Food safety has been a global concern for many years. While global sourcing of foods and ingredients provides great opportunity for variety and diversity of cultural products, there are significant risks. Programs that regulate food safety and quality in countries around the world vary in their scope and effectiveness, with many being underfunded. Rapidly developing countries may lack the expertise, laboratory resources for testing, and established inspection programs to adequately promote the safety of foods. Rather, these countries may be more focused on providing enough food for their citizens. Lack of documentation or traceability in the exporting country can further exacerbate the situation. Of course, safety problems in food imported from more developed countries also occur, and the source of food borne disease outbreaks are found regularly within the United States.

Improving Import Food Safety gathers together vital information on the food safety programs of national governments, the food industry, and the testing industry. Chapters have been contributed by authors from the United States, Latin America, Europe, and Asia. Readers will learn about a variety of regulatory approaches to food safety at the federal and state levels in the United States, as well as in selected countries and within the food industry itself. They will also gain insights into the nature and source of safety problems, in addition to approaches to food safety around the world.

The book is divided into three sections:

• Highlighting Key Issues: authors illustrate the millions of permutations for the origin of ingredients, discussing the difficulty of policing imports, providing a unique perspective on the economic situation in China, and insight into development of support for small farm producers in Mexico.

• Legal and Regulatory Issues/Structures in the USA and Abroad: describes the legal and regulatory system in the European Union, the United States, and China, plus a chapter addressing global approaches to fraud.

• Potential Strategies to Improve Import Safety: presents strategies to deal with what are ultimately global issues, but on multiple levels. Perspectives are provided by authors from industry, an industry trade association, academia, and a recently semi-retired, global ambassador of food safety.

Readers will find this book noteworthy because of the diverse topics and perspectives offered on the challenges of keeping food safe in a global economy. Authors come from a variety of backgrounds, and each has provided a unique perspective on this critical topic. The volume is aimed at importers and exporters of foods and ingredients; food microbiologists, food safety and QC/QA personnel; regulatory and legal personnel in food manufacturing companies; food policy makers and regulatory officials; and faculty and graduate students in food science.

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Improving Import Food Safety
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Improving Import Food Safety

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Food safety has been a global concern for many years. Industry leaders have invested billions of dollars to try to ensure the safety of their products, while regulators from governments around the world have promulgated laws to try and protect consumers from unsafe food. Over the past 5 to 10 years the ability to detect foodborne outbreaks has become much more sophisticated. Today we can detect food safety problems and correlate them with illnesses and adverse reactions faster than ever before. As these problems are detected, the media has brought these situations to the attention of consumers around the world.

Programs that regulate food safety and quality in countries around the world vary in their scope and effectiveness, with many being under-funded. Rapidly developing countries may not have the expertise, laboratory resources for testing, and established inspection programs to adequately promote safety of foods. Rather, these countries may be more focused on providing enough food for their citizens. Lack of documentation or traceability in the exporting country can further exacerbate the situation. Of course, safety problems in food imported from more developed countries also occurs and we regularly find the source of foodborne disease outbreaks within our own country.

In this book we have gathered information about food safety programs from governments, the food industry, and the testing industry. Chapters have been contributed by authors from the United States, Latin America, Europe, and Asia. You will be able to learn about a variety of regulatory approaches to food safety at the federal and state levels in the United States, as well as in a few selected countries, and within the food industry itself. You may also gain insights into the nature and source of problems, in addition to approaches to food safety around our world.
In the first set of chapters the magnitude of the entire food safety issue is highlighted. The authors bring this forth in dramatic fashion, illustrating the millions of permutations for the origin of ingredients, discussing the difficulty of policing imports, providing a unique perspective on the economic situation in China, and insight into the development of support for small farm producers in Mexico.

Doing business in today’s global economy calls for understanding the environment in which our trading partners work. We must understand their difficulties in production as well as the laws and regulations under which they work. Therefore, we have included a second section of chapters describing the legal and regulatory system in a variety of countries: the European Union, the United States, and China. We have also included a chapter addressing global approaches to fraud, but very much based on the US system. However, we have not delved into the Food Safety Modernization Act of 2011 because as we write this, the rules are being written.

The last section approaches the complex issue of food safety and presents potential strategies to deal with what are ultimately global issues, but on multiple levels. Perspectives are provided by authors from industry, an industry trade association, academia, and a recently semi-retired, global ambassador of food safety. A number of suggestions for improving food safety are discussed, as well ideas for new programs and processes.

The reader will find this book noteworthy because of the diverse topics and perspectives offered on challenges of food safety in a global economy. The authors come from a variety of backgrounds and each of them has provided a unique perspective on this critical topic. The background information that is provided will give the reader a broad perspective and solid understanding of the global nature of food safety issues. The chapters addressing regulatory structures will round out the readers’ understanding of the topic, and the authors’ insights into different ways to improve food safety will leave the reader with a multitude of “thought provoking” ideas.

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Part I

Highlighting Key Issues
Overview

The food system is becoming ever more globally integrated, providing a broader array of foods available all year long than ever before. This adaptive, dynamic system does this very rapidly and at very low cost due to the high efficiency of the food and agriculture supply firms and chains. Globalized, just-in-time and cost-optimized supply chains do
not come without concomitant risks. The lengthening of a supply chain and the inclusion of firms of different scales inherently increases the risks associated with that supply chain. Sourcing from a wide range of countries also places a reliance on the food protection (safety and defense) systems of the source country to protect consumers in the country of consumption. One of the challenges of this reliance is that, in some cases, the actual source of the product or ingredient may be difficult for regulators, or in some cases even food-system firms, to discern due to how data are captured and shared in food supply chains. Dynamic import risks and other emerging risks, demonstrate the need for new mitigation strategies to reduce the risk to public health from our globally interdependent food system.

**Supply Chain Complexity**

The supply chain for even apparently simple items can be much more complicated than it would appear, especially if it is a multicomponent product where the supply chain of each ingredient or component must be considered as well. Figure 1.1 provides a simplified characterization of the supply chain for a quick service restaurant sandwich. The 11 basic components of this item make their way from primary production to consumption through a simplified supply chain that includes

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*Figure 1.1. A simplified characterization of the supply chain for a cheeseburger. (Copyright 2010 National Center for Food Protection and Defense. All rights reserved.)*
Global Food System Risks

harvest, storage, production, and retail food service to the consumer, with transportation between each step. Considering this simple system, a contamination that could occur at three, unspecified points in the supply chain for the item represents over 45,000 permutations and combinations of potential contamination scenarios. All of the potential scenarios would have the potential to cause harm, either public health or economic, or in some cases both.

Consider, however, that the actual composition of a cheeseburger, for illustration purposes a Big Mac as per McDonald’s nutritional information, contains all of the ingredients shown in Figure 1.2. Considering the same threat, that the supply chain is contaminated in three locations but no indication of where, means that there are over two million permutations and combinations of potential contamination scenarios. This does not take into account how much more complicated it would become with the inclusion of each of the ingredient’s supply chains. This is one reason why multicomponent foods, which are a rising source of foodborne illness outbreaks, pose a significant challenge during foodborne illness outbreak epidemiology and food

Figure 1.2. All of the ingredients in a McDonald’s Big Mac. (Graphic copyright 2010 National Center for Food Protection and Defense. All rights reserved.)
trace-back investigations. While this complexity is obviously important for food safety, it is perhaps more important for food defense as there are many more ingredients that are viable candidates for intentional contamination than are likely to be the vehicle for accidental food safety contamination.

Imports further complicate existing food protection challenges. While only the producer would have the opportunity to know the probable origin of the ingredients in the finished product, looking at where they could come from is enlightening. Choosing just four of the ingredients from Figure 1.2 illustrates this point: imports of beef into the United States in 2010 came from 10 countries (Australia, Canada, Chile, Costa Rica, Honduras, Japan, Mexico, New Zealand, Nicaragua, and Uruguay); imports of tomatoes from 12 countries (Belgium, Canada, China, Costa Rica, Dominican Republic, France, Guatemala, Israel, Mexico, Netherlands, New Zealand, and the United Kingdom); imports of wheat gluten from 17 countries (Australia, Belgium, Canada, China, France, Germany, India, Italy, Kazakhstan, Lithuania, Netherlands, Poland, Sweden, Switzerland, Taiwan, Thailand, and Turkey); and imports of vinegar from 36 countries (Argentina, Australia, Austria, Belgium, Brazil, Cambodia, Canada, Chile, China, Colombia, Dominican Republic, France, Germany, Greece, Honduras, Hong Kong, Israel, Italy, Japan, Jordan, Korea, Lebanon, Mexico, Monaco, Netherlands, Panama, Peru, Philippines, Poland, Portugal, Serbia, South Africa, Spain, Taiwan, Turkey, and the United Kingdom) (US Department of Agriculture Foreign Agricultural Service, 2008). These countries encompass a wide range of food protection system capabilities and challenges.

**Increasing Role of Imports**

Food and agriculture imports have been rising rapidly, accelerating as early as 2003. In 2003 the total food and agriculture imports to the United States totaled just over $35 billion. In 2010, that increased to nearly $82 billion (US Department of Agriculture, 2010). This rate will likely accelerate in the coming years. This is driven by a number of factors, including: increased food and agriculture industries outside the United States; consumer desire for a wide variety of fresh fruits and vegetables; increased consumption of seafood; and many others. While the United States continues to be a net exporter of food and
agriculture, there are more food manufacturing firms registered to produce food for United States consumption in FDA's Bioterrorism Registration Database outside the United States (150,000) than in the United States (130,000).

**Unusual Sources for Imports**

The globalization of the food system results in more countries being sources of food products for the United States than ever before. The countries are not always, however, those that you would expect. Table 1.1 is a selective list of source countries and the foods and ingredients imported most from those countries in 2008 (US Department of Agriculture, 2010). These sources may have food safety and defense systems that are different, either better or worse, than those of the United States. In some cases they also may not be a rational source of

<table>
<thead>
<tr>
<th>Country</th>
<th>Import</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>Sage</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>Juices</td>
</tr>
<tr>
<td>Bosnia/Herzegovina</td>
<td>Pastry</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Honey</td>
</tr>
<tr>
<td>Chad</td>
<td>Gums</td>
</tr>
<tr>
<td>Georgia</td>
<td>Fruit juice</td>
</tr>
<tr>
<td>Haiti</td>
<td>Cocoa beans</td>
</tr>
<tr>
<td>Iran</td>
<td>Juices</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>Wheat gluten</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>Walnuts</td>
</tr>
<tr>
<td>Lebanon</td>
<td>Fruit/nut preparation</td>
</tr>
<tr>
<td>Mongolia</td>
<td>Honey</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Rice</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>Tea</td>
</tr>
<tr>
<td>Sudan</td>
<td>Gums</td>
</tr>
<tr>
<td>Syria</td>
<td>Olive oil</td>
</tr>
<tr>
<td>Venezuela</td>
<td>Sesame seeds</td>
</tr>
<tr>
<td>Yemen</td>
<td>Coffee</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>Sugar</td>
</tr>
</tbody>
</table>
the commodity. At a US Governmental level this is a challenge because the only source of data on country of origin is what is captured through import data collections under the tariff system. For tariff purposes, the country of origin is the one that represents > 50% of the economic value of the item at the border.

As an example of tariff rules, consider how Canada can be identified as the single largest source of cocoa and cocoa preparations for the United States (US Department of Agriculture, 2010), even though there is no cocoa grown in Canada. Since cocoa beans are often further processed outside of the growing country, including Canada, it seems reasonable that the economic value of the cocoa butter, chocolate blocks, or other products coming into the United States could represent > 50% Canadian added value. Less obvious, however, is that Canada is the second largest source of citric acid at 40% of total citric acid imports in 2010, even though there are no citric acid production facilities in Canada. The economic value, for tariff purposes includes all costs: transportation, labor, and packaging. Bulk receipt of a product in Canada that is then blended or ground or otherwise handled and then packed off into smaller unit sizes before being shipped to the United States could end up being assessed as > 50% Canadian economic value, as is evidently the case for citric acid. The tariff system was developed to protect the private sector from unfair business practices, as a result its use as a public health tool to validate the source of materials is of variable utility.

There are other cases where the fact that the country is even a source of imported foods, juices from Iran for example, is itself surprising. There are others where the country is a source of a food or ingredient that does not seem logical, such as fish being the largest import from Kazakhstan whose main agriculture industries, as identified in the Central Intelligence Agency World Fact Book, are wheat, cotton, and livestock.

Examining a specific commodity in detail yields other surprises. Table 1.2 lists all the countries that were sources of shrimp into the United States in 2010 (US International Trade Commission, 2010). While most are obvious sources, such as Vietnam and Thailand, there are some that are somewhat surprising. When shrimp products are included, which includes processed foods, another non-obvious source country like Estonia is added to the list. There are also cases where the import data may reflect trans-shipment or further processing