessed 7 February 2018).
- WTO. (2018). DS495: Korea — Import bans, and testing and certification requirements for radionuclides. [https://www.wto.org/english/tratop\\_e/dispu\\_e/cases\\_e/ds495\\_e.htm](https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds495_e.htm). (Accessed 7 March 2018).
- Xiaodong, W. (2017). Japan urged to deal with Fukushima-affected food. *China Daily* 17 March 2017. [http://www.chinadaily.com.cn/china/2017-03/17/content\\_28588406.htm](http://www.chinadaily.com.cn/china/2017-03/17/content_28588406.htm). (Accessed 7 February 2018).
- Yoo, S. Y. (2012). Republic of Korea 2012 sea products market brief.

[https://gain.fas.usda.gov/Recent%20GAIN%20Publications/2012%20Seafood%20Products%20Market%20Brief\\_Seoul%20ATO\\_Korea%20-%20Republic%20of\\_4-17-2012.pdf](https://gain.fas.usda.gov/Recent%20GAIN%20Publications/2012%20Seafood%20Products%20Market%20Brief_Seoul%20ATO_Korea%20-%20Republic%20of_4-17-2012.pdf). (Accessed 7 February 2018).

Manuscript received: Feb. 09, 2018; Review completed: Feb. 26, 2018; Accepted: Mar. 09, 2018