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Enhancing Food Safety In the APEC Region

Changing consumption patterns, longer shipping distances, and the rising share of perishable food products in trade are all generating concerns about food safety in the Asia Pacific Economic Cooperation (APEC) region. Recent outbreaks of foodborne illness in China (contamination by rat poison in Nanjing) and the U.S. (*Listeria* in the Northeast) have heightened that concern. Such incidents result in added health care costs to society, lost productivity, and changes in consumer behavior that can adversely affect a firm or an entire industry.

However, lack of data, underreporting of cases, and epidemiological difficulties in tying disease to food consumption hamper understanding of the risk and trends of foodborne illness in the APEC region. Although underreporting is most serious in regions with limited public resources, even researchers using data on the U.S. make large adjustments to foodborne morbidity and mortality data to account for underreporting.

Researchers in some APEC economies, such as China, Chinese Taipei, Korea, and New Zealand, report rising incidence of foodborne illness. Yet investigators in Malaysia found fewer food poisoning,

cholera, and typhoid cases. Data-related difficulties prevented making judgments in Australia and the Philippines. According to the U.S. Centers for Disease Control and Prevention (CDC), the incidence of seven common foodborne bacterial diseases in the U.S. dropped 23 percent between 1996 and 2001. But new pathogens, such as *E. coli* O-157 and *Cyclospora*, are always emerging. The lack of consistent and comprehensive data makes it difficult to establish trends about the regional incidence of foodborne illness over time.

Compared with other causes of death, the best estimates suggest that foodborne illness ranks low. World Health Organization (WHO) statistics show infectious diseases, of which many foodborne diseases are a subset, rank well below heart disease, cancer, and accidents as a cause of

death worldwide, even in less developed regions.

The CDC estimates 5,000 people die each year from microbial pathogens in the U.S. While the number of deaths from foodborne pathogens is relatively small, the incidence of illness and hospitalization appears quite significant. The CDC calculates 76 million cases of foodborne illnesses (one case for every four in the population) occur each year in the U.S., with 325,000 associated hospitalizations. The young, the elderly, and those with autoimmune deficiencies are the most prone.

In addition to acute illness caused by pathogens, other widely recognized food safety risks include:

- *sequelae* or longer-term aftereffects (e.g., neurological, cardiac, kidney disease, or rheumatoid syndrome) associated with most acute foodborne illnesses;
- environmental toxins (e.g., lead and mercury) and persistent organic pollutants (e.g., dioxin);
- prions associated with bovine spongiform encephalopathy (BSE, also known as “mad cow” disease); and
- transmission of disease through food from animals to humans (e.g., tuberculosis).

Some perceived food safety risks are more controversial:

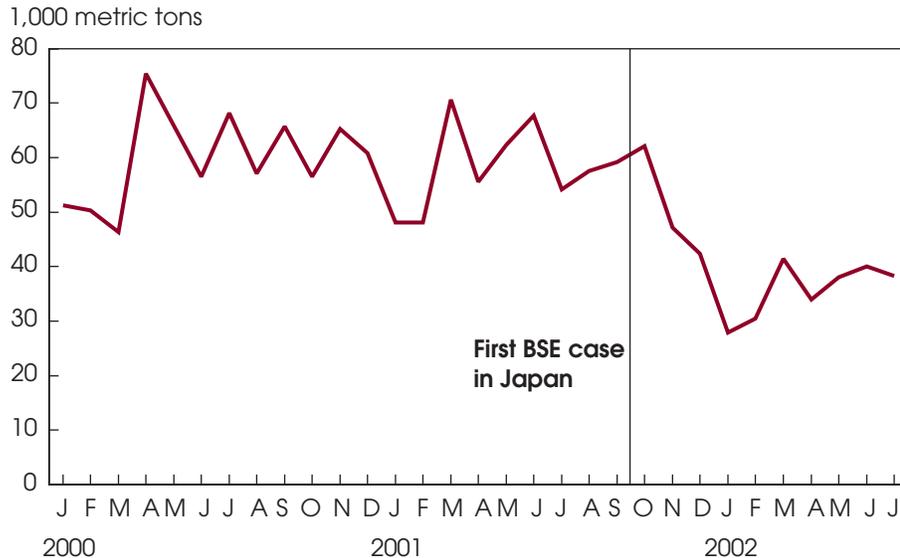
- pesticide residues and food additives; and
- irradiated foods or animal products produced with growth hormones and antibiotics.

Food safety concerns can also hinder international food trade and are intertwined with questions about the health

This article is a summarized version of *Making the Region's Food Supplies Safer*, a report released at the 14th APEC Ministerial Meeting in Los Cabos, Mexico, October 23-25, 2002. USDA's Economic Research Service collaborated in the report along with economists from 15 Pacific Rim economies. Dr. Jinap Selamat, Professor, Department of Food Science, Universiti Putra Malaysia, provided leadership in developing the report's outline.

The complete report and economy-by-economy profiles of participating countries are available on the web at www.pecc.org/food.

Japan's Beef Imports Drop in Aftermath of First Domestic BSE Case



BSE= bovine spongiform encephalopathy, also known as "mad cow" disease.
Source: World Trade Atlas.

Economic Research Service, USDA

consequences of food containing genetically modified organisms, the labeling of these foods, and the uncertainty of their long-term impact on the environment.

Ranking Food Pathogens

Although cultures and diets across the APEC region are highly diverse and levels of development vary, some commonality surfaces when ranking specific pathogens found in food. Ten of the 11 APEC economies reporting information on foodborne illness indicate *Salmonella* as a leading cause. The ubiquity of *Salmonella* is associated with the widespread rise in consumption of many perishable products across the region. *Vibriosis* and Norwalk-type viruses are important hazards associated with fish and shellfish consumption, common in Korea and Chinese Taipei.

While *Salmonella*, *Staphylococcus*, *Campylobacter*, and *E. coli* appear to be the more common causes of foodborne illnesses in the region, other pathogens such as *Listeria* and *botulism* are less common but more deadly. Most commonly involved in disease outbreaks and contamination are processed foods, fresh horticultural products, and meats—those foods that are enjoying increased popularity consistent with income and urban

growth. Although most outbreaks affect few people and are localized, some affect hundreds and even thousands: for example, the *E. coli* infection of radish sprouts in 1996 and dairy products contaminated by *Staphylococcus* in 2000 in Japan; and the *Salmonella*-ice cream (1994) and *Cyclospora*-raspberry (1996) cases in the U.S.

Estimating Economic Costs

In general, foodborne illness entails costs to:

- individuals/households (e.g., medical care, loss of work, and premature death);

- industry (e.g., lost business and trade, product liability suits, additional cost from applying systems/techniques to boost food safety); and
- the regulatory and public health sectors (e.g., disease surveillance, outbreak investigations).

Estimating these costs is difficult. Most calculations are partial, focusing on the direct cost of healthcare and losses to individual productivity, not the costs to business and the public sector. In Australia, researchers estimated the costs of foodborne illness at \$1.7 billion in 1999. In South Korea, researchers recently appraised the direct cost of food poisoning from meats alone to be \$16-\$28 million per year. And in the U.S., five foodborne pathogens cause \$6.9 billion each year in health care costs and lost productivity. These costs are low relative to each economy's gross domestic product and reflect their partial nature and the relatively low incidence of serious sickness and death from foodborne causes.

Since consumers usually have many choices about the foods they consume and where they consume them, news of tainted food can induce strong changes in consumer behavior, sometimes out of proportion to the real risk of adverse health consequences. Such response can have a devastating impact on a food industry firm and its employees or even more broadly on an entire industry's reputation, sales revenue, and trade.

A company involved in the spread of a foodborne pathogen can also face costs imposed by courts or government agencies, including fines, product recalls, and

APEC Goals & Membership

APEC, the Asia Pacific Economic Cooperation Forum, is an informal grouping of market-oriented Asia-Pacific economies sharing goals of managing the growing interdependence in the Pacific region and sustaining its economic growth. Started in 1989, APEC provides a forum for ministerial-level discussions and cooperation on a range of economic issues, including trade promotion and liberalization, investment and technology transfer, human resource development, energy, telecommunications, transportation, and others.

Members are Australia, Brunei, Canada, Chile, China, Hong Kong-China, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Chinese Taipei, Thailand, the U.S., and Vietnam.

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Examples of Foodborne Disease and Contamination in the APEC Region

Disease/contaminant	Countries reporting outbreaks	Source or vector
<i>Listeria monocytogenes</i>	Australia, Canada, U.S.	Fruit salad, smoked salmon cream cheese, hot dogs, deli meats
<i>Salmonella</i>	Australia, Chile, Korea, New Zealand, U.S.	Pork rolls, unpasteurized orange juice, mayonnaise, meat, raw eggs, fruit
<i>E. coli</i> bacteria O-157	Chile, Japan, Korea, U.S.	Fast food, radish sprouts, meat, unpasteurized juice, lettuce
<i>Staphylococcus aureus</i>	Japan	Unhygienic production-line valve at dairy company
<i>Cyclospora cayetanensis</i>	U.S.	Imported raspberries
Norwalk-like virus	Australia, New Zealand	Sick food handler, oysters
Creutzfeldt-Jakob	Canada (Saskatchewan)	Meat likely consumed in UK from cattle infected with BSE
BSE	Japan	Five cases confirmed since Sept. 2001
Chloramphenicol	Canada	Imported honey and honey products
Cyanide	Chile	Several grapes shipped to U.S. thought to be contaminated
Antibiotics	China	Exports of prawns, shrimp, poultry and rabbit meat
Unreported	China	Soybean drink consumed by students
Rat poison	China	Deliberate poisoning of food in food shop
Cadmium or mercury	Chinese Taipei (central region)	Rice
Polluted storm water	Chinese Taipei (Taipei city)	Prepared box lunches
High levels of pesticide	Japan	Imported green soybeans
Vibrio	Korea	Seafood (clams)
Dioxin	Malaysia	Imported dairy and meat products
3-MCPD, gravy genotoxic carcinogen	Malaysia	Imported savory foods; soups, prepared meals, snacks, and mixes
Hepatitis A	U.S. (Michigan)	Imported strawberries; point of contamination unknown

List is not all-inclusive.

Sources: Pacific Food System Outlook papers from April 16-18, 2002 meeting in Santiago, Chile; various other Internet and newspaper sources.

Economic Research Service, USDA

temporary or permanent plant closures as well as large liability settlements and associated legal costs. Potential market and liability losses are strong incentives for food firms to ensure the food supply is as safe as possible.

Two cases from APEC economies illustrate the strong consumer reaction to events related to the food industry. In September 2001, BSE was detected in a 5-year old Holstein cow in Japan's Chiba Prefecture, the first case discovered in Asia. Authorities discovered four more infected animals during the next 12 months. BSE is a brain-wasting disease caused by prions and is linked to a human variant, Creutzfeldt-Jakobs disease, which killed one person in Canada in August 2002 and approximately 100 people in Great Britain, where BSE is most often found.

In the 3 months following the first BSE case, consumers in Japan reduced beef consumption 40-60 percent, with an equally dramatic decline in beef imports. Sales at 3,800 McDonald's outlets in Japan dropped sharply, despite reassurances that only beef imported from three BSE-free economies (U.S., Australia, and Canada) were being used. Sales of meat products at other chains also fell. In 2002, beef consumption is anticipated to be lower in Japan than last year, causing economic losses for both beef cattle and dairy producers. Consumption is likely to recover over time.

In a rapid response to the sharp public reaction, Japan's Ministry of Agriculture, Forestry, and Fisheries (MAFF) established a system in October 2001 to restrict the movement of cattle at risk of BSE. The MAFF also introduced a ban on the

use of all livestock feed containing meat and bone meal, the suspected carrier of the disease.

Another example of sharp reaction to a food supply problem occurred in the U.S. with negative outcomes for both the Chilean and U.S. food industries. In March 1989, an anonymous caller to the U.S. Embassy in Santiago, Chile claimed that Chilean fruit bound for the U.S. was injected with cyanide. A U.S. Food and Drug Administration (FDA) inspector in Philadelphia, where most Chilean fruit enters the U.S., discovered in a shipment two grapes that were punctured and a third that appeared slit. After testing positive for a non-lethal dose of cyanide, the FDA issued an order banning entry of Chilean fruit into the U.S. and requiring the destruction of all Chilean fruit then in U.S. marketing channels.

Four days later, after Chile adopted certain safety measures and no further contamination was discovered, the U.S. lifted the ban on Chilean grapes. But in the meantime, the incident affected half of Chile's grape production that season, including the loss of more than 20,000 jobs. The ban adversely affected not only producers, but all commercial points along the supply chain of the Chilean fruit export industry, with losses estimated at more than \$400 million.

Setting Standards— Public & Private Roles

Because of limited public resources and strong private sector incentives for promoting food safety, some APEC governments are implementing risk management systems that grant businesses flexibility in their performance of operations as long as the required food safety outcomes are achieved. These systems rely on a model that delineates the following sector roles and implementation activities:

- government acting as the regulator, setting appropriate sanitary standards;
- industry taking full responsibility for producing food products that conform to those standards, using risk-based management plans; and
- objective auditors verifying compliance with standards.

Consistent with this model, Hazard Analysis and Critical Control Points (HACCP) is a system increasingly adopted by governments and the food industry that identifies potential sources of food safety hazards and establishes procedures to prevent, eliminate, or reduce these hazards. The HACCP system builds on Good Agricultural Practices that ensure a clean and safe working environment for employees while eliminating the potential for food contamination and are often integrated with ISO 9000 practices oriented toward meeting customer requirements. HACCP is mandatory in several APEC economies for certain perishable products, some of which are important to export trade:

- processed fish in Canada;
- seafood in Malaysia destined for export to the European Union and the U.S.;

- meat and poultry processors and slaughterhouses in the U.S.;
- all slaughterhouses in South Korea (by 2003); and
- seafood and dairy products in New Zealand.

In other APEC economies and food sectors, HACCP is encouraged but voluntary. In some instances, food industry organizations may mandate use of a HACCP system by their members, such as the Frozen Seafood Union in Chinese Taipei and the Meat Industry Council in New Zealand. Some export-dependent industries have adopted HACCP voluntarily, including Chile's fruit and Peru's asparagus industries, in an effort to differentiate their products as being safe and to meet the demands of importers. Demands by foreign buyers regarding certification and such requirements as traceability can be costly and variable, particularly for small and medium-sized firms in less developed economies. For example, regulations imposed by Europe may not be the same as those imposed by the U.S. or Japan.

The use of internationally recognized quality management systems is particularly prevalent in New Zealand's primary agricultural industries, such as kiwifruit and apple growing, and sheep, beef, and dairy farming along with their related processing industries.

In Canada, 327 establishments are certified as HACCP-compliant, and another 337 plants, mostly meat processing establishments, operate under HACCP principles and are awaiting recognition. Non-meat industries are encouraged to begin incorporating HACCP principles into processing and food preparation practices in anticipation that compliance will become mandatory.

In Malaysia, 85 food firms have applied for certification under the HACCP system, and 55 have successfully obtained certification. The majority of these are from the seafood industry.

The public sector in the APEC region supports a range of food safety training and education programs, including training on HACCP systems, food safety education

for handlers in the food service sector, and programs for consumers on how to reduce their risks of foodborne illness in the home.

Training in food hygiene and handling, for example, has increased substantially in Chile during the past few years. The agency channeling public resources to this area reported 403 training courses and 14,000 students in 2000. Since 1996, Malaysia's Ministry of Health has administered mandatory training programs for food handlers, and has since established the Food Handlers Training Institute, which conducts a compulsory food safety program for all operators of food stalls and restaurants.

In a consolidated effort to reduce foodborne illness, provincial governments across Canada worked with industry associations and consumer, environmental, and health groups to create the "Canadian Partnership for Consumer Food Safety Education." The partnership informs Canadians about safe food-handling techniques to reduce the risk of microbial contamination. The "Thermometer" program in the U.S. is an example of a public campaign to encourage proper meat cooking at home. And New Zealand's Food Safety Partnership promotes four safety actions for consumers: clean hands and utensils, thorough cooking of meats, adequate covering of food before and after cooking, and storage of perishables at low temperatures.

International and regional efforts to harmonize food safety standards have helped to facilitate trade and instill consumer confidence in the safety of imports. The need for economies to align with international food safety standards has grown with trade. Codex Alimentarius (CODEX), created 40 years ago by the WHO and the Food and Agricultural Organization, has helped this process. CODEX is used as a global reference for food standards by many regional trade organizations in which APEC members participate. These organizations acknowledge the importance of food safety and common standards to facilitate trade.

The Association of Southeast Asian Nations subcommittee on Food Science and Technology facilitates collaborative

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research and development on food safety and quality assurance systems, including nutritional quality, improvement of existing technologies, and the development and strengthening of the scientific basis for technology development and innovation. The leading harmonization agreement in the APEC region is the Australia New Zealand Food Authority (ANZFA) which develops food standards for both countries.

The North American Free Trade Agreement created a committee on sanitary and phytosanitary measures (SPS) to facilitate improvement in food safety and sanitary conditions and to align SPS measures across Mexico, Canada, and the U.S.

Sharing Information— Cooperating on Research

Sharing data is an important part of disease surveillance, and several organizations are cooperating in the tracking of foodborne illness, facilitated by use of the Internet. APEC's Emerging Infections Network is intended to address containment of infectious diseases, including some foodborne diseases, regionally and globally. WHO, with the participation of 113 countries, has a global surveillance system for some foodborne diseases. PulseNet is a U.S. laboratory-based surveillance system using DNA fingerprinting for several foodborne pathogens,

including *E. coli* O-157:H7, *Salmonella*, *Shigella*, *Listeria*, *Campylobacter*, *C. perfringens*, and cholera. The system facilitates prompt identification of outbreaks and timely food product recalls when necessary. PulseNet has an international dimension: Canada joined in 2000, and scientists from Japan, Hong Kong China, and Chinese Taipei have been trained to use the system. FoodNet is another U.S. government surveillance system for foodborne illness, tracking population-based incidence rates, epidemiological trends, hospitalizations, and deaths by selected pathogens.

APEC needs a strong commitment to generate more comprehensive data on the incidence of foodborne illness and its causes and to share this information around the region. Better data will reduce uncertainties and enhance risk analysis to enable more rapid identification, mitigation, and elimination of the threat from an outbreak. Pinning down specific pathogens and locating them in the food supply chain will reduce the human toll and help reduce uncertainty faced by food suppliers. Responsible government agencies will be able to mobilize a more robust and rapid response to prevent pathogens or contain their spread.

International cooperation is a necessary dimension in data and information development and sharing because of the sub-

stantial role of trade in disease outbreaks and in other food safety issues. Similarly, better data and research will inspire public confidence in the ability to assess the risk of foodborne illness with any given outbreak and to respond accordingly. Better information should make the consumer response to foodborne events more consistent with actual risks. Uncertainty about food safety is the enemy of both rational behavior and business investment in the APEC region's food system.

The public and private sectors are working cooperatively to harmonize science-based standards and implement practices aligned with HACCP in food processing and food service. These practices are proven to be effective in reducing the incidence of some foodborne pathogens in the U.S. Adoption of HACCP has been voluntary in many export sectors in APEC because of the strong incentive for these businesses to differentiate their product as being "beyond reproach" from the standpoint of food safety and to establish credibility with buyers. The high cost of implementation of HACCP by mid- and small-sized firms may require public support.



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