U.S. DEPARTMENT OF AGRICULTURE

Economic Research Service

Economic Research Report Number 286

March 2021

China's Refusals of Food Imports

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Economic Research Service
www.ers.usda.gov

Recommended citation format for this publication:

Gale, Fred. March 2021. *China's Refusals of Food Imports,* ERR-286, U.S. Department of Agriculture, Economic Research Service.

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Abstract

China is adopting stricter food safety measures that apply to both imported and domestically produced food. This study is the first to compile and analyze China's refusals of imported food in order to assess regulatory compliance problems identified by inspectors at the Chinese border. China rejected less than 1 percent of imported food shipments from all countries and regions during 2006-19. The rate of refusal varies from year to year. Some potential exporters may be deterred from selling to China due to risks of heightened scrutiny at certain times, strict requirements for documentation and labeling, and standards that may require reformulation of products. The European Union (EU) had the largest number of refusals of any exporter, mainly because its food exports to China are predominantly processed and packaged products, which China refuses more frequently. China's refusal rate of U.S. foods was slightly less than the average for all countries and regions.

Keywords: China, international trade, food safety, inspections, sanitary and phytosanitary requirements, barriers to trade.

Acknowledgments

The author thanks Shawn Arita and Mirvat Sewadeh, USDA, Office of the Chief Economist (OCE), for their contributions to this study when with USDA, Economic Research Service (ERS). The report benefited from comments from four external reviewers, reviews by ERS and USDA's Office of the Chief Economist and Foreign Agricultural Service, and editorial comments from Christopher Whitney, ERS.

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U.S. DEPARTMENT OF AGRICULTURE

A report summary from the Economic Research Service March 2021

China's Refusals of Food Imports

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What Is the Issue?

China has adopted many new standards, laws, and regulations during the last two decades to address its food safety problems. Exporters aspiring to sell to that country's growing market must comply with these measures. This report profiles the kinds of foods refused entry by China and the violations reported. The results of this analysis can inform exporters and leaders in business and government about China's enforcement of safety regulations for imported foods.

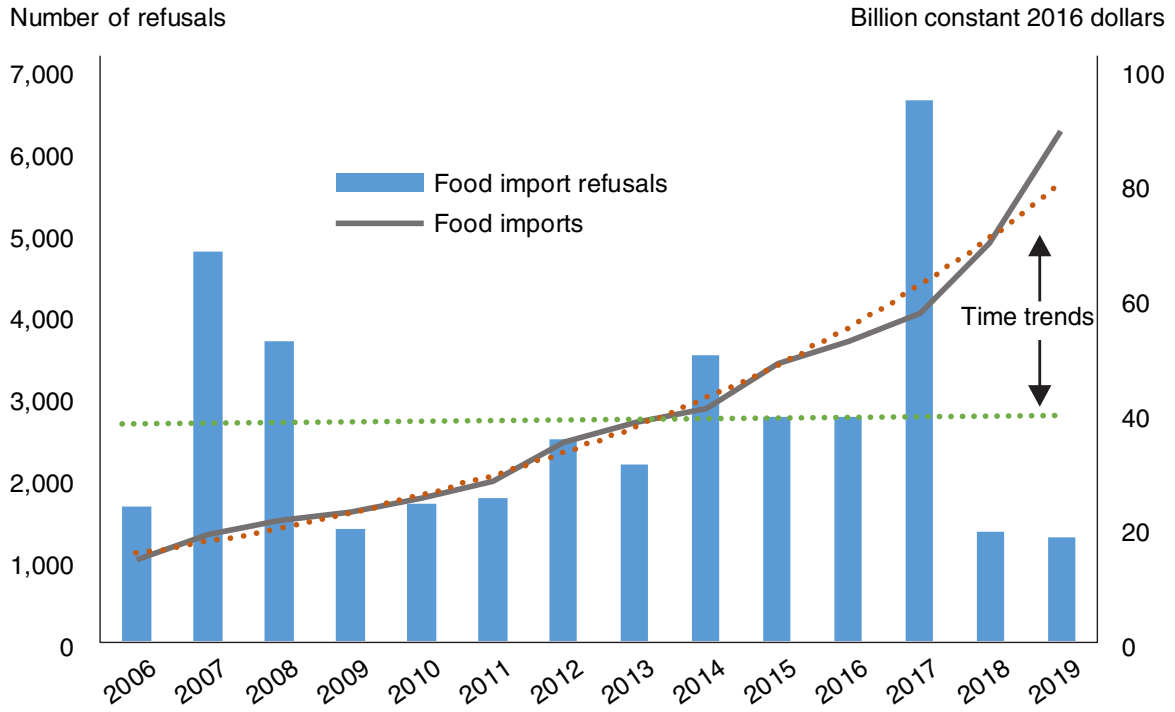
What Did the Study Find?

China's food safety laws and regulations require exporters of many commodities to pass audits and register with Chinese authorities. China accepted more than 99 percent of food imports during 2006-19, but thousands of shipments are refused annually due to violations of China's many laws, regulations, and standards. China's refusals did not trend upward during 2006-19, although its food imports did rise rapidly. Refusals fluctuated from year to year, peaking in 2007 and 2017 and dropping to their lowest-ever totals in 2018-19. The rate of refusal varies from year to year. Refusals surged during years when officials launched campaigns to step up inspections and regulatory enforcement.

Food additives and chemical composition that did not conform to Chinese standards and regulations were the most frequently cited violations for refusals. Other common reasons for refusals were incomplete or improper documentation and registrations, and problems with labels, packaging, and expiration dates. The prevalence of specific violations varied across products. For example, violations related to documents and procedures accounted for about half of meat refusals.

U.S. products accounted for 8.7 percent of China's food imports and 9.2 percent of China's food import refusals. The largest number of China's import refusals included processed and packaged consumer-ready foods. Refused processed products come predominantly from the European Union, United States, Australia, New Zealand, and Japan.

China food import refusals and value of imports from all countries and regions, 2006-19



Notes: The value of food imports is deflated with the International Monetary Fund's Primary Commodity Index for food. Green dots show the trend in food import refusals; red dots show the trend in food imports.

Source: USDA, Economic Research Service analysis of data from China General Administration of Quality Supervision, Inspection and Quarantine, China General Administration of Customs, and customs data accessed through the Trade Data Monitor.

China's COVID-19-related refusals of meat and seafood shipments during 2020 attracted attention from trading partners. Though data for calendar year 2020 were not yet available, USDA's Economic Research Service (ERS) analyzed data for the first 7 months of the year. The examination showed China rejecting more meat and seafood shipments in the months before the pandemic as import volumes rose.

How Was the Study Conducted?

The study compiled records of 37,906 food shipments refused by China's border inspectors from 2006 to 2019. ERS researchers also analyzed 1,050 refusals for the first 7 months of 2020 to investigate COVID-19-related refusals. ERS obtained the lists from websites of China's border inspection agencies. Customs data on China's total food imports were tabulated to evaluate the quantity of refusals against actual imports. Domestic food testing results for 2019 were summarized to characterize domestic food safety enforcement for comparison.

Explanation of key acronyms

AQSIQ	China General Administration of Quality Supervision, Inspection, and Quarantine
CIQ	China Inspection and Quarantine
COVID-19	Novel coronavirus 2019
CFDA	China Food and Drug Administration
GAC	China General Administration of Customs
RASFF	European Union Rapid Alert System for Food and Feed Imports
SAMR	China State Administration for Market Regulation
US FDA	U.S. Food and Drug Administration
WTO	World Trade Organization

China's Refusals of Food Imports

Introduction

China's food imports are growing as living standards in the country rise (State Council, 2019b). Increasing imports also reflect preferences among Chinese consumers for imported foods that have a reputation for superior safety and quality (Knight et al., 2008; Hanser and Li, 2015; Kendall et al., 2018). Chinese officials have sponsored "China International Import Expos" to promote the "opening" of China's market to give consumers easier access to imported foods (State Council, 2018).

At the same time, Chinese officials have adopted more stringent regulations to address the country's numerous food safety incidents. New regulations and standards applying to both domestic and foreign producers increase the challenges for exporters seeking access to China's market. China's food safety laws and specific regulatory measures include provisions for rigorous assessments of prospective foreign food suppliers, requirements for documentation, record-keeping, packaging, labeling, and tracking of imported foods—and restrictions on hundreds of additives, chemicals, ingredients, and contaminants. Recent documents issued by inspection agencies highlighted safety questions related to the growing volume of imported food (AQSIQ, 2016, 2017a; General Administration of Customs, 2018). China's State Administration for Market Regulation (2019) described the safety of imported foods as "uneven," and the State Council (2019a) called for a renewed "National Gatekeeper" action plan to strengthen oversight of imported food.

China's policymakers often state that the country's food safety regulations and enforcement are science-based measures, consistent with international principles intended to protect consumers (State Council, 2007; AQSIQ, 2017; China National Health Commission, 2020). There are, nevertheless, concerns that some measures may discriminate against exporters or could be used as a trade barrier. For example, an industry consultant interviewed by the American Chamber of Commerce in Shanghai (2018) warned prospective exporters that imported food items are likely to face more scrutiny than domestic Chinese products and observed that many problems were encountered at the point of entry. News media attributed a large drop in China's fruit and vegetable imports from Vietnam to confusion over new Chinese requirements for phytosanitary documents, certificates of origin, reviews of labels, and sample testing for each shipment (Neo, 2019). During 2020, some Australian officials raised concerns that suspension of several beef exporters was a retaliatory action (ABC Rural, 2020; Reuters, 2020a). Industry officials in the United States, Brazil, and other countries raised concerns that China's measures to certify that imports were free of the COVID-19 virus imposed costs on food exporters without clearly reducing risk to consumers (Wall Street Journal, 2020; Reuters, 2020b).

Many countries refuse entry to food shipments that fail to meet regulations and standards. Data on such refusals by the United States and the European Union (EU) have been studied previously to assess food safety risks posed by imported food. Studies of U.S. import refusals (Buzby et al., 2008; Buzby and Roberts, 2011; Bovay, 2016) found that excessive levels of pesticide residues on vegetables, microbial pathogens in seafood shipments, and adulteration of spices and flavorings were common. Foods from China were frequently identified as sources of food safety risk in those studies. Gale and Buzby (2009) examined U.S. refusals of foods imported from China and found

that U.S. inspectors at the border commonly cited the presence of filth, unsafe additives, and excessive veterinary drug residues in seafood. Analyses by Jongwanich (2009) and Henson and Olale (2011) raised concerns that refusals acted as barriers to the U.S. and EU markets for products from countries at lower levels of development.

China has adopted regulations governing the safety of food it imports that Chinese officials call the "strictest ever" (Beijing Youth Daily, 2017; Peoples Daily, 2019). Chinese authorities have frequently revised laws and regulations as they sought to address chronic problems in domestic food supplies, and these measures also apply to foreign suppliers. This report reviews the development of that country's food safety regulation and analyzes patterns of food imports refused at China's border in order to summarize challenges that food exporters in the United States and other countries face as they seek access to the growing China market. This report analyzes China's refusals of imported foods in order to provide guidance for exporters, business leaders, and policymakers who want to export food to China. While the number of refusals has not kept up with rapid growth in food imports, exporters face uncertainty regarding the enforcement of numerous Chinese standards, laws, and regulations. Analysis of refusals reveals the types of products most frequently refused, the types of violations cited, and whether food from the United States is rejected at a higher or lower rate than food from other countries and regions. The current study is the first to compile and examine the Chinese import refusal data in detail.[1]

China's import refusals provide a broad indicator of how food safety regulations affect the country's rapidly growing import market. Chinese government reports have cited the number of refusals as an indicator of efforts to control the safety of imported food (State Council, 2007; AQSIQ, 2016, 2017; China National Health Commission, 2020). The refusals are just one component of a prevention-based food safety system that also includes approvals of exporting countries and firms, record-keeping, certifications, documentation, labeling, packaging, and other requirements. Chinese authorities do not reveal the proportion of food imports tested or inspected, and refusals can reflect either changes in enforcement effort or the incidence of problems.

The report begins with a discussion of China's food safety regime for imports and describes the food import refusal data. It analyzes the time trend in food import refusals, number of refusals by product, violations reported, and refusals of foods from various countries and regions of origin. The report briefly reviews suspensions of exporters and other Chinese measures used during the COVID-19 pandemic. Concluding comments summarize the findings.

[1]Arita, et al. (2017) showed that China's refusals of pork shipments occurred in spurts that did not reflect the volume of trade.

Background: China's Evolving Food Safety Regime for Imports

In the 1990s and early 2000s, Chinese authorities prioritized regulations to ensure the safety of food exports because China was a net exporter of food at that time (Gale and Hu, 2012). China's basic framework for regulating the safety of imported food was established when the country joined the World Trade Organization (WTO) in 2001. As a WTO member, China must abide by the organization's sanitary and phytosanitary agreement. The agreement calls for enacting food safety laws based on science and risk assessment and equal application of laws to domestic and imported food. During the months leading up to its formal accession to the WTO, China set up the General Administration of Quality Supervision, Inspection, and Quarantine (AQSIQ) to supervise the safety of manufactured, imported, and exported food. Regional China Inspection and Quarantine (CIQ) authorities were set up under AQSIQ to examine food at the point of entry. According to a white paper on food safety issued by the State Council (2007), the regulatory system for imported food at that time used risk analysis to determine whether foreign countries could be approved as suppliers of high-risk foods, such as meat and vegetables. CIQs were authorized to increase testing and inspections and detain or suspend food imports when evidence of heightened risk was detected.

Concerns over food safety during China's first decade as a WTO member focused on incidents arising from domestic Chinese products. These incidents included foods containing excessive levels of pesticides and veterinary drug residues, heavy metals and other pollutants, presence of toxic additives and dyes, adulteration with nonfood substances, and sale of meat from diseased animals (Chen and Zhang, 2017). As a net exporter of food in the first decade after it joined the WTO, China's exports raised food safety concerns in foreign markets. Japan adopted stronger regulations of agricultural chemicals in foods in 2006 after detecting problems with foods imported from China (Chen et al., 2008). U.S. concerns about the safety of imported food were heightened by a U.S. Food and Drug Administration (FDA) import alert regarding Chinese fish and shellfish and the discovery of adulterated pet food and wheat gluten from China during 2007 (Schmitt et al., 2007; Barboza and Barrieneuvo, 2007; Gale and Buzby, 2009; Moyer et al., 2017).

Soon after, China's State Council (2007) issued a white paper describing safeguards to ensure safety of the country's food. The paper appeared to be a rebuttal of concerns about the safety of food produced in China, but it also discussed measures to ensure the safety of food imported to China. The paper cited 2,458 noncompliant food imports during 2006 and discussed consultations with U.S. authorities to resolve problems detected in pork imported from the United States. The paper described the safety of imported food as having been "stable for many years," with compliance rates ranging from 99.1 to 99.5 percent during 2004-07. A State Council "National Product Quality and Food Safety Remediation Action Plan," issued in August 2007, focused on rectifying domestic problems—but also targeted "illegal imports of meat and fruit" (China National Development and Reform Commission, 2007).

Despite safeguards discussed in the white paper, China's most-publicized domestic food safety incident occurred in 2008 when 300,000 infants were hospitalized, and 6 died from kidney failure after consuming infant formula adulterated with melamine (Bánáti and Klaus, 2010; Qian et al., 2011). Testing by Chinese authorities detected melamine in products of several of China's major infant formula producers. According to Lepeintre and Sun (2018), the infant formula incident prompted Chinese authorities to "take the bull by the horns" in their overhaul of domestic food safety regula-

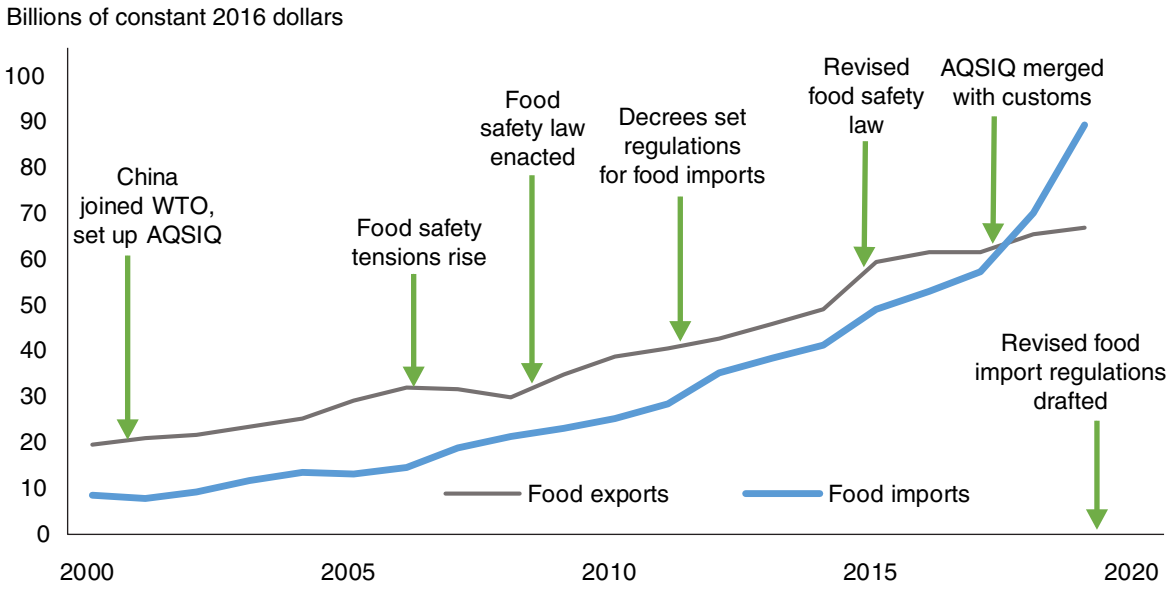
tion. Chinese food marketing studies identified a lack of confidence in domestic food. The lack of confidence resulted from the infant formula adulteration and other food safety incidents as factors influencing Chinese consumers' growing demand for imported food and consumer use of foreign brands as a signal of safety (Knight et al., 2008; Hanser and Li, 2015; Kendall et al., 2018).

China issued its first food safety law in 2009, less than a year after the infant formula incident. Before this law was enacted, food safety was governed by 10 different laws covering areas such as food hygiene, product quality, consumer protection, inspection and quarantine, standardization, measurement, and agricultural product quality and safety (State Council, 2007). The 2009 law called for consolidation of food standards and mandated penalties for violators. The law also established a food recall system and created a national commission to coordinate various regulatory bodies supervising safety in different stages of the food supply chain—agriculture, transportation and marketing, processing, food service, import, and export (Zhang, 2009).

- Authorities refined regulations for imported food as China's food imports grew rapidly (figure 1).[2] Following the 2009 food safety law, AQSIQ issued decrees that set a framework for approving foreign food suppliers, documenting shipments, and inspecting and testing shipments at the border.
- In 2011, Administrative Measures for the Safety of Imported and Exported Foods (AQSIQ Decree 144) set core regulations that emphasized prevention through registration of exporters. Decree 144 also set regulations concerning documentation for shipments to supplement testing and inspection of imported food at the border, and it set inspection procedures for imported food. The measure gave local AQSIQ inspectors the authority to conduct on-site inspections of foreign food manufacturing facilities, verify documents, and detain products that failed to comply with the regulations.
- In 2012, AQSIQ Administrative Measures for Registration of Overseas Manufacturers of Imported Food (AQSIQ Decree 145) set registration requirements for foreign food producers.
- In December 2015, an Implementation Catalogue for Registration of Overseas Manufacturers of Imported Food required registration for manufacturers exporting meat, seafood, dairy, infant formula, and bird nests to China. U.S. meat and poultry facilities under the jurisdiction of USDA's Food Safety and Inspection Service are exempt from the full registration requirements (USDA-FAS, 2020).
- Additional AQSIQ and CFDA decrees and regulatory measures set requirements for registration, packaging, and labels for specific products like grains and oilseeds, dairy products, infant formula, health foods, food for medical purposes, vegetable oil, meat, and poultry.

[2]See USDA-FAS (2020) for a comprehensive discussion of China's regulatory measures for food imports.

Figure 1
China's food imports, exports, and regulatory highlights, 2000-19



Note: Import and export values were deflated to constant 2016 dollars using the International Monetary Fund's Primary Commodity Index for food. AQSIQ=General Administration for Quality Supervision, Inspection and Quarantine; WTO=World Trade Organization. "Food" includes products specified by AQSIQ (2017); it excludes soybeans and animal feeds.

Source: USDA, Economic Research Service using China customs data accessed through the Trade Data Monitor.

The State Council (2014) called for a food safety rectification that included crackdowns on agricultural chemicals in food, recycling of cooking oil and other foods, meat slaughter and processing, and revisions to food safety regulations. According to Zhang et al. (2018), several factors prompted a 2015 revision of the food safety law and other legal framework changes for food safety. These factors include: lack of coordination among regulatory bodies, redundant standards, need for transparency, rapid growth in the food industry, the emergence of new pathogens, and incidents of food fraud and food allergies. The 2015 law emphasized supervision of the food production process rather than inspection of products, placed responsibility for safety on producers and importers of food products, and established a recall system for imported food. The law called for on-site inspections of foreign producers, food safety certifications, more extensive testing, record-keeping requirements, stricter penalties, revisions of standards, stringent regulations for pesticide use, and reorganization of regulatory agencies (Balzano, 2015). The law included special provisions for medically formulated foods, and it required infant formula manufacturers to register products and submit technical information to Chinese authorities (USDA-FAS, 2017). China subsequently revised hundreds of standards (Economy Daily, 2018) and pledged to set more than 7,000 new maximum residue limits for agricultural chemicals (Ministry of Agriculture and Rural Affairs, 2019).

A 2018 Chinese government reorganization placed AQSIQ's supervision of imported and exported food within the General Administration of Customs (GAC). It also merged China's Food and Drug Administration (CFDA) and AQSIQ's oversight of food processors in a newly created State Administration of Market Regulation (SAMR). Draft regulations issued during 2019-20 consolidated previous measures, broadened registration requirements, and clarified responsibilities of GAC after its merger with AQSIQ.

- In 2019, a draft revision of Decree 145, Administrative Measures for Registration of Overseas Manufacturers of Imported Foods, would extend registration requirements to producers of all foods exported to China (Peoples Daily, 2019).
- In 2020, GAC issued draft Measures for the Safety Administration of Imported and Exported Food. This draft designated GAC as the agency responsible for imported food safety—and the draft regulations stated they would replace regulatory measures for imported meat, aquatic, and dairy products.

According to Lepeintre and Sun (2018, p. 196), China's regulation of imported food safety is based on international principles adopted from the Codex Alimentarius Commission. However, standards and implementation are adjusted to suit "specific conditions" and "the historical process and development stage of the country's food safety governance of food imports and exports." Strict standards aimed at specific problems in China unfamiliar to foreign suppliers may increase the risk of regulatory violations for exporters selling products in the country. One example of these standards is the extensive negotiation undertaken by exporters of gin and tonic water with Chinese customs officials. These negotiations were undertaken to allow products containing ingredients such as lavender and quinine, which were banned by Chinese standards because the ingredients were only allowed for use in traditional Chinese medicines (Whitehead, 2019). A revision of infant formula standards set new tolerances for many ingredients (see box, "New infant formula standards challenge domestic and foreign suppliers").

New infant formula standards challenge domestic and foreign suppliers

China's Health Commission developed revised standards for infant formula that it called "the strictest in the world" (Beijing Youth Daily, 2017). The revisions made nutrients such as choline mandatory—and increased the required proportion of whey protein and lactose. The revisions also adjusted upper and lower limits for vitamins, niacin, folic acid, sodium, potassium, and copper.

China's 2015 Food Safety Law introduced an infant formula registration system that required all suppliers to submit formulations for approval by the end of 2017 (Chen, 2019). News media estimated that more than 3,000 formulas were available in Chinese markets before the registration process had begun. During the registration process, the China Food and Drug Administration (CFDA) approved about 1,300 formulas, submitted by 93 Chinese producers and 35 foreign producers (Yicai, 2020).

According to Chinese news media, the revisions and re-registration process largely aimed to reduce the large number of products available in the markets. The process also tried to eliminate small domestic producers that substituted sugar for higher protein ingredients as a cost-saving measure (Yicai, 2018). In addition, the revisions raised costs for foreign suppliers who had to submit materials and take measures to ensure that their products met the specific requirements in the Chinese standards.

The CFDA required both domestic and foreign companies to re-register their products to maintain their right to sell in the Chinese market. The CFDA also required companies to submit technical details on production processes, formulas, and third-party test results to verify their products' compliance before January 2018. In 2020, news media reported that companies were already preparing for the next round of registrations because these registrations must be renewed every 5 years (Yicai, 2020).

An AQSIQ (2017) white paper summarized imported food safety regulations as a whole-process system with measures to control food safety risks before, during, and after entering China.

- A review of the exporter's food safety system must demonstrate that exports comply with Chinese requirements before approving a country as an exporter. Following an inspection and audit, foreign exporters must be registered. Imported plants and animals must have an inspection and quarantine approval.
- Importers or their agents must declare imported products when they arrive in China. The importers must apply for inspection and submit relevant documents for review—such as contracts, invoices, packing lists, bills of lading, health certificates, animal and plant quarantine entry permits, and other documents. An importer-exporter file system must be established to track shipments.
- Labels and instructions on food packages must be translated into Chinese script. They must identify the country of origin and the name and address of the domestic importing agent. Some foods have additional requirements. For example, infant formula labels ban 18 words, phrases, implied claims, and Chinese homonyms for the words.

- Meat and seafood can only enter at designated border points, have special testing requirements, and may be held in quarantine.
- Certain products—such as infant formula, vegetable oil, rice, and sausage casings—have special supervision and higher sampling rates. Noncompliant shipments can be remediated, turned away, or destroyed.
- Importers must establish records of foods. The records must include product name, specification, quantity, production date, batch number, shelf life, and contact information for exporters and domestic agents. Shipments are tracked after they enter China, and a recall system must be in place.

Draft regulations published in 2020, "Measures for the Safety Administration of Imported and Exported Food," summarize the diverse reasons for refusing entry of imported food.[3] Customs officials are authorized to inspect the sanitation of transport equipment and storage; verify that registration numbers, contents, and labels of shipments are consistent with documentation submitted to customs; determine whether packaging and labels comply with standards and regulations; inspect shipments for spoilage, insects, mold/mildew, and frost; and check that food was kept at the proper temperature. The regulations instruct GAC to formulate annual plans for sample-testing and inspections of imported food, but these plans and information about the number of inspections are not publicly available. The regulations also authorize local customs organizations to conduct their own programs and inspections to address local needs, implying that procedures and testing may differ across ports.

Several public campaigns called attention to issues with imported foods in recent years. The State Council (2014) launched a food safety remediation campaign that included instructions to strictly regulate imported food, with special instructions for imported infant formula and food sold on e-commerce platforms. AQSIQ's (2017b) 5-year plan for 2016-20 included a "National Gate" (国门) initiative. The initiative comprised an imported food safety assurance project. The project focuses on the safety of food imported via e-commerce, development of personnel to inspect and audit overseas suppliers, and automation to speed up the customs clearance process for imports. The plan's "imported food safety assurance" campaign led to increased inspections and warnings about the risks of imported food, including U.S. beef, Russian ice cream, and food from Japan (Xinhua, 2017). The Chinese Peoples Daily newspaper (2017) warned consumers about fraudulent imports and mislabeled products that lacked domestic sanitation certificates.[4] Shanghai's inspection and quarantine authority explained that it had adopted a series of measures to ensure the safety of imported foods in order to address the growing prevalence of fraudulent and mislabeled foods that were, in turn, prompted by the demand for imported products (Shanghai Peoples Net, 2017). During the 2020 COVID-19 pandemic, Chinese officials raised concerns that the virus could be transmitted by shipments of imported food. Chinese officials conducted extensive testing of imported food, suspended some exporters of meat and seafood, and encouraged importers to request that exporters provide declarations that shipments were virus-free (Reuters, 2020a, 2020b; Wall Street Journal, 2020). China's National Health Commission issued guidelines calling for meat suppliers in Brazil to conduct extensive virus testing and reconfigure meat processing plants (Colussi, 2020).

[3]While these are new regulations, the regulations summarize the basic process that was in place during 2019, and earlier years when the refusals in this study were generated.

[4]Food fraud in China's domestic market has been a longstanding concern (Moyer et al., 2017).

Intermittent crackdowns and shifting of resources to anti-smuggling initiatives or other priorities may cause enforcement effort to vary from year to year and from port to port. USDA-FAS (2016) warned exporters that interpretations of quarantine regulations can vary across different levels of government and different ports. USDA-FAS (2018) warned exporters to China that regulations change frequently and that some CIQs may adopt new procedures and requirements before others. Some Chinese policy documents indicate that the strength of inspections and quarantine measures can be used as a policy tool to protect domestic industries and to regulate market supply (Ni, 2013). Annual "Number 1 documents" on rural policy issued by China's central communist party leadership occasionally contained similar language, including a suggestion to "explore adoption of effective measures compliant with international rules to adjust agricultural imports and exports" (State Council, 2008). The 2016-20 plan for AQSIQ pledged to use inspection and quarantine functions to support foreign diplomacy and to implement macro control measures that regulate the supply of products in the Chinese market (AQSIQ, 2017b).

During trade tensions with the United States and Canada in 2018, there were reports that China had heightened inspections of products from both countries. China's suspension of Canadian pork imports for four months in 2019 was attributed to a banned feed additive and falsified documents, but it coincided with political tensions between the two countries. China suspended beef imports from several Australian suppliers during a period of political tensions in 2020.

A guide for food exporters (USDA-FAS, 2016) warned potential exporters that China has strict requirements for documentation of shipments, packaging, labeling, and containers. An industry consultant interviewed by American Chamber of Commerce Shanghai (2018) cautioned prospective food exporters on several points: Chinese standards for ingredients and contaminants may differ from the exporting country's standard, foods containing additives not on a list of approved substances may be rejected, and shipments are sometimes held up until detailed product label formatting requirements are satisfied. According to USDA-FAS (2020), import inspection authorities reported that labeling problems generated consumer complaints and a chief reason for food import noncompliance.[5]

[5]The American Chamber of Commerce (2018) interview warned that "professional consumers" look for violations in imported foods in the hope of receiving financial compensation.

China Food Import Refusal Data

For this report, USDA Economic Research Service (ERS) compiled monthly lists of refused food shipments posted on the websites of China's AQSIQ and GAC during 2006-19 and found 37,906 refused shipments. ERS analyzed the number of shipments refused, types of foods refused, violations cited, and countries/regions of origin of the refused foods.

The China import refusals are similar to compilations of food import refusals by U.S. and EU border inspectors that were examined in previous studies. China's food import refusal reports are similar to import refusals posted by the U.S. FDA. China also issues import alerts that are similar to U.S. FDA alerts issued for products from particular companies or countries that have had repeated violations or other indicators of heightened food safety risk. The EU's Rapid Alert System for Food and Feed Imports (RASFF), a platform for sharing information about food and feed health risks among member States, includes the number of border rejections, as well as other alerts and notifications (Bánáti and Klaus, 2010; European Commission, 2019).

The scope of Chinese import refusal reports includes food products in Harmonized System (HS) chapters 02 to 24.[6] The reports exclude agricultural commodities not directly consumed as food, and they appear to exclude bulk shipments of most grains and oilseeds. The only grains listed in the reports are rice, sorghum, and buckwheat. Thus, the imports covered by these refusals do not correspond to agricultural imports since the refusals exclude commodities like soybeans, cotton, most animal feeds, and cassava. The scope of products covered by China's import refusals differs from U.S. FDA import refusals, which exclude most meats (the USDA supervises food safety of meat in the United States). It also differs from the EU's RASFF which includes animal feeds.

Monthly reports for this analysis were obtained from China's AQSIQ and GAC web sites. The reports are only available in Chinese.

- Recent reports are available from "Import-Export Food Safety" pages on the websites of GAC and the National Food Quality Supervision and Inspection Center.
- ERS obtained most of the reports from an AQSIQ website that was no longer accessible after a March 2018 merger with GAC. Some reports not listed on that site were discovered on other sites via internet searches. ERS found reports for every month during 2006-19, except June 2006.

Each monthly product refusal report lists shipments refused. Many reports list multiple shipments of the same product, and ERS counted each of these as a separate refusal. Records include product name, country/region of origin, name of the foreign manufacturer, name of the importer, an HS industry code, the shipment's weight, the violations that prompted refusal, and port of entry. While most text is in Chinese characters, names of many exporters and some products are in English. ERS translated country/region names to English and appended dates and product codes—2-digit and 4-digit HS codes—to each record. During some months, the report identified specific ports of entry, but many reports identified only the province where the shipment arrived.

[6]The Harmonized System is an international nomenclature for classifying products in international trade. The system includes 2-digit chapters that are subdivided into more detailed subcategories. As noted below, the import refusals provide a detailed 10-digit category for products.

Violations and most other data were posted as Chinese text that was not standardized from one year to the next, making it difficult to summarize the violations. Violations reported frequently included variations of "label not compliant," "did not provide certificates or certification materials," "exceeded expiration date," "excessive bacteria," or "excessive moisture." Hundreds of individual chemical compounds, dyes, and additives were cited, often just a few times or even just once each per year. ERS tabulated more than 400 separate Chinese text strings describing violations. A precise count of unique violations was difficult to make since many text strings were slight variations of the same text.

ERS analyzed the trend in import refusals during 2006-19 to determine whether stricter regulations and procedures have led to rising refusals of imported food. Detailed analysis of refusals by product, country, and type of violation was limited to a more recent period of 2013-19. Analysis of 1,050 refusals during the COVID-19 pandemic in January-July 2020 illustrates some trading partners' concerns that China's use of measures to reduce risk of contamination disrupted food trade.

China does not reveal the total number of imported food shipments, nor the number of inspections conducted, so there is no information to determine whether changes in the number of refusals reflect changes in number of shipments or frequency of inspections. ERS calculated refusal rates using indicators of import value and volume from customs statistics. The dollar value of food imports allows aggregation of different types of products. The physical weight (or volume in liters of some beverages) of shipments refused varied widely, from a few kilograms to thousands of metric tons, so it seemed inappropriate to aggregate all types of shipments by weight. The analysis calculates a refusal rate using dollar value except for refusal rates for categories of similar products, which also report a refusal rate based on the weight of shipments.

Analysis of Import Refusals

Trends in refusals, 2006-19

Table 1 displays the number of food shipments refused by China annually during 2006-19. Refusals of food from all countries and regions totaled 37,906 shipments, an average of 2,708 per year. China refused 3,494 food shipments from the United States, an average of 250 per year. U.S. shipments accounted for 9.2 percent of all refusals. The U.S. share rose as high as 16.9 percent in 2009, fell to 3.4 percent in 2016, and rose to 8.1 percent in 2019. The U.S.'s share of shipments refused by China was close to or below the 9-percent average in all but one year during 2013-19.

ERS estimates China refused 0.2 to 0.5 percent of imported food shipments from all countries and regions during 2012-17 (see box, "China refuses less than 1 percent of all imported food shipments"). Sample testing of domestic food in Chinese retail outlets during 2018-19 found higher rejection rates of 2.4 to 2.5 percent (Ministry of Agriculture and Rural Affairs, 2019; Xinhua Net, 2019; Peoples Daily, 2020). China typically does not report testing results for imported food, but an official from the SAMR revealed that 0.75 percent of imported food samples drawn from domestic markets during January-June 2020 were rejected due to excessive agricultural chemicals or otherwise failing to meet standards (China National Health Commission, 2020).[7]

China's food imports rose in value from $11.8 billion to $88.6 billion during 2006-19 (with no adjustment for inflation; the data are deflated in the trend analysis below).[8] U.S. products had an 8.7-percent average share of China's food imports, slightly less than their 9.2-percent share of China's food import refusals. The similarity of these shares suggests that China does not reject food imports from the United States at a significantly higher rate than it rejects foods from other foreign suppliers.

[7]Presumably, these imported foods inspected by SAMR had already been granted entry to the Chinese market by GAC.

[8]Note that the value of food imports differs from the value of agricultural imports. AQSIQ's definition of food imports excludes agricultural products not consumed directly by humans such as soybeans, animal feeds, cotton, and animal hides.

Table 1
China's refusals of food imports and value of food imports, 2006-19

Year	Refused food shipments			Value of all food imports		
	From all countries and regions	From United States	Share from United States	From all countries and regions	From United States	Share from United States
	Number		Percent	Billion dollars		Percent
2006	1,673	97	5.8	11.8	1.3	10.9
2007	4,764	573	12.0	17.6	1.9	11.0
2008	3,694	489	13.2	23.5	2.8	11.8
2009	1,399	237	16.9	21.3	2.3	10.8
2010	1,684	133	7.9	26.3	2.5	9.6
2011	1,761	210	11.9	35.3	4.3	12.2
2012	2,493	308	12.4	42.1	4.5	10.8
2013	2,162	175	8.1	46.1	4.4	9.5
2014	3,501	250	7.1	48.6	4.4	9.0
2015	2,748	151	5.5	48.1	3.7	7.7
2016	2,766	93	3.4	52.7	5.0	9.4
2017	6,624	525	7.9	59.7	5.0	8.4
2018	1,351	149	11.0	71.6	4.8	6.7
2019	1,286	104	8.1	88.6	4.7	5.3
Average	**2,708**	**250**	**9.2**	**42.4**	**3.7**	**8.7**

Note: Food imports as defined by China's General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ)--excludes soybeans, grains (except rice), and nonfood agricultural products. Data are not adjusted for inflation.

Source: USDA, Economic Research Service analysis of data from AQSIQ, China's General Administration of Customs, and customs data accessed through Trade Data Monitor.

China refuses less than 1 percent of all imported food shipments

Chinese authorities do not regularly report the number of shipments received or inspected. A few data items reported in white papers on food safety indicate that the proportion of food shipments refused has consistently been less than 1 percent, and the proportion has declined over time.

China's State Council (2007) reported noncompliance rates for all imported food shipments of 0.71 percent in 2004, 0.54 percent in 2005, 0.89 percent in 2006, and 0.74 percent in the first half of 2007.

According to the China General Administration of Quality Supervision, Inspection, and Quarantine (AQSIQ 2016, 2017) and China's Customs Administration (2018), the annual number of food shipments imported by China (from all countries and regions) rose from 834,000 to 1.4 million between 2012 and 2017. Using the number of food shipments revealed by these reports, the USDA Economic Research Service calculated the proportion of all shipments refused ranged from 0.22 to 0.34 percent between 2012 and 2016 and then peaked at 0.46 percent in 2017. These refusal rates are lower than the rates (0.54 to 0.74 percent) reported by State Council (2007) for 2004-07.

These rejection rates do not necessarily reflect the actual incidence of violations among all shipments. The low percentage could reflect a low proportion of shipments that were tested or inspected.

China's Customs Administration (2020) reported finding 42 noncompliant shipments in special testing of 68,000 shipments during June 11-17, 2020. These numbers imply a refusal rate of just 0.06 percent.

Table 2
Calculation of refusal rate for imported food shipments from all countries and regions, 2012-17

Year	Refused shipments Number	All food shipments Number	Refusal rate Percent
2012	2,493	834,000	0.30
2013	2,162	965,000	0.22
2014	3,501	1,042,000	0.34
2015	2,748	1,199,000	0.23
2016	2,766	1,324,000	0.23
2017	6,624	1,429,000	0.46

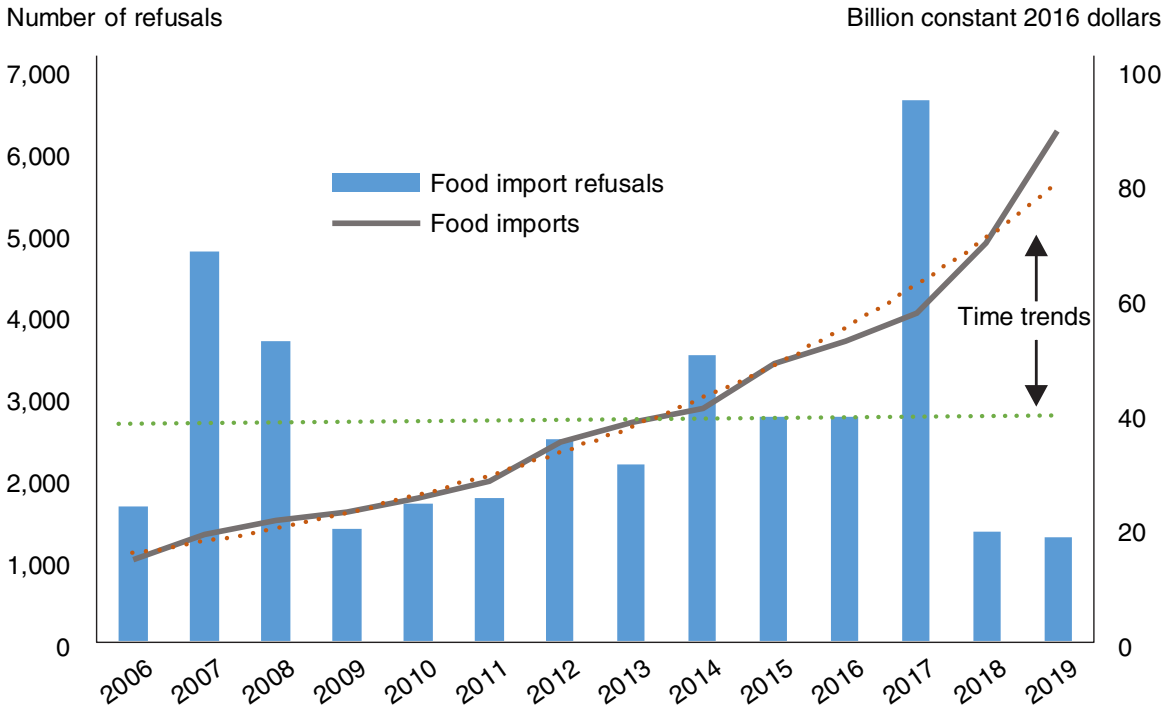
Sources: USDA, Economic Research Service, AQSIQ (2016; 2017), and GAC (2018) calculations.

The number of refusals from all countries and regions fluctuated from year to year, but no trend is evident (figure 2). The number surged in 2007-08 and 2017, but the number declined sharply after each surge. Fitting a time trend to the number of refusals results in an R^2 close to zero, confirming the absence of a trend:

$$Refusals = 2657 + 7.8 \times (year - 2006), R^2 = .0005.$$ [9]

The fitted trend line is displayed in figure 2, along with the actual refusals. The large number of refusals during 2007 corresponds to heightened concerns about food safety (State Council, 2007) and may reflect a "tit-for-tat" reaction by Chinese officials to concerns expressed by the United States and other countries over the safety of imports from China that year. Inspection of refusals for 2006-08 revealed a wider scope of products during those years, as well as a much larger number of refusals of vegetable oils and fish than in later years (see box, "Data reveals changes in refusals after 2008"). The 2014 surge in refusals corresponds to another State Council (2014) food safety remediation. The spike in refusals during 2017 coincided with an imported food safety assurance campaign and AQSIQ's 5-year plan for food safety (AQSIQ, 2017a, 2017b). China introduced food safety regulations following the 2009 and 2015 food safety laws that placed greater emphasis on prevention and risk-based supervision (and presumably less reliance on inspections at the border). The smallest number of refusals were reported during 2018-19, the most recent years for which data were available for this study. This drop also coincided with the reorganization of Chinese government food safety regulatory departments in 2018.

Figure 2
China food import refusals and value of imports from all countries and regions, 2006-19



Notes: The value of food imports is deflated with the International Monetary Fund's Primary Commodity Index for food. Green dots show the trend in food import refusals; red dots show the trend in food imports.

Source: USDA, Economic Research Service analysis of data from China's General Administration of Quality Supervision, Inspection and Quarantine, General Administration of Customs, and customs data accessed through Trade Data Monitor.

[9]The year variable is transformed so that the intercept represents the expected value in 2006.

Data reveals changes in refusals after 2008

Inspection of refusals revealed a wider scope of products included in the refusals and much higher frequency of refusals of some products during 2006-08 than in subsequent years. For example, hundreds of refusals of mung beans, coffee beans, and cassava from Southeast Asian countries reported during 2006-08 were not present in later years. China predominantly rejected these items for the presence of pests, a violation infrequently reported in subsequent years. This pattern suggests that China narrowed the scope of products in 2009. Products in some other categories also had more frequent refusals during 2006-08 than during subsequent years.

Table 3 illustrates the apparent change in reporting by comparing the number of refusals reported in 2008 with the average for 2009-19 for some product categories with large differences: meats, fish and shellfish, vegetables, fruit, and vegetable oils (data for 2006-07 could not be included in this analysis because product codes were not reported for those years). In 2008 there were more than 550 refusals of products in Harmonized System codes 07 and 08—which include fresh vegetables, cassava, and fruit—but only 22 refusals in 2009. The 419 refusals of vegetables during 2008 far exceeded the 2009-19 annual average of 14. The number of vegetable oil refusals in 2008 was 10 times the average for 2009-19, and fish and shellfish refusals in 2008 were more than 5 times the average for 2009-19. There was a discrete drop in refusals between 2008 and 2009 for each product.

Table 3
China's import refusals from all countries and regions fell sharply for some products after 2008

HS code	Category	2008	Annual average 2009-19
		Number	
02	Meat	198	86
03	Fish and shellfish	562	92
07	Vegetables	419	14
08	Fruit	138	29
15	Vegetable oil	325	32

Note: Refusals from all countries and regions for select product categories that had much higher refusals before 2009 revealed by inspection of the data. No product codes were reported in 2006 or 2007.

Source: USDA, Economic Research Service analysis of data from China's General Administration of Quality Supervision, Inspection and Quarantine and General Administration of Customs.

In contrast to the lack of trend in refusals, China's food imports grew exponentially. ERS deflated China's food imports, using the International Monetary Fund's Primary Commodity Index for Food (2016=100), and fit an exponential time trend to the data. An exponential trend fit the data better than a linear or quadratic trend. The trend implied 12.7 percent annual growth in China's food imports, with an R^2 of 0.99, indicating a very strong trend:

$$Food\ Imports = 2.74 \times e^{0.127 \times (Year - 2006)}, R^2 = .99$$

The coefficient on the trend variable [year – 2006] is statistically significant.[10]

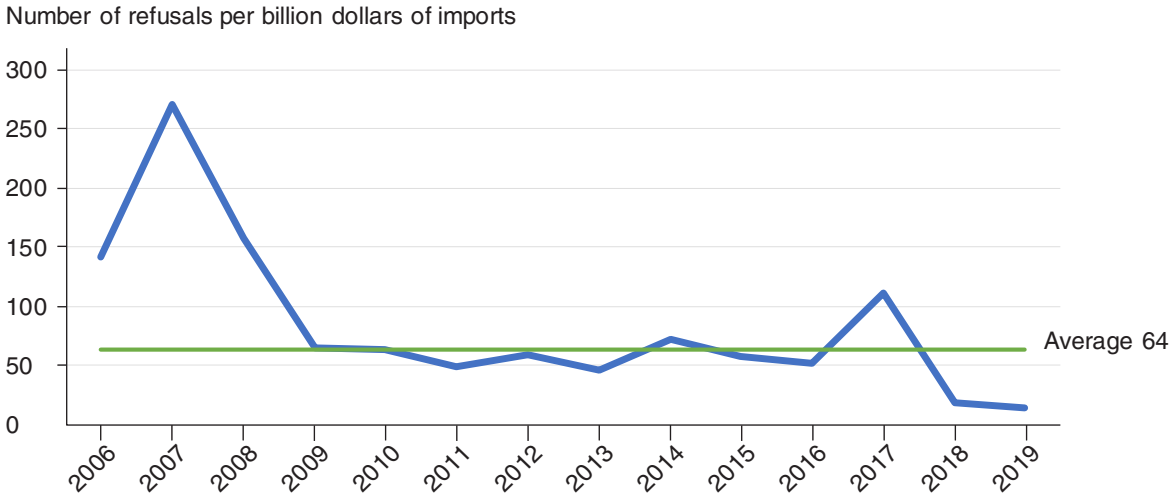
The lack of trend in food import refusals, in conjunction with the strong exponential trend in food imports, indicates that refusals did not increase in proportion to the value of imports. In studies of U.S. FDA food import refusals, Buzby and Roberts (2011) and Bovay (2016) also found that refusals did not keep pace with growth in food imports. An analysis of the EU's RASFF system by Bánáti and Klaus (2010) found the number of notifications plateaued in 2005, and the European Commission (2019) reported no trend in the number of European import rejections during 2012-18.

Refusal rates for imported food were calculated by scaling the annual number of China's refusals by the deflated value of food imports. The refusal rate generally declined over time, but the data did not display a clear declining trend (figure 3). The average refusal rate during 2006-19 was 64 refusals per billion dollars of imports, but the rate during the first three years (2006-08) was more than twice the average, and the rate during the final two years of the period (2018-19) was less than a third of the average. Peaks are evident in 2007 (271 per billion dollars) and 2017 (111 per billion dollars), but no trend in refusal rate is apparent during 2009-16. The peak in number of refusals during 2006-08 shown in figure 2 is magnified when the refusal rate is calculated, since food imports grew rapidly over time. The peak refusal rate of 111 per billion dollars during 2017 is less than half the 2007 peak, despite the clear peak in absolute number of refusals during 2017, since the value of imports rose rapidly from 2007 to 2017. It is also evident that the refusal rate fell to much lower levels of 19 per billion dollars during 2018 and 15 per billion dollars during 2019, far less than the 2009-19 average of 64 per billion dollars.

In view of China's rapid growth in imports and changes in the regulatory regime, the analysis below will exclude data from earlier years and focus on more recent data from 2013-19. This period follows the introduction of AQSIQ decrees 145 and 146 issued in 2011-12. It also includes 2013-16 when the refusal rate was relatively stable, the peak in refusals during 2017, and the low refusals during 2018-19.

[10]A linear trend fit the undeflated data, but residuals displayed a cyclical pattern that seemed to correspond to cycles in food prices. Both the undeflated and deflated data indicate that the trend accelerated during 2017-19.

Figure 3
China's import refusal rate for food from all countries and regions, 2006-19



Note: Refusal rate is ratio of import refusals to food import value in constant 2016 dollars.

Source: USDA, Economic Research Service calculations using data from China's General Administration of Quality Supervision, Inspection and Quarantine and General Administration of Customs.

Countries and Regions with the Most Shipments Refused

During 2013-19, China refused shipments from 104 countries and regions (additionally, there were 10 refusals from "China" and 3 from "ocean fishing"). Table 4 lists 22 countries and regions that supplied at least $500 million of China's food imports per year. The 27 EU countries, when counted as a single region, were the largest suppliers of China's food imports ($11.6 billion per year) and had 740 shipments refused per year. The EU refusal rate of 64 shipments per billion dollars was higher than the 47 shipments per billion dollars average during 2013-19. The United States was the third-leading supplier of China's food imports ($4.9 billion) and the fourth-leading supplier of refused shipments (207 per year).[11] The refusal rate for U.S. food during 2013-19 averaged 42 per billion dollars. The U.S. rate was slightly lower than the overall average. This rate is consistent with data for 2006-19 reported in table 1 showing the share of refusals of U.S. food was slightly lower than the share of China's food imports that came from the United States.

Refusal rates for most other leading suppliers of China's food imports were less than the overall average. New Zealand was the second-leading supplier of food imports ($11.6 billion per year), but the refusal rate for New Zealand food (9 per billion dollars) was much lower than the average. Among countries supplying more than $1 billion in food imports, most had refusal rates less than half the average: Russia (20 per billion dollars), Canada (12 per billion dollars), Indonesia, Brazil, and Argentina (14 per billion dollars), and Chile (9 per billion dollars). Several neighboring Asian countries and regions had refusal rates that far exceeded the average: Taiwan (605 per billion dollars), Japan (369 per billion dollars), and South Korea (194 per billion dollars). Hong Kong (773 per billion dollars) is not shown in table 4, but its rate was the highest of any country or region.

[11]Readers may be surprised to find that China's food imports from the European Union and New Zealand exceed imports from the United States and Brazil. The definition of food here excludes soybeans, feed grains, cotton, animal hides, and raw sugar that are large-value agricultural items that China imports from the United States and Brazil.

Taiwan, Hong Kong, South Korea, and Japan together accounted for 35 percent of refused imports and just 4 percent of China's food imports. Food imported to China from Hong Kong is largely transshipped through the territory or processed/packaged there before being shipped to China or purchased in Hong Kong by visitors or agents from China. The inspection of China's refusals of food shipments from Hong Kong revealed some anomalies. Most of the refusals of food from Hong Kong listed manufacturers based outside of the territory in countries worldwide. Sixty percent of the refusals of Hong Kong food were reported in 2016, suggesting that China conducted a campaign focused on products from Hong Kong that year. Other nearby Asian countries, Malaysia (39 per billion dollars), Vietnam (36 per billion dollars), and Thailand (28 per billion dollars) had refusal rates higher than most other top food import suppliers but less than the overall average (and less than the EU and U.S. refusal rates). Countries that were not among the top suppliers of food imports, with refusal rates above the average, included Switzerland (92 per billion dollars), Turkey (237 per billion dollars), Mongolia (64 per billion dollars), and Kazakhstan (108 per billion dollars).

High refusal rates for EU and U.S. food were unexpected, since many Chinese consumers view foods from these regions as having superior quality and safety (Kendall et al., 2018). This pattern also contrasts with earlier studies of U.S. and EU refusals that found a preponderance of refusals from lower-middle income countries—including China itself. Analysis later in this report will explore how the mix of products imported from different countries and regions affects their refusal rates.

Table 4
Food import refusals and import value from leading supplier countries/regions, 2013-19

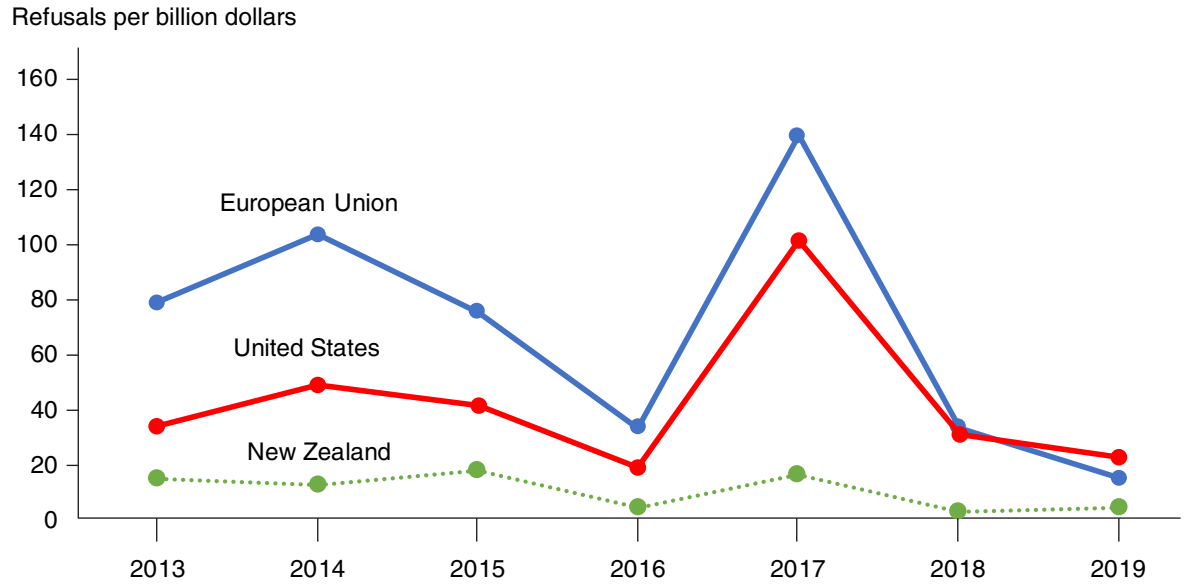
Region	Refusals per year Number	Food imports per year Million dollars	Refusal rate Number per billion dollars
All countries/regions	2,920	62,567	47
European Union	740	11,603	64
New Zealand	55	5,873	9
United States	207	4,917	42
Canada	57	4,527	12
Indonesia	60	4,279	14
Australia	111	3,895	28
Thailand	102	3,550	29
Malaysia	109	2,807	39
Brazil	34	2,449	14
Vietnam	85	2,389	36
Chile	12	2,055	6
Russia	39	2,000	20
Argentina	18	1,332	14
India	15	927	16
Philippines	12	766	16
Taiwan	456	755	605
South Korea	145	750	194
Uruguay	4	729	6
Ukraine	10	650	15
Japan	229	622	369
Ecuador	6	617	10
Norway	10	527	18

Note: Table shows countries and regions that supplied at least $500 million of China's food imports per year during 2013-19. Eighty-four other countries and regions not shown also had food shipments refused.

Source: USDA, Economic Research Service calculations using data from China's General Administration of Quality Supervision, Inspection, and Quarantine and General Administration of Customs.

Figure 4 shows that refusal rates for the top three food import suppliers—the EU, United States, and New Zealand—displayed similar year-to-year fluctuations. EU and U.S. refusal rates peaked in 2014 and 2017, and all three had low rates during 2016 and 2018-19. The New Zealand refusal rate was consistently lower than the EU and U.S. refusal rates from 2013-19. The EU refusal rate clearly exceeded the U.S. refusal rate during 2013-17, but the EU and U.S. rates were nearly the same in 2018, and the EU rate (15 per billion dollars) fell below the U.S. rate (22 per billion dollars) in 2019. The reported refusals of U.S. foods do not display an obvious increase after the United States and China began to assess retaliatory tariffs on one another's products in April 2018, but the drop in refusals for foods from all countries in 2018 makes it difficult to evaluate the level of refusals that year (see box, China's refusals of U.S. foods during 2018-19).

Figure 4
China import refusal rates for top three food import suppliers, 2013-19



Note: Refusal rate is the ratio of import refusals to food import value in constant 2016 dollars.

Source: USDA, Economic Research Service calculations using data from China's General Administration of Quality Supervision, Inspection and Quarantine and General Administration of Customs.

China's refusals of U.S. foods during 2018-19

The United States and China assessed punitive tariffs on one another's products beginning in April 2018. News media reported that China's customs inspectors also scrutinized U.S. food imports more closely after tariffs were put in place (Reuters, 2018). ERS examined the import refusal data to determine whether customs officials refused U.S. food imports at a higher rate during this period.

Establishing a benchmark to evaluate refusal rates after April 2018 is difficult, since refusal rates were unusually high during the previous year (2017), and a sharp decline in refusals of foods from all countries and regions—including the United States—is evident in 2018. Moreover, monthly data show U.S. refusals fluctuated from month to month during 2018-19 (figure 5). Fewer than 10 refusals of U.S. food were reported for 18 of 24 months during 2018-19, but 30 or more refusals were reported for five months. Refusals of EU food (not subject to punitive tariffs) were less variable and appear to have declined during 2018-19 (also shown in figure 5).

Table 5 compares the number of refusals and refusal rates for two periods:

- Years before the punitive tariffs: 2013-16
- The 12 months following the initiation of punitive tariffs: May 2018-April 2019

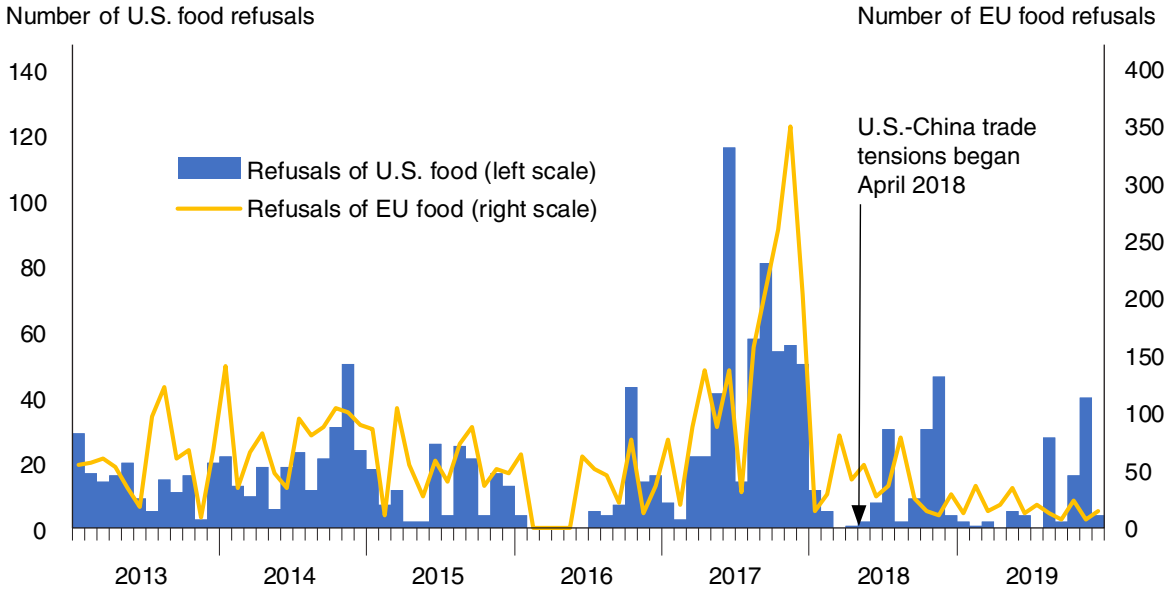
The table excludes data from 2017 when refusals were unusually high for both U.S. and EU food, apparently due to an intensive campaign by Chinese customs officials to screen imported food shipments during that year. Table 4 shows the number of refusals from both the United States and the European Union during May 2018-April 2019 was lower than during 2013-16. However, the number of EU refusals fell more dramatically (from 684 per year during 2013-16 to 369 during May 2018-April 2019) than the decline in U.S. refusals (from 167 to 136 per year during the same periods).

Note that these averages are lower than the U.S. and EU averages shown in table 4 because they exclude data from 2017.

China's imports of food from the United States declined slightly from an annual average of $4.1 billion during 2013-16 to $4.0 billion during May 2018-April 2019. However, food imports from the EU increased from $8.5 billion annually to $13.6 billion during the same period. Thus, the refusal rate for EU food fell much faster than the refusal rate for U.S. food. The EU rate fell below the U.S. refusal rate as observed in figure 4. The refusal rate for U.S. food fell marginally from 41 per billion dollars in 2013-16 to 34 per billion dollars in May 2018-April 2019, while the refusal rate for EU food fell from 80 per billion dollars to 27 per billion dollars.

Thus, while no clear increase in the refusal rate of U.S. food was evident after China assessed punitive tariffs on U.S. food in 2018, the U.S. rate did not follow the general decline in refusal rates during 2018-19 observed in figure 3. Refusals of U.S. food did not fall as sharply as refusals of food from the European Union. The U.S. refusal rate of 34 per billion dollars during the 12 months after the punitive tariffs were assessed (reflecting broader trade tensions) exceeded the refusal rate for EU food and exceeded the average for all countries and regions during 2018 (30 per billion dollars) and 2019 (22 per billion dollars) shown in figure 3.

Figure 5
China's refusals of food imports from United States and European Union, monthly 2013-19



Source: USDA, Economic Research Service calculations using data from China's General Administration of Quality Supervision, Inspection and Quarantine, and General Administration of Customs.

Table 5
China's average annual refusals of U.S. and EU food, 2013-16 and 2018-19

Time period	United States	European Union
	Refusals (number)	
Average 2013-16	167	684
May 2018- April 2019	136	369
	Refusal rate (number per billion dollars)	
Average 2013-16	41	80
May 2018- April 2019	34	27

Note: Annual averages for 2013-16 and 12-months after U.S. and China assessed punitive tariffs in April 2018. Data for 2017 was excluded because refusals were unusually high. Food import data was deflated with the IMF primary commodity index for food. Refusal rate is ratio of refusals to food imports.

Source: USDA, Economic Research Service calculations using data from China customs.

The refusals of U.S. food products during 2018-19 included more than 98 metric tons of meat and seafood—plus a variety of consumer-ready foods, beverages, and food ingredients—such as 47.6 metric tons of cake mixes (table 6). Anecdotal reports indicated that Chinese authorities targeted U.S. pork for closer inspections. Meat and seafood accounted for the largest volume of refusals, with only two U.S. pork shipments cited for lack of documentation and a noncompliant label. China rejected 13 shipments of beef from a single U.S. supplier (totaling more than 16 metric tons) for documentation issues. China also rejected several U.S. seafood shipments for lack of documents and failure to complete inspection procedures.

The diverse mix of U.S. products refused during 2018-19 and their violations are shown in table 6 Twenty-two shipments of meat and seafood comprised the largest volume of refusals. Other U.S. refusals included mostly processed and consumer-ready foods—including 70 shipments of food for infants and 39 shipments of protein drinks and powders. China refused soft drinks and several beverages made from mushrooms, bird's nest, and watermelon for high bacteria counts, labeling issues, and additives. The refusals included multiple batches from the same U.S. companies. In August 2019, 28 shipments of candy, cake mixes, and granulated sugar produced by the same U.S. firm, were rejected for being past their expiration date. In November 2019, China refused 26 shipments of beer from the same U.S. company for degradation/filth. In July 2018, it refused two shipments of wine from another supplier for documentation issues.

Table 6
China's refusals of U.S. food products, 2018-19

Products refused	Shipments refused	Volume of shipments refused	Types of violations cited
	Number	Kilograms	
Meat, seafood	22	98,115	Documentation, labeling, expiration
Flour, cake mix	14	47,634	Expiration date, additives
Protein drinks and mixes	39	32,058	Bacteria, labeling, additives, documentation
Dried fruit	2	28,227	Labeling, documentation
Fruit flavored syrup	10	10,268	Labeling
Candy, granulated sugar	21	15,670	Expiration date, physical inspection
Beer and wine	28	6,588	Filth, documentation
Nonalcoholic beverages	10	5,338	Bacteria, labeling, additives
Breads, cookies, cereals, noodles	22	5,976	Documentation, labeling, additives, spoilage, bacteria count, acidity
Food for infants	70	3,377	Documentation, vitamin E, labeling
Cheese, butter	5	816	Documentation, moisture, additives
Yeast	1	800	Documentation
Seaweed	1	780	Inspection procedures
Salad dressing	1	400	Additives
Nuts	1	372	Labeling, documentation
Energy bars	1	216	Labeling
Canned food	2	155	Documentation
Chocolate	2	72	Labeling, additives
Grilled peppers	2	14	Expiration date

Source: USDA, Economic Research Service calculations using data from China's General Administration of Customs refusals of U.S. shipments, 2018-19.

Import refusals by product category

China's refusals of products from all countries and regions for 2013-19 were tabulated by product category to illustrate the mix of products refused. Product categories were formed using the HS codes that are widely used to classify products in tariff schedules and foreign trade statistics. Table 7 shows the average number of refusals per year for broad 2-digit HS categories and selected subcategories. The tabular analysis separates dairy products and honey (within product code HS 04) and sugar and confections (within HS 17). It displays rice separately since that category accounted for nearly all refusals in HS 10 (grains). The table shows components of HS 19 and HS 22, diverse categories that had large numbers of refusals.[12] Table 7 also shows the aggregate weight of shipments refused in each category.

[12]The table omits some categories with just a few refusals, such as seaweed (HS 1212), sorghum (HS 1007), buckwheat (HS 1008), sausage casings (HS 0504), inedible animal and vegetable products (HS 05, 06, and 14), and salt (HS 25).

Table 7 shows that refusals were concentrated among five categories that accounted for 65 percent of refusals during 2013-19:[13]

- Cereals, breads, pastries, snacks, and baking products (HS 1904-1905) [Examples: crackers, cakes, pita, breakfast foods, potato chips, cheese puffs, red bean porridge]
- Water, sweetened beverages, and alcohol (HS 2201-2208) [Examples: mineral water, soft drinks, soybean milk, flavored milk, wine, beer, liquor]
- Miscellaneous food preparations (HS 21) [Examples: flavored drink mix, soup mix, mint-flavor syrup, ice cream, fried tofu, nutritional supplements]
- Products of fruit, nuts, and vegetables (HS 20) [Examples: canned vegetables and fruit, fruit juice, snacks made from nuts and seaweed, roasted peppers, dried fruit]
- Dairy products (HS 0401-0406) [Examples: powdered milk, yogurt, cheese, powdered whey]

Two refusal rates were calculated:

- Number of refusals per billion dollars of imports in the category.
- Ratio of the volume of refusals to the volume of imports (both in kilograms), expressed as a percentage. Import data for beverages were reported in liters and most refusals were reported in kilograms, so refusal rates for HS 22 are in kilograms per liter.

Table 7 shows that refusal rates varied widely across product categories. Several categories had refusal rates that far exceeded the overall average of 47 per billion dollars for 2013-19, reported earlier in table 4, but nearly all refusal rates by volume were less than 0.5 percent of import volume. Honey had the highest refusal rate by dollar value (753 per billion dollars), and its high volume-based refusal rate also stood out as the only rate exceeding 1 percent (see box: "China's high refusal rate for imported honey"). Other categories with refusal rates of 500-600 per billion dollars included confections; cereals, breads, and other baking products; pasta and noodles; and sweetened beverages and water. Other categories with refusal rates above 100 per billion dollars included tea, coffee, and spices; prepared meat; chocolate; food preparations; and alcoholic beverages. Volume-based refusal rates were in the range of 0.13 to 0.18 percent for these categories. After honey, sweetened beverages had the second-highest volume-based refusal rate (0.41 percent).

Refusal rates were lower for items with a lower degree of processing that China imports in large volumes. Rates were below the average for meats, fish and shellfish, edible oils, vegetables, and fruit and nuts. Refusal rates by volume were lowest for starch, sugar, and fruit and nuts—all were less than 0.01 percent of import volume. The combined volume of edible oil refusals was 9,142 metric tons, more than any other category, but this was only 0.08 percent of the volume imported. The volume of meat, fish, and shellfish refusals averaged more than 1,000 metric tons, but these were less than 0.05 percent of import volume.

[13] Inspection of the refusals revealed that some products were classified in multiple categories. For example, powdered milk for infants was most often classified in "processed grain and milk" (HS 190110), but some refused shipments described as infant formula were classified as a dairy product (HS 0402). Flavored milk was classified in beverages and dairy products. Soybean milk was classified in both HS 21 and HS 22. Products were classified according to their HS codes without adjustment.

Refusals of dairy products (30 per billion dollars) were below the average rate. Dairy refusals of 0.018 percent of import volume were less than the volume-based refusal rates for meat (.033 percent) and fish (.046 percent). Refusals of infant food (20 per billion dollars, a category that also includes infant formula) were also below the average and much lower than rates for other types of processed food categories. The low rates for dairy foods may reflect the high degree of attention given to regulating the safety of both imported and domestic dairy products following China's infant formula adulteration incident in 2008 and adoption of regulations implementing the 2009 and 2015 food safety laws (as described earlier in this report).

Table 7
China's refusals of imported food, by category, 2013-19

HS codes	Category description	Annual average		Refusal rate		Average annual imports
		Refusals	Volume			
		Number	Metric tons (1000 KG)	(1) Refusals per $bil	(2) Percent of import volume	Billion dollars
02	Meats	107	1,238	11	0.033	9.74
03	Fish and shellfish	105	1,404	12	0.046	8.70
0401-0406	Dairy	148	370	30	0.018	4.89
0409	Honey	53	70	753	1.305	0.07
07	Vegetables	17	212	26	0.014	4.55
08	Fruit, nuts	35	334	5	0.007	6.83
09	Tea, coffee, spices	99	243	167	0.157	0.59
1006	Rice	6	731	4	0.026	1.43
11	Starch	14	126	13	0.006	1.01
12	Oilseeds	20	1,879	9	0.042	2.26
15	Edible oils	36	9,142	4	0.083	8.81
16	Prepared meat and fish	55	118	203	0.146	0.27
1701-1702	Sugar	11	127	7	0.008	1.54
1704	Confections	120	34	639	0.066	0.19
18	Chocolate, cocoa	104	288	135	0.161	0.77
190110	Infant food	51	48	16	0.020	3.28
1902	Pasta, noodles	91	105	506	0.135	0.18
1904-1905	Cereals, breads, pastries, cookies, baking products	562	327	667	0.178	0.84
20	Prods. of fruit, nuts, vegetables	246	432	237	0.087	1.04
21	Food preparations	478	280	209	0.090	2.28
2201	Water	37	281	509	0.077	0.07
2202	Sweetened beverages	206	1,239	522	0.410	0.40
2203-2208	Alcoholic beverages	232	392	103	0.024	2.24

Source: USDA, Economic Research Service analysis of data from China's General Administration for Quality, Safety, Inspection and Quarantine and General Administration of Customs.

The categories with the highest refusal rates and the largest number of refusals are mainly composed of processed, packaged, and consumer-ready items—while bulk items with a lower degree of

processing had the lowest refusal rates. Prepared meat and fish had a higher refusal rate than less-processed meat and fish, and confections and chocolate had refusal rates that were much higher than the refusal rate for minimally processed sugar. Pasta and noodles and baking products had high refusal rates, while rice had the lowest refusal rate per billion dollars of imports. The predominance of processed food products among China's refusals contrasts with studies of U.S. import refusals that found seafood, fresh produce, and spices and flavorings were most common among refused products (Buzby et al., 2008; Buzby and Roberts, 2011; Gale and Buzby, 2009; Bovay, 2016). The frequency of China's processed food refusals parallels Jongwanich's (2009) concern that processed food products encountered trade barriers when attempting to access markets.

China's high refusal rate for imported honey

On one hand, China's high refusal rate for honey seems consistent with the prevalence of problems with imported honey reported by news media and industry studies (Strayer et al., 2014). On the other hand, China's high rate of imported honey rejections is ironic since Chinese honey products have been the focus of many of the concerns about adulteration, mislabeling, and antibiotic residues raised by importers in other countries (Steavenson, 2019).

China's refusals cited the addition of sugar and unspecified adulteration in 23 percent of refused honey imports, and antibiotic residues were cited in another 13 percent—consistent with complaints noted in the global honey industry. However, excessive bacteria counts were the most cited violation (28 percent of honey refusals). In domestic food testing, Chinese authorities also acknowledged concern about the country's own honey by targeting honey in domestic markets for increased testing during 2019 (SAMR, 2019). According to SAMR (2020), the rejection rate for Chinese honey in domestic testing increased by 3.2 percentage points to 5.7 percent during 2019, and rejections were attributed to excessive antibiotic residues and microbial contamination. (This rejection rate is higher than the rate calculated by the USDA, Economic Research Service from publicly posted testing results (See box, "Noncompliant foods in China's domestic markets").

Customs data show China's honey imports averaged just 5,400 metric tons per year during 2013-19, while its exports averaged 129,000 metric tons. Four countries/regions (New Zealand, European Union, Australia, and Thailand) accounted for 68 percent of China's honey imports also accounted for 61 percent of China's refused honey imports during 2013-19. Hong Kong accounted for 12 percent of honey import refusals. Many of the manufacturers named for "Hong Kong" refusals appeared to be based in countries outside the territory, nearly all occurred during one year (2016), and most were refused at Chinese ports far from Hong Kong (such as Xinjiang, Inner Mongolia, and Shandong). The United States, Canada, Russia, and Kyrgyzstan each had an average of 2-3 honey refusals per year, and 14 other countries had 2 or fewer per year during 2013-20. All but two of the refusals of U.S. honey cited excessive bacterial counts. China reported no refusals of U.S. honey during 2018-19.

Noncompliant foods in China's domestic markets

Domestic food testing results reported by China's State Administration of Market Regulation (SAMR) provide perspective on the prevalence of problems discovered in imported food (see appendix A). No details about the sampling and testing have been published. The rejection rates are not comparable to the refusal rates for imported foods calculated in this report. However, the results indicate the types of problems detected in domestic food.

A Chinese government official said domestic food testing results showed steady progress, but the official also acknowledged that problems persisted due to the large number of producers and consumers, the emergence of new e-commerce platforms, and illegal actions by some producers (SAMR, 2020). Chinese authorities rejected 2.3 percent of food samples from domestic markets tested in 2019 (table 8). Noncompliance was highest in food service establishments (5.7 percent), while fresh produce in agricultural markets (1.9 percent) had a much lower noncompliance rate. SAMR (2020) reported the noncompliance rate for e-commerce was 3.2 percent, but it rose 1.2 percentage points from 2018.

The high noncompliance rates for domestic vegetable products, starch, fruit, and nuts shown in table 7 contrast with low rates for imported foods in these categories reported in table 6. The low noncompliance rate for infant formula is consistent with the low refusal rate for imported infant formula. Noncompliance rates for meat and fish were less than 1 percentage point below the average, but the refusal rates for imported meat and fish were less than the average for imported food. Noncompliance rates for domestic grain products, snack foods, cookies, frozen food, tea, chocolate, and coffee were below average, in contrast to above-average refusal rates for similar categories of imported food.

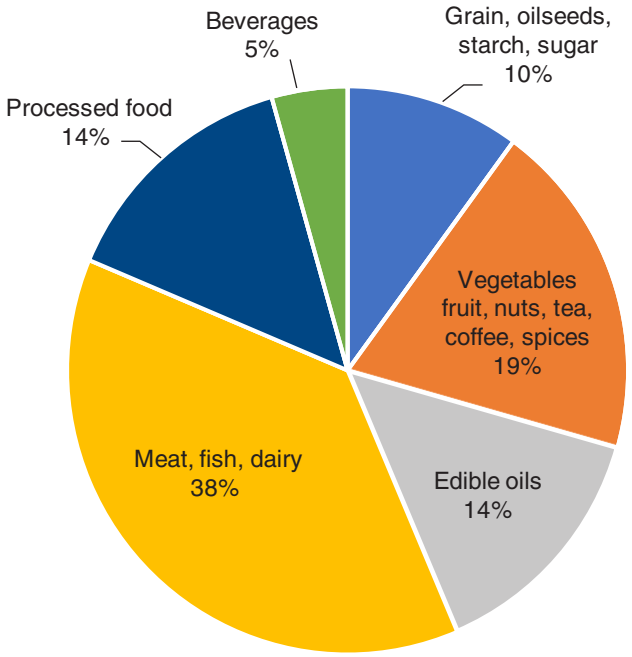
Table 8
Testing results for foods in Chinese domestic markets, 2019

Category	Noncompliant	Category	Noncompliant
	Percent		Percent
Total, all products	2.26		
Food service	5.65	Snack foods	1.27
Vegetable products	5.16	Grain products	0.99
Instant foods	4.19	Cookies	0.97
Starch	3.16	Flavorings	0.91
Fruit products	3.15	Special meals	0.89
Roasted food and nuts	2.95	Candy	0.82
Frozen beverages	2.69	Tea	0.78
Alcohol	2.54	Frozen food	0.59
Honey	2.15	Health food	0.50
Cakes	2.04	Canned food	0.50
Beverages	1.94	Salt	0.36
Fresh produce in markets	1.90	Eggs	0.35
Fish and shellfish prods.	1.86	Food additives	0.35
Bean products	1.51	Cocoa and coffee	0.33
Meats	1.49	Dairy	0.24
Fats and oils	1.38	Infant formula	0.21
Sugar	1.34	Food for medical use	0.00

Source: USDA, Economic Research Service compilation from China's Food and Drug Administration and State Administration of Market Regulation quarterly testing reports.

Products with a low degree of processing that tend to have low refusal rates make up a large proportion of China's food imports, a pattern that lowers the overall refusal rate. Figure 6 shows that meat, fish, and dairy accounted for 38 percent of China's food import value during 2013-19, more than twice these products' share of import refusals (15 percent) shown in figure 7.[14] Fats and oils accounted for 14 percent of imports, but only 1 percent of refusals. Other products with minimal processing—grains, oilseeds, sugar, starch, vegetables, fruits, nuts, tea, and spices—also had shares of import value that far exceeded their share of refusals. In contrast, processed food and beverages (the categories with the highest refusal rates) accounted for 77 percent of China's import refusals—but these categories accounted for only 19 percent of the value of food imports.

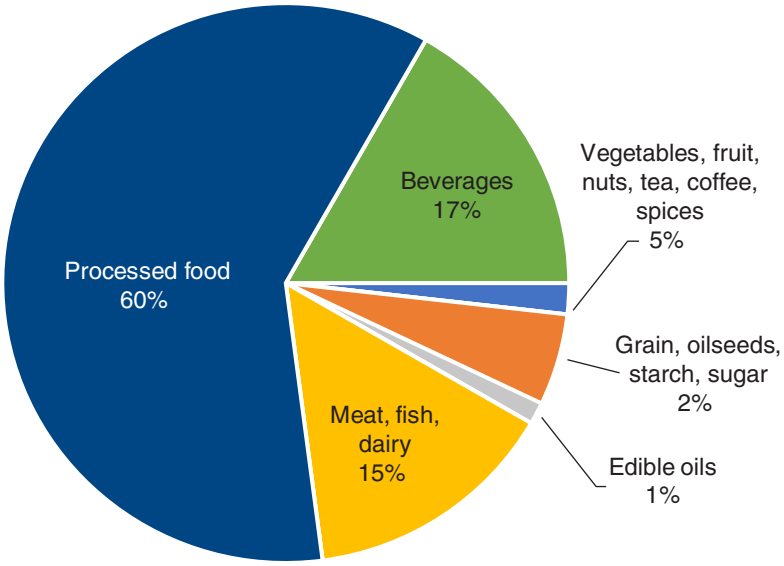
Figure 6
Product shares of China's food imports, 2013-19



Source: USDA, Economic Research Service analysis of customs data from table 3.

[14]Honey, the product with the highest refusal rate, is included in meat, fish, and dairy because the Harmonized System groups honey with dairy under HS chapter 04. However, honey's share of imports is negligible.

Figure 7
Product shares of China's refused imports, 2013-19



Source: USDA, Economic Research Service analysis of food import refusals from table 3.

The varying mix of food products imported by China from different countries may influence the refusal rates by country or region shown in table 4. For example, processed foods and beverages compose 57 percent of China's food imports from the European Union, 26 percent of imports from the United States, 13 percent of imports from New Zealand, 8 percent of imports from Indonesia, and just 2 percent of imports from Canada. Thus, the high EU refusal rate shown in table 4 may reflect a predominance of products that are refused at high rates. Conversely, Indonesia's low refusal rate may reflect the predominance of products that tend to have low refusal rates.

ERS investigated the role of product mix by calculating an "expected" refusal rate, using average product-category refusal rates from all countries or regions (shown in table 4 and each country's product mix. This analysis assumes that China has similar refusal rates for product categories for each country, so the mix of products imported from a country or region may influence the overall refusal rate expected for that country or region.

The expected number of refusals for country/region k, ER_k, is:

$$ER_k = \sum_{j=1}^{N} r_j \times M_{jk}$$

Where r_j is the average refusal rate for product category j (assumed to be the same for each country/region), M_{jk} is the value of China's imports of product j from country/region k, and N is the number of product categories. The expected refusal rate for country/region k (number per billion dollars of imports) is the ratio of expected refusals to total food imports from country/region k:

$$e_k = ER_k / \sum_j M_{jk}$$

Table 9 shows the expected and actual refusal rates for the top countries or regions supplying China's food imports. The expected EU refusal rate (85 per billion dollars) exceeded the expected rate for the United States (59 per billion dollars), New Zealand (43 per billion dollars), and most other

countries/region—due to the high proportion of processed food products and beverages in China's imports from the European Union. South Korea, Taiwan, and Japan had the highest expected rates. Expected refusal rates for Canada, Indonesia, Russia, Argentina, Uruguay, Ukraine, Ecuador, and Norway were low, reflecting the predominance of items with low refusal rates in the product mix China imports from these countries.

China's actual refusal rate for EU foods was less than the expected rate. While table 4 indicated that EU food was refused at a rate higher than the average, that high rate reflected the mix of foods imported from the European Union. Given the mix of products imported from the European Union, China refused its food imports at a lower rate than would be expected. It also refused U.S. food at a rate lower than expected, based on its product mix. Food from New Zealand, Australia, Chile, and India had low actual refusal rates compared with their expected rates.

This analysis confirms that Taiwan, South Korea, and Japan have unusually high refusal rates. The expected refusal rates for these countries/regions are the highest ones shown in table 9, reflecting the predominance of products with high refusal rates. However, the product mix of imports from these countries/regions only explains part of their high actual refusal rates. Taiwan (a difference of 600), Japan (a difference of 273), and South Korea (a difference of 60) have—by far—the largest positive difference between actual and expected refusal rates. These unusually high rates inflate the overall refusal rates. The high rates from neighboring countries or regions might reflect the interception of foods carried by travelers, tensions over food safety, or food fraud.

Table 9
Expected import refusal rates based on China's mix of food imports from top 20 supplying countries/regions, 2013-19

Country/region	"Expected" refusal rate	Actual refusal rate	Actual - expected
		Number per billion dollars	
European Union	85	64	-21
New Zealand	43	9	-34
United States	59	42	-17
Canada	14	12	-2
Indonesia	18	14	-4
Australia	53	28	-25
Thailand	30	29	-1
Malaysia	36	39	3
Brazil	22	14	-8
Vietnam	32	36	4
Chile	21	6	-15
Russia	14	20	6
Argentina	12	14	2
India	32	16	-16
Philippines	21	16	-5
Taiwan	106	605	499
South Korea	134	194	60
Uruguay	12	6	-6
Ukraine	8	15	7
Japan	96	369	273
Ecuador	14	10	-4
Norway	13	18	5

Note: "Expected" refusals were calculated by multiplying the value of China's imports for each product category by average refusal rate for the category and calculating the sum. Countries and regions that supplied at least $500 million per year of China's food imports from 2013-19 are displayed.

Source: USDA, Economic Research Service calculations using data from table 7.

Violations reported for import refusals

Like studies of U.S. FDA import refusals (Buzby et al., 2008; Bovay, 2016), this study profiles the regulatory violations cited for refusals. China's import refusals cited hundreds of regulatory violations that included presence of pathogens or filth, improper chemical composition, contaminants, failure to comply with requirements for documentation, labeling and packaging, and expired products. ERS compiled a list of 22,673 violations reported by China's import refusal reports during 2013-19.[15] ERS classified the violations into seven broad categories, based on the frequency of their appearance and differing types of food safety risks and challenges for exporters:

[15]By comparison, this number of violations far exceeds the 208 "violation code translations" listed on U.S. FDA's web site.

- Labels and packaging do not comply with Chinese law or regulations.
- Documentation and registrations were not supplied or inconsistent.
- Food was past expiration date or had no expiration date.
- Additives and chemical compounds not allowed or were in excess of tolerances.
- Bacteria, molds, or aflatoxins were detected.
- Degradation, spoilage, odors, or insects.
- Contaminants: meat from unapproved source, rare earth, genetically modified material, other contaminants.

Chinese and U.S. FDA refusals include many similar violations for labeling, plant registration, bacteria counts, chloramphenicol, salmonella, and vibrio chlorae. The Chinese violations cited hundreds of specific chemicals and substances that U.S. FDA refusals often coded as "pesticides" or "veterinary drug residues." About 5 percent of China's refusals cited two or more violations. ERS counted each violation separately, so the number of violations exceeds the number of refused shipments reported earlier in this report.[16]

The chemical composition of products accounted for the largest share of violations (27 percent) (table 10). This category included hundreds of additives, dyes, chemical compounds, heavy metals, and improper levels of vitamins, acidity, protein, calcium, iron, zinc, and oxygen reported each year. Disallowed or excessive residues of pesticide and veterinary drugs are included in this category. Some violations specified substances detected through testing, while others listed "in excess" or did not comply with standards. Many violations did not specify whether contaminants were discovered through testing or physical examination.

[16]For 2013-19, ERS counted 22,673 violations for 20,438 shipments, a ratio of 1.11 violations per shipment. By comparison, Bovay's (2016) analysis of U.S. FDA refusals reported a higher ratio of 1.6 violations per refused shipment.

Table 10.
Categories of violations reported for China's refusals of food imports from all countries and regions, 2013-19

Violation category	Examples of violations	Violations, 2013-19	Share of violations
		Number	Percent
Additives and chemical composition	Excessive use of additives or dyes Improper levels of protein, acidity, calcium, iron, zinc, vitamins, benzoic acid, heavy metals, pesticides, or veterinary drugs	6,226	27
Labels and packaging	Label not compliant No Chinese label Packaging not compliant	4,487	20
Documents, registrations	Documents missing or incorrect Exporter not registered or certified Product not inspected Region not approved for export to China	4,359	19
Past expiration date	Use by date or shelf life exceeded or not provided	2,130	9
Bacteria, mold, aflatoxins	Excessive bacteria count, mold, aflatoxins, pathogens, or yeast	3,185	14
Degradation	Spoilage, bad odor, detection of insects, excessive moisture, failed visual examination, or container damaged	1,633	7
Contaminants	Unapproved meat, rare earth, genetically modified material, or other contaminants	586	3
Total violations		22,673	100

Note: Number of violations exceeds the 20,438 shipments refused during 2013-19, because some shipments reported multiple violations. Sixty-seven proactive recalls by exporters reported in 2017 are not shown.

Source: USDA, Economic Research Service analysis of China's Food and Drug Administration and State Administration of Market Regulation data.

As a supplement to this broad classification, ERS translated 1,884 citations of 250 unique substances cited for 2017 (the year with the largest number of refusals reported) to illustrate the diverse additives and chemical compounds cited for violations (see appendix B, "Complete List of Chemicals and Additives Cited as Violations in 2017"). The citations included hundreds of chemical compounds outside specified tolerances—such as vitamins, iron, zinc, calcium, benzoic acid, and other preservatives; dozens of dyes and additives; peroxide and acidity levels; heavy metals; and rare earths. Improper levels of vitamin E (98 violations) and benzoic acid (48 violations) were the most frequently cited problems among chemicals and additives during 2017. Most substances were only cited a few times, and many were cited only once that year.

Documentation/registration and labeling/packaging violations each accounted for about a fifth of violations shown in table 9. Few reports specified which documents were missing or improper. Some reports said the exporter failed to complete inspection and quarantine procedures or supply a testing report. In this report, shipments refused from regions not approved for export to China are classified as documentation problems. A few refusals specified the shipment lacked a Chinese label, but many

refusal reports indicating "noncompliant label" or "noncompliant packaging" did not specify the problem with the label or package.

Problems with bacteria, mold, pathogens, and toxins emitted by molds accounted for 14 percent of violations. Some reports cited coliform, salmonella, streptococcus bacteria, and viruses of animals and fish—but many did not identify the bacteria, mold, or pathogen. Improper levels of yeast were included in this category. About 7 percent of refusals were the result of obvious degradation of shipments. These were identified as "rotten," "bad smell," "excessive moisture," presence of insects, and rejection after physical examination. Only 2 percent of refusals reported contaminants or adulteration in shipments. Contaminants mentioned include rare earth (mainly in tea leaves), presence of meat from unapproved regions in food shipments, unapproved genetically modified material (there were about 10-20 detections of this type of violation each year), and a few other contaminants such as diesel oil or seeds.

In China's domestic food testing, by comparison, microorganisms and residues of pesticides and veterinary drugs were more commonly cited violations than they were for imported food refusals. Food additives were a commonly cited problem for both imported and domestic food (see box, "Microorganism violations are the most common violation in China's domestic food").

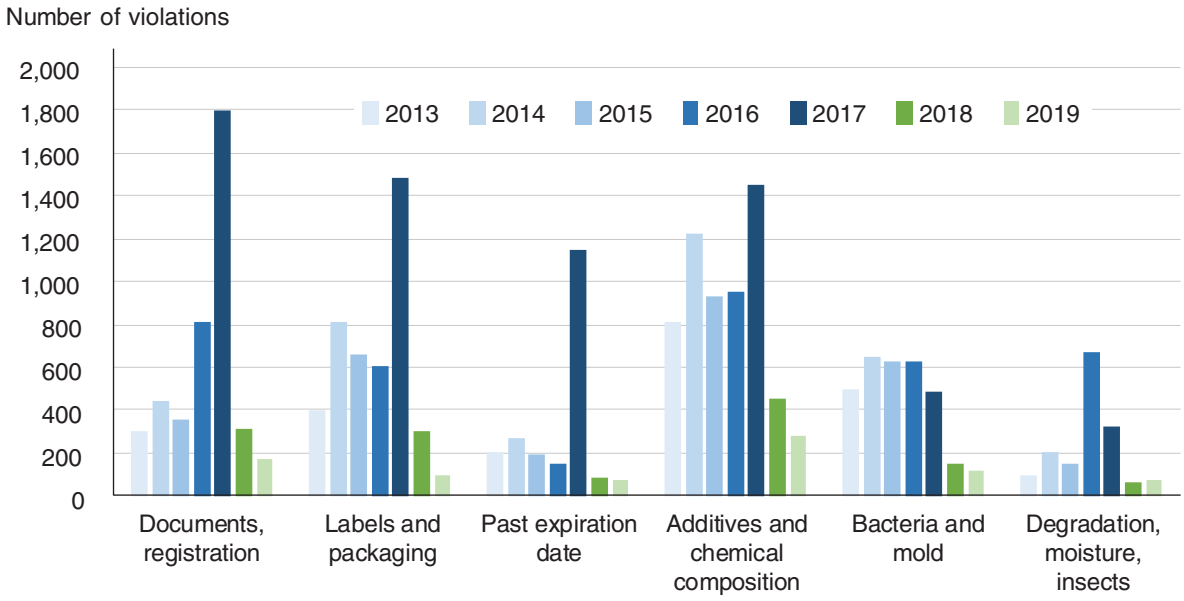
The incidence of different types of violations varied from year to year in a manner that suggests China targeted some violations for scrutiny in certain years. Figure 8 shows the number of violations reported annually from 2013 to 2019 for each of the top five categories identified in table 9. Figure 8 shows that number of violations for documents/registration, labels/packaging, and expiration date during 2017 were more than double their number in other years. The peak in overall refusals during 2017, observed earlier in this report, reflects clear peaks in these three violation categories. The number of violations for additives and chemical composition was elevated in 2017 but not as prominently. The number of violations for degradation peaked in 2016. In contrast, the number of bacteria and mold violations were relatively steady, until it dropped sharply in 2018 and 2019. During 2018 and 2019, the number of additive or chemical violations fell dramatically, and few violations for expiration dates and degradation were reported during those years. The wide year-to-year variation in violations suggests variation in enforcement effort.

China's refusals have a smaller proportion of violations—due to pesticide and veterinary drug residues, microbial pathogens, and filth—than were reported by studies of U.S. import refusals (Buzby et al., 2008; Gale and Buzby, 2009; Buzby and Roberts, 2011; Bovay, 2016).[17] The frequency of problems with documentation and labeling in violations reported by China is consistent with Buzby and Roberts' (2011) finding that imported foods often had problems related to "record-keeping or information transmittal rather than … acute or chronic health hazards."

[17]Only 31 citations of veterinary drugs and feed additives were found in 1,884 additive and chemical violations tabulated from refusals in 2017 (see appendix table B1).

Figure 8

China food import refusals: violations by category, by year, 2013-19



Note: Violations exceed number of refused shipments due to multiple violations in some shipments.

See table 9 for category descriptions. “Contaminants” excluded due to the small number of violations.

Source: USDA, Economic Research Service analysis of China’s food import refusals reported by the General Administration of Quality Supervision, Inspection and Quarantine, and General Administration of Customs.

Microorganisms are the most common violation in China's domestic food

Reports on domestic food testing in China highlighted persistent problems with microorganism contamination and pesticide or veterinary drug residues. Additives and chemical composition that were cited most frequently in imported food refusals were less commonly cited in domestic food testing.

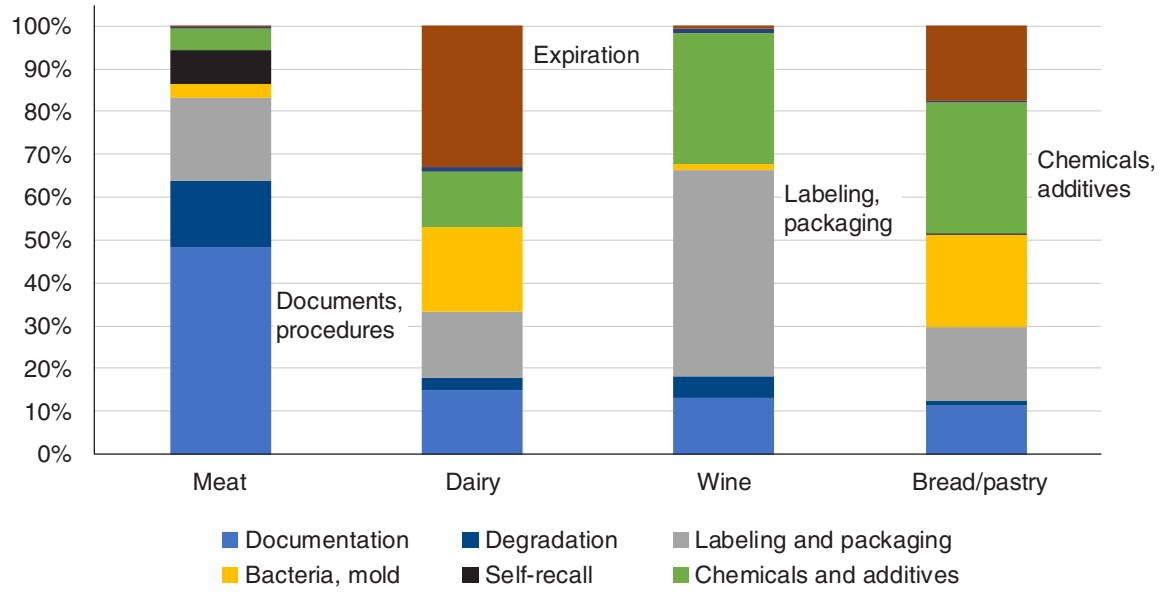
China's State Administration of Market Regulation (SAMR, 2019) plans for testing domestic foods called for all foods to be checked for levels of benzoic acid and sorbic acid—both commonly cited in import refusals. The plans also targeted lead, arsenic, other heavy metals, dyes, nitrates, and nitrites for testing in many foods. Salmonella, bacteria counts, levels of protein, and acidity were also to be checked. Pasteurized milk was to be checked for aflatoxin, dexamethasone (a steroid), melamine, lead, staphylococcus, and salmonella. Pork liver and soybean oil were classified as "high risk." Liver was to be tested for four types of growth-promoting beta agonists and a number of antibiotics. Soybean oil was to be checked for acidity, arsenic, lead, solvent residues, and several chemical compounds.

SAMR (2020) reported contamination with microorganisms was the most-cited violation in testing of foods from China's domestic markets during 2019. Microorganisms accounted for 28 percent of noncompliant tests, twice the share of "bacteria, mold, and aflatoxins" violations for imported foods in table 10.

Residues of pesticides and veterinary drugs accounted for 17 percent of noncompliant domestic products. Xinhua (2019) highlighted a decline in chloramphenicol rejection rates in honey from 1.5 percent to 0.4 percent during 2015-18. Import refusals cited only a few violations related to antibiotics and pesticides, so they were included in the "additives and chemical composition" category and not reported separately.

SAMR reported that excessive food additives accounted for 23 percent of domestic food violations during 2019, slightly less than the 27 percent share of imported food violations for "chemical substances." Failure to conform to standards for vitamins, nutrients, and other substances was a common issue included in "chemical substance" refusals of imported foods—but these problems were not mentioned in reports about domestic food testing. Documentation, labels, packaging, and expiration dates—which together accounted for nearly half of import refusals—were not mentioned in domestic testing results either. The Xinhua (2019) and SAMR (2020) both highlighted the absence of melamine violations in domestic infant formula.

Figure 9
Share of violations by type of product refused from all countries and regions, 2013-19
Number of refusals



Note: Chart shows share of violations for each product category (see table 5 for descriptions). Includes multiple violations for some shipments.

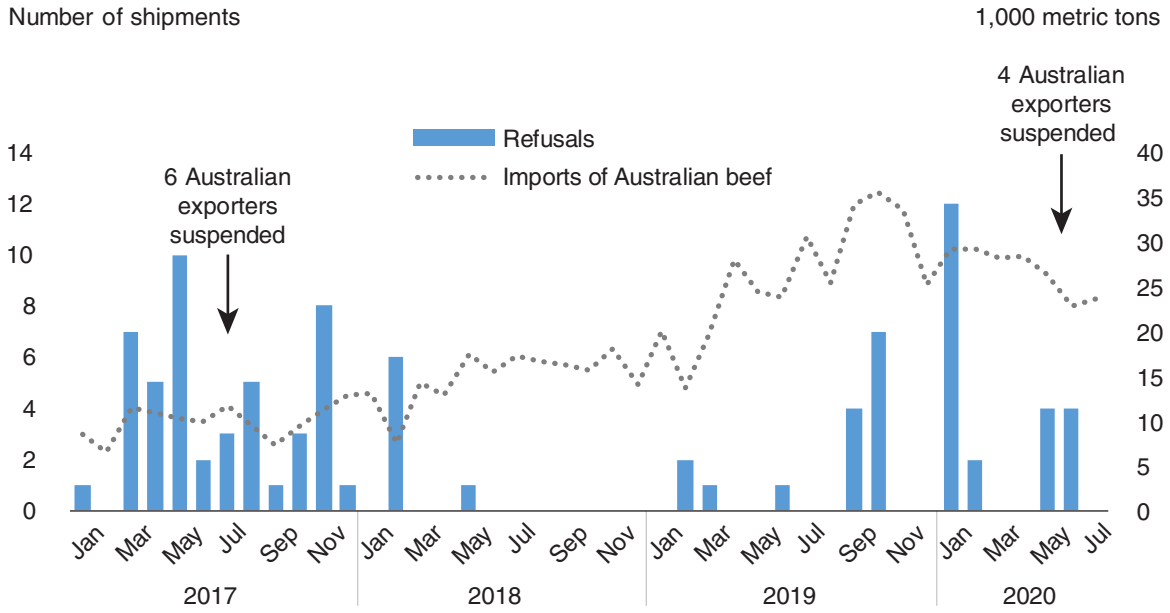
Source: USDA, Economic Research Service analysis of China's food import refusals reported by the General Administration of Quality Supervision, Inspection and Quarantine, and General Administration of Customs.

China's food import suspensions during the 2020 COVID-19 pandemic

During the COVID-19 pandemic in 2020, China's approach to managing risk through suspension of foreign exporters and tighter import inspections attracted scrutiny from some trading partners. This section briefly reviews these events by drawing upon news media accounts and refusals of food imports available through July 2020, when this report was under development. These events illustrate the difficulty of discerning whether import refusals and suspensions of exporters are motivated by genuine food safety concerns or attempts to curb imports. Import data show that refusals coincided with China's rising volumes of meat and seafood imports.

Suspension of beef imports from four Australian suppliers in May 2020 raised concerns that a food safety measure was being used as a trade barrier. Although China's customs authority cited problems with labeling and health certificates, some Australian industry and government officials suspected the ban was announced as retaliation for Australia's call for an investigation of the origin of the COVID-19 virus (Reuters, 2020a). However, there was a history of problems with these suppliers. In July 2017, China suspended six Australian beef suppliers (including units of the same suppliers suspended in 2020) for labeling issues (ABC Rural, 2017). An examination of import refusals showed China rejected 90 shipments of Australian beef from January 2017-June 2020 (figure 10). Of those, it refused 51 shipments from the suppliers suspended in May 2020. China reported refusals in the months before and after both suspensions.

Figure 10
China's refusals of Australian beef, monthly, 2017-20



Source: USDA, Economic Research Service analysis of data from China's General Administration of Quality Supervision, Inspection and Quarantine, and General Administration of Customs.

According to news media accounts, at least one Australian exporter acknowledged shortcomings in its operations and submitted to an audit after taking corrective actions (ABC Rural, 2020). Importers commented that "sloppiness" and imprecise cutting had been common in beef shipped by the suspended Australian suppliers, but importers also praised the quality of the beef (South China Morning Post, 2020). Importers acknowledged the Chinese requirements were difficult to satisfy, noted that the Shanghai port enforced rules more strictly than others, and an Australian industry official commented that Chinese officials' tolerance for conformity to rules varied over time (South China Morning Post, 2020).

China's imports of Australian beef surged in the years after the 2017 refusals. Customs data show China's imports of Australian beef averaged 10,000 metric tons per month during 2017 when 46 shipments were refused (figure 10). During 2018, imports rose to an average of 48,000 metric tons per month when only 7 shipments were refused. The resurgence of refusals during 2019 coincided with a sharp increase in imports of Australian beef to 34,000 metric tons in October. Imports dropped to 23,000 metric tons per month during June and July 2020 after the suspension of 4 Australian suppliers was announced. According to news media, Australian beef suppliers diverted their shipments to markets in the United States and South Korea—countries with high food safety standards—after the Chinese ban (South China Morning Post, 2020b).

During June 2020, Chinese officials raised concerns that the COVID-19 virus could be transmitted through imported meat and seafood. Chinese officials linked an outbreak of COVID-19 in Beijing to a cutting board used for Norwegian salmon in Beijing's Xinfadi wholesale market, although international and Chinese public health authorities said there was no evidence food could transmit the virus. Chinese authorities detected no positive samples after a week of testing frozen meat and seafood—both imported and domestic—in storage units and markets all over China. China Customs Administration (2020) reported finding 42 noncompliant shipments in 68,000 samples of

imported meat, seafood, and other frozen products during June 11-17—but no COVID-19 virus was discovered.

During June 2020, China suspended pork and poultry imports from processing plants in various countries of Europe, North America, and South America, where workers had been infected with COVID-19 (some plants proactively suspended shipments). About the same time, food exporters in various countries began receiving requests from Chinese importers—apparently prompted by Chinese customs authorities—to sign a letter attesting their products were not contaminated with COVID-19 and the products complied with Chinese laws and regulations (Wall Street Journal, 2020). Some prominent companies agreed to sign the letters, but others raised concerns about a lack of clarity regarding testing and their potential liability (Farm Progress, 2020). Officials in the United States, Australia, and the EU released statements noting there was no evidence the virus was transmitted by food (Bloomberg Law, 2020). In July, China's National Health Commission announced new requirements for processing plants in several countries exporting meat to China, including nucleic acid testing for COVID-19 and a complete traceability system (Farmdoc, 2020).

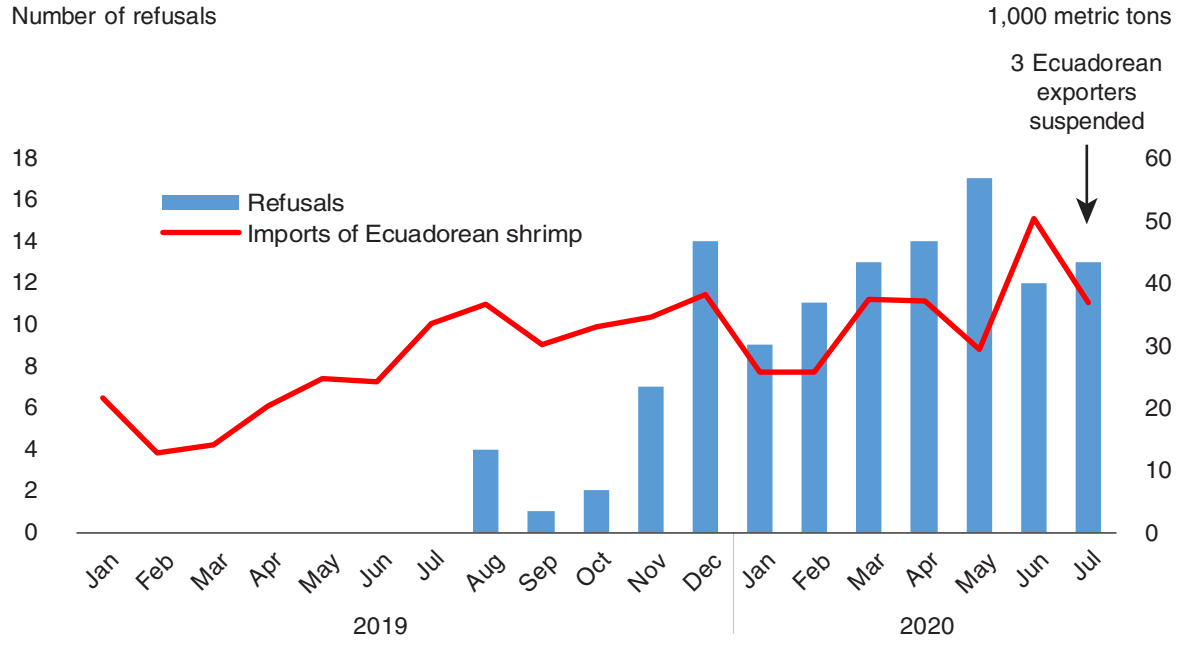
On July 10, 2020, a Chinese customs official announced a suspension of shrimp imports from three companies in Ecuador after intensive testing of 227,934 samples from imported food shipments found 5 samples from these exporters tested positive for the COVID-19 virus (China National Health Commission, 2020). The positive samples were obtained from a shipping container and external packaging—no samples of shrimp or other food tested positive. The suspension applied only to the three suppliers (the customs official announced their names and registration numbers). After the suspension, shrimp from other Ecuadorean suppliers and earlier batches were still offered on e-commerce sites (Beijing Youth News, 2020). Some stores and restaurants removed Ecuadorean shrimp from their shelves, while one retailer conducted its own testing before offering imported seafood for sale (Jiemian News, 2020). Wholesalers told Jiemian News that domestic shrimp was commonly repackaged as an imported product.

An examination of import refusals revealed China had frequently detected shrimp diseases in shipments from 23 different Ecuadorean companies from August 2019-July 2020 when the COVID-19 detection was announced (Beijing Youth Daily, 2020). Analysis of refusal reports shows China refused 117 shipments of Ecuadorean shrimp during those 12 months, totaling more than 2,000 metric tons. However, nearly all those refusals cited "detected animal disease" (检出动物疫病) as the violation, including all but two of the refusals during July 2020 when COVID-19 was detected.[18] There were 23 Ecuadorean companies that had shrimp shipments refused between August 2019 and July 2020. Two of the companies cited for having COVID-positive shipments accounted for 34 percent of the refusals, and the third company did not appear on the refusal reports.

The refusals of Ecuadorean shrimp during 2019-20 followed a surge of imports, from 20,000 metric tons per month in the first four months of 2019 to a peak of 50,000 metric tons in June 2020. The suspension of Ecuadorean exporters in July 2020 came a month after the peak volume of imports. The refused shipments were just 0.5 percent of the total volume of Ecuadorean shrimp imported from August 2019-July 2020.

[18]During July 2020, one Ecuadorean shipment was cited for lacking inspection and quarantine approval and a second shipment was cited as "self-recalled."

Figure 11
China's refusals of shrimp from Ecuador, monthly 2019-20



Source: USDA, Economic Research Service analysis of data from China's General Administration of Customs.

The suspensions of Australian beef and Ecuadorean shrimp occurred during a broad-based increase in imports and refusals of meat and seafood rejections from multiple countries. Figure 12 displays China's monthly refusals and imports (in 1,000 metric tons) of meat and seafood (HS 02 and 03) during 2018-20. The number of meat and seafood refusals increased from less than 20 in most months during 2018 and the first half of 2019 to 30-50 per month from August 2019 to May 2020. A much higher number of 89 refusals occurred in June 2020—the month China began to raise concerns about COVID-19 transmission via imported seafood and meat—and 81 refusals occurred in July 2020. None of these refusals reported violations related to COVID-19; violations included failure to complete inspection and quarantine procedures, documentation and labeling problems, and detection of animal diseases. These refusals included beef from Australia; shrimp from Ecuador (discussed above), Peru, Vietnam, Greenland, and India[19]; chicken from Russia, United States, Brazil, and Afghanistan; other meat from Brazil, Canada, Costa Rica, and the Netherlands; and fish from Japan and other sources.

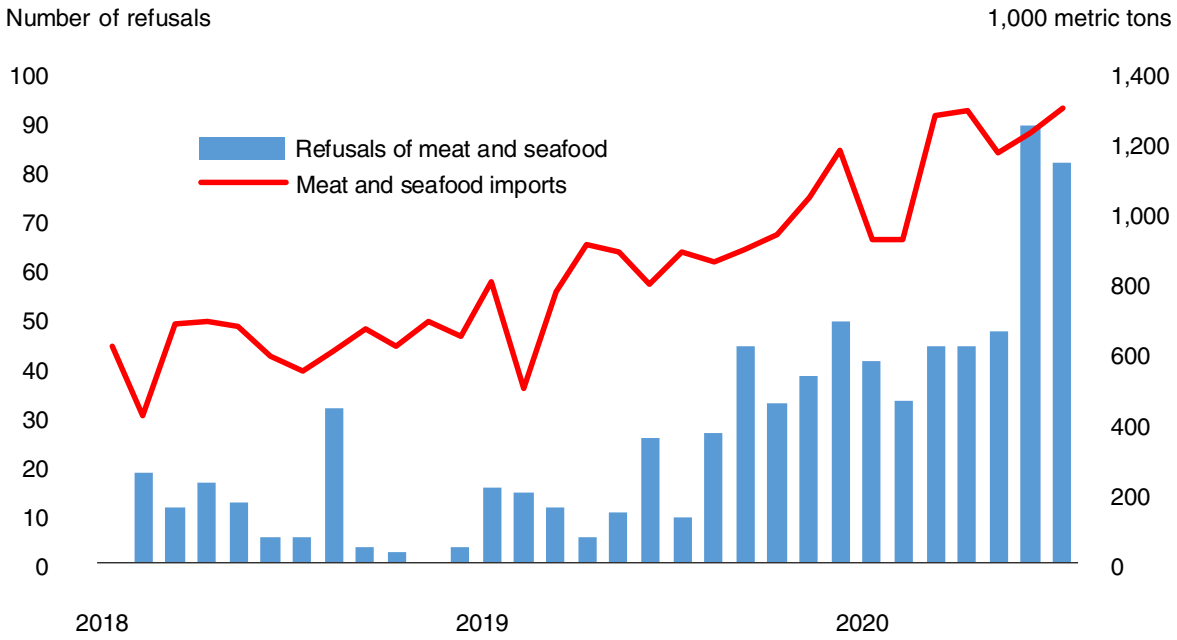
China's meat and seafood imports from all countries and regions increased during 2019-20, prompted by a shortage of pork due to a swine disease that caused meat prices to rise dramatically (Haley and Gale, 2020). During 2018, China's imports of meat and seafood averaged about 600,000 metric tons per month. During 2019, imports rose to 800,000 metric tons or more in most months and reached over 1.1 million metric tons in December.[20] Meat and seafood imports reached an even higher level of over 1.2 million tons per month during March-July 2020. The increase in refusals

[19]Shipments of "South American" shrimp from Vietnam, India, and Malaysia were among the refusals, suggesting these products may have been shipped from Ecuador to China through third countries or falsely labeled.

[20]China's imports tend to have a seasonal peak before the Lunar New Year holiday (in January or February) and a decline in the month that follows the holiday. China's peak outbreak of COVID-19 in January-February 2020 constrained import volume during those months.

may reflect the increase in volume of imports; however, the trend analysis conducted earlier in this report found no general correspondence between growth in food imports and refusals.

Figure 12
China's imports and refusals of meat and seafood, monthly, 2018-20



Source: USDA, Economic Research Service analysis of data from China's General Administration of Customs.

At a July 10 press conference announcing the Ecuadorean shrimp suspensions, Chinese officials and researchers insisted COVID-19-related measures were adopted to ensure the safety of imported food, and they denied the measures disrupted international trade (China National Health Commission, 2020). Officials asserted that testing, suspensions, and other measures were consistent with the WTO's Sanitary and Phytosanitary Agreement. Several Chinese officials urged food producers to adopt practices suggested by guidelines issued by the United Nations World Health Organization (WHO) and Food and Agriculture Organization. At the news conference, officials acknowledged transmission of COVID-19 by food was very unlikely and no positive results had been found in food samples. Nevertheless, the officials cited the risk of virus transmission via food for suspending suppliers and monitoring food imports more closely. None of the officials mentioned the letters exporters had been asked to sign in June. A Chinese diplomat told a Brazilian industry group that new requirements for meat processors were justified because the virus could be transmitted by packaging (Farmdoc, 2020).

During the news conference, a Ministry of Commerce official called on all countries to follow the rules set by the WTO and WHO and to refrain from adopting measures that would disrupt international food supply chains. The official said China's customs clearance procedures had been expedited to clear up a backlog of frozen food shipments at ports caused by intensive inspections and testing for the COVID-19 virus. A customs official recited a pledge from Chinese President Xi Jinping that China would open its food market to imports, and he called for collaboration between customs organizations in various countries and "joint governance" of the safety of imported and exported food.

Conclusion

China's imports of food are growing rapidly as rising living standards and new marketing channels give consumers access to a broader selection of foods. Like the United States, EU, and other countries and regions—China refuses imports of food that violate its laws, regulations, and standards. China's refusals of imported food products at the border are one of the few indicators of the strictness of its regulation of food imports. This report was the first to compile data on China's food import refusals, document trends in refusals, report rates of refusal by product and country/region, and to identify common violations.

China's stricter food safety regulations raise the bar for exporters seeking access to China's market. Chinese standards have detailed specifications and tolerances for nutritional components and additives. Inspectors at the border refuse entry to products lacking proper approvals and documents, as well as sanitation problems, illegal substances, or poor physical condition of shipments. A large portion of refusals are due to requirements for exporter registrations, documentation of shipments, and strict requirements for labels and sell-by dates. Failure of additives, chemicals, and nutritive components of foods to meet standards account for the largest share of refusals. Hundreds of additives, dyes, vitamins, genetically modified materials, heavy metals, and improper chemical composition were cited as violations in imported food—but most were cited just a few times. The cost of testing to detect these irregularities may limit the number of refusals for such items. Microorganisms, pests, and degradation of shipments accounted for a smaller share of refusals.

Despite growing attention to the safety of imported food reflected by new laws and issuance of numerous documents and regulations, the number of food import refusals did not increase over time. Refusals averaged 64 per billion dollars of food imports over 2006-19, but the lowest rates were during the most recent years: 19 per billion dollars in 2018 and 15 per billion dollars in 2019. China refused 0.22-0.46 percent of imported food shipments during recent years. The volume of refused shipments was less than 0.5 percent of the volume of imported products for all product categories except honey.

The trend in refusal rate by itself is not an indicator of the stringency of China's food import regulation. Prevention-based requirements for gaining country approval, conformity to new Chinese standards, registering as an exporter, and product labeling raise the costs of entering the Chinese market and may deter some potential exporters. Small and medium enterprises, and those in less-developed countries, may be less able to bear these costs.

In general, the number of refusals did not rise in parallel with the growth in China's food imports. While ERS analysis found the value of China's food imports in constant dollars rose at an average of 12.7 percent per year during 2006-19, no trend could be detected in either the number of refusals or the refusal rate per dollar of imports. The import refusals rate surged during 2007 and 2017, but the rate was lowest during the last two years (2018-19) of data ERS examined. The analysis did observe an increase in refusals of meat and seafood during 2019-20 that corresponded to a surge in imports of these items. Measures to reduce the risk of COVID-19 transmission during 2020 followed a surge in meat and seafood refusals that cited violations unrelated to the COVID-19 virus, but Chinese officials denied that the measures sought to disrupt trade.

The 2017 surge in refusals reflected increases in refusals for documentation, labeling, and expiration dates. Intermittent campaigns to scrutinize imports or focus on specific products mean the risk

of rejection can vary from year to year. The growth in responsibilities for border inspection and competing initiatives in anti-smuggling, trade facilitation, and other functions may require authorities to shift resources as priorities move from one initiative to another. Year-to-year variation in refusals and the broad array of potential violations may raise business risks to food exporters selling to China.

A disproportionately large share of refused imports comprised high-value foods such as baking products, juices, confections, and beverages. Labeling requirements, the larger number of ingredients, and more complex standards may increase the likelihood of a violation for such products. However, infant formula—which has received extensive regulatory scrutiny—had a relatively low refusal rate at the border, and it had a low incidence of problems detected in China's domestic food testing.

The mix of products supplied by countries and regions was a factor influencing the number of their food shipments refused by China. The largest number of food shipments refused by China came from the European Union, but the prevalence of processed food imports from that region seems to account for the region's high refusal rate. The above-average refusal rate for U.S. products also reflects the large proportion of processed products exported by the United States to China. Refusal rates for Taiwan, Japan, and South Korea were even higher than their product mixes suggested. In contrast, the items China imported from Canada, Indonesia, Russia, Argentina, Uruguay, Ukraine, Ecuador, and Norway comprised products such as rapeseed, edible oils, and fish that tend to be refused at low rates.

The study did not find any distinctive pattern in China's refusals of food imports from the United States. Despite recent trade tensions between the United States and China, the number of refusals of U.S. food was low during 2018-19. However, China's refusal rate for EU foods fell below the rate for U.S. foods for the first time during 2019. Other top suppliers of China's food imports—New Zealand, Canada, and Indonesia—had lower refusal rates than U.S. food. The product categories with the largest number of U.S. foods refused were processed items such as food preparations; beverages; bread, pastry, and baking products; infant food; and fruit, nut, and vegetable preparations.

China's approach to regulating food safety will receive greater attention as the country increases its imports of food and other agricultural products. China's initiatives to increase imports from new suppliers in countries like Ecuador with limited experience meeting safety standards in overseas markets may result in rejections of products. China's ambitions to play a greater role in the international bodies that set international food safety standards and rules will also attract interest in its approach to food safety regulation.

Note that the data analyzed in this report did not include grains, soybeans, and other nonfood agricultural products—but enforcement of phytosanitary requirements and inspection of nonfood commodities are likely to be broadly similar to the patterns observed for food import refusals.

Appendix A
Food Inspections in Chinese Domestic Markets

Chinese government agencies have tested food samples from domestic markets since 1985. Chen and Zhang (2017) cited rising compliance rates in government testing of food samples, ranging from 71 percent to 96.8 percent between 1985 and 2015. State Council (2007) cited compliance rates of 78-85 percent during 2005-07. The China Food and Drug Administration (CFDA) reported 97.6 percent compliance rates in both 2018 and 2019—based on samples from food processors, markets, restaurants, and cafeterias.

Testing is not comparable across years since testing authorities changed, samples differed in size, and authorities acknowledged that testing focuses on different problems in different years. Several different branches of China's government conducted testing in various years. CFDA began testing food in 2014, and CFDA merged with the State Administration of Market Regulation (SAMR) in 2018.

SAMR (2019) reported that a sampling plan for testing was formulated to address specific problems in a particular year. Sampling is based on past problems encountered and the degree of risk. Set quantities of some foods sold via e-commerce and import channels (processed grains, cookies, edible oils, dairy products, beverages, wines, fried foods, and nuts) are chosen for testing. Responsibility for sampling foods from different types of establishments and markets is divided among central, provincial, and local governments.

USDA, Economic Research Service (ERS) calculated 2019 testing results from quarterly results posted on the SAMR website. According to ERS's compilation of test results, China tested more than 4.7 million samples from retail and agricultural markets, food service establishments, and food additives (appendix table A1). (In a compilation of 2018 testing results, ERS found 3.3 million samples were tested.) Noncompliance rates were 1.9 percent for agricultural products and 1.8 percent for products from retail markets. Food service establishments had the highest rate of noncompliance (5.7 percent).

The domestic food noncompliance rates are the percentage of noncompliant samples, while food import refusal rates calculated in this report are percentages of all imports. Thus, the domestic food noncompliance rates and the food import refusal rates are not directly comparable. The Chinese Government's import refusal data do not reveal how many samples it chose for inspection or testing.

Appendix table A1

Results of food testing in Chinese domestic markets, 2019

Category	Samples	Non-compliant	
	Number	Number	Percent
Food products in retail outlets	2,152,889	38,337	1.8
Foods in agricultural markets	2,032,049	38,638	1.9
Food service establishments	509,547	28,798	5.7
Food additives	8,249	29	0.4
Other	34,039	1,262	3.7
Total	**4,736,773**	**107,064**	**2.3**

Source: USDA, Economic Research Service analysis of quarterly reports by the China Food and Drug Administration.

Appendix B
Complete List of Chemicals and Additives Cited as Violations in 2017

Improper use of additives and chemical composition were commonly cited in China's refusals of food imports, but the large number of violations listed (and varying Chinese text) made analysis of these violations difficult. USDA, Economic Research Service (ERS) analyzed additives and chemicals cited in 2017—the year with the largest number of refusals—by tabulating occurrences of Chinese text strings classified in this report as "additive and chemical composition" in tables 5 and 6, and figures 3 and 4. The refusal reports identified violations as substances not permitted, used in excess, used illegally, or not compliant with Chinese standards. In some instances, the substance was listed without specifying the type of violation.

ERS grouped text strings that appeared to refer to the same violation and classified them into subcategories: chemical analysis of food, metals, vitamins, antibiotics/feed additives, minerals/chemical elements, dyes/colorants, and other chemical compounds and additives. This appendix lists specific violations in these categories, and the number of times they were cited in food import refusals, to illustrate the wide range of items cited.

ERS found more than 250 unique substances or chemicals that appeared a combined 1,884 times in refusal reports during 2017 (appendix table B1). In instances where a single shipment had multiple substances cited, each substance was tabulated as a separate violation. Because of this, the 1,884 violations exceed the number of "additives and chemical composition" violations reported for 2017 in figure 4 of this report.

Vitamins were the most commonly cited type of chemical-related problem with 366 violations. Vitamin E was the single most-frequently cited substance, with 98 violations, while vitamins B2, B12, and B1 were cited more than 40 times each. Problems with metals were cited 214 times, with improper iron content cited most frequently—45 times. Antibiotics were cited only 30 times, and one feed additive banned by China—ractopamine—was cited once. Thirty different dyes were cited a total of 160 times. A catch-all category of 172 "other" chemical additives and compounds were cited 974 times, an average of less than 6 violations each. Improper levels of benzoic acid were the second-most cited problem with 57 violations. Fourteen dyes and 61 other additives/compounds were cited only once during 2017.

Appendix table B1

Detailed list of chemicals and additives cited for excessive or improper use by China in food import refusals, 2017

Category/item	Times cited
Chemical analysis of food:	**76**
Peroxide value	25
Acidity	17
Protein	10
Volatile base	8
Carbon dioxide	6
Fatty acids	3
Fat	3
Calories	2
Hydrogen	1
Oxygen consumption	1
Metals:	**214**
Iron	45
Zinc	38
Rare earth	36
Cadmium	26
Selenium	13
Strontium	12
Arsenic	9
Copper	9
Chromium	8
Lead	8
Magnesium	5
Manganese	3
Inorganic arsenic	2
Minerals, chemical elements:	**63**
Calcium	33
Silica	21
Phosphorus	4
Phosphate	2
Ash	1
Sodium	1
Silicone	1
Vitamins:	**366**
Vitamin E	98
Vitamin B2	45
Vitamin B12	42
Vitamin B1	41
Vitamin A	35
Vitamin D	32
Vitamin C	31
Vitamin B6	20
Vitamin B	9
Vitamin B5	5
Vitamin K	3
Vitamin B3	2
Vitamin D3	2
Multivitamins	1
Antibiotics, feed additives:	**31**
Chloramphenicol	11
Metronidazole	9
Furacillin	4
Chlortetracycline	2
Penicillin	2
Ofloxacin	1
Oxytetracycline	1
Ractopamine	1

continued—

Appendix table B1

Detailed list of chemicals and additives cited for excessive or improper use by China in food import refusals, 2017—continued

Category/item	Times cited	Category/item	Times cited
Dyes and colorants:	**160**	**Other chemical compounds and additives:**	**974**
Lemon yellow	24	Benzoic acid	57
Caramel color	22	Stevioside	44
Bright blue	20	Sulfur dioxide	38
Sunset yellow	17	Sucralose	29
Purple cabbage	10	Saccharin sodium	28
Carmine red	8	Sorbic acid	27
Patent blue	7	Biotin	22
Seduction Red	7	Sodium aluminosilicate	22
Safflower yellow	6	Potassium iodide	20
Kale red	6	L-Arginine	19
Cherry red	5	Licorice extract	19
Gardenia Blue	4	Potassium sorbate	19
Bright black	3	Tartrazine	19
Chili red	3	Niacin	18
Quinoline yellow	3	Caffeine	17
Acid red	2	Cochineal Extract	15
Apple green	1	Copper sulfate	15
Carmine orange	1	Titanium dioxide	15
Chocolate Brown HT	1	Tartaric acid	15
Brillion black food coloring	1	Acesulfame Potassium	14
Gardenia Yellow	1	Ammonium carbonate	14
Indigo	1	Soluble solids	14
Monascus yellow pigment	1	Spices (unspecified)	13
Purple Sweet Potato Pigment	1	Folate	12
Red cabbage pigment	1	Food additive (not specified)	12
Sea buckthorn yellow	1	Hydrogenated rosin glyceride	12
Shellac red	1	L-leucine, L-valine and L-i	12
Tamarind pigment	1	Curcumin	11
Iron oxide black	1	Nitrites	11
Roselle Red	1	Riboflavin	11

continued—

Appendix table B1

Detailed list of chemicals and additives cited for excessive or improper use by China in food import refusals, 2017—continued

Category/item	Times cited	Category/item	Times cited
Other chemical compounds and additives, continued:			
Calcium lactate	10	Calcium carbonate	4
Folic acid	9	Chlorophyll copper	4
Methanol	9	Citric acid	4
Nutrient (not specified)	9	Ferric ammonium citrate	4
Sorbitol	9	Inositol	4
Dibutyl hydroxytoluene	8	Potassium nitrate	4
Sodium metabisulfite	8	Sodium dihydrogen phosphate	4
Sodium molybdate	8	Taurine	4
Magnesium citrate	7	Calcium citrate	3
Plant sugar content	7	Copper gluconate	3
Anthocyanin	7	Dioctyl succinate	3
Chili oleoresin	6	Magnesium salt	3
Chlorophyll	6	Manganese sulfate	3
Enzyme-treated rutin	6	Nucleotide	3
Magnesium chloride	6	Phosphoric acid	3
Retinoic acid	6	Potassium metabisulfite	3
Fumaric acid	5	Sodium chloride	3
Lutein	5	Sodium diacetate	3
Magnesium sulfate	5	Sorbitan monostearate	3
Pantothenic acid calcium	5	Sugar content	3
Polyglycerol ricinoleate	5	ß-cyclodextrin	3
Potassium hydroxide	5	Aluminum silicate	2
Sodium nitrate	5	Anthocyanins	2
Wood Rosin Glyceride	5	Benzopyrene	2
Zinc oxide	5	Calcium alginate	2
Aspartame	5	Calcium sorbate	2
Ascorbyl palmitate	4	Carnauba wax	2
Bergamot oil	4	Chloroform	2
Boundary indicator	4	Choline	2
Bromate	4	D calcium pantothenate	2
Butyl hydroxyanisole	6	DL-Sodium tartrate	2

continued—

Appendix table B1

Detailed list of chemicals and additives cited for excessive or improper use by China in food import refusals, 2017—continued

Category/item	Times cited	Category/item	Times cited
Other chemical compounds and additives, continued:			
Deoxynivalenol	2	Caustic Caramel	1
		Copper chlorophyll sodium s	1
Disodium ethylene diamine tetra acetate	2	DEHP	1
Disodium nucleotide	2	Elderberry	1
L-aspartic acid	2	Ferrous sulfate	1
L-tartaric acid	2	Flavone	1
Lithium	2	Gellan Gum	1
Mecobalamin	2	Glucomannan	1
Methylmercury	2	Glucose	1
Polyoxyethylene	2	Glutamine	1
Potassium benzoate	2	Glycerol	1
Potassium tartrate	2	Glycerol ester of wood rosin	1
Propyl paraben	2	Glycyrrhizin	1
Rosemary extract	2	Guar gum	1
Sodium fluoride	2	Hexametaphosphate	1
Sodium glutamate	2	Inulin	1
Sodium salt	2	Iron pyrophosphate	1
Sodium selenite	2	L-carnitine	1
Turmeric	2	Lactase	1
“Da huang”	1	Luohan fruit flavor	1
Acetate starch	1	Microcrystalline cellulose	1
Acid sodium phosphate	1	Natural rubber	1
Alkali amide	1	Neotame	1
Amino acid	1	Phosphorylated distarch phosphate	1
Astaxanthin	1	Phycocyanin	1
Azo red	1	Plant carbon melanin	1
B-carotene and flavor	1	Potassium aluminum silicate	1
Beta carotene	1	Potassium bisulfite	1
Red bilberry	1		
Calcium pantothenate	1		
Capsaicin	1		

continued—

Appendix table B1

Detailed list of chemicals and additives cited for excessive or improper use by China in food import refusals, 2017—continued

Category/item	Times cited	Category/item	Times cited
Other chemical compounds and additives, continued:			
Potassium paraben	1	Sucrose isobutyrate	1
Potassium salt	1	Tea theanine	1
Propylene glycol alginate	1	Tragacanth	1
Sodium 2-methyl-2-phenoxypr	1	Volatile acid	1
Sodium hyaluronate	1	Wax	1
Sodium hydroxide	1	Xanthan Gum	1
Sodium pyrophosphate	1	Zinc gluconate	1
Sodium stearoyl lactylate and disodium phosphate	1	Chili oleoresin	1
Sodium tripolyphosphate	1	Di-(2-ethylhexyl) phthalate	1
Stearic acid	1	ß-carotene	1

Note: Table shows number of times problems with the amount or use of each substance was cited in a food import refusal during 2017.

Source: USDA, Economic Research Service analysis and translation of text strings extracted from China General Administration of Quality Supervision, Inspection and Quarantine, and General Administration of Customs reports of food import refusals.

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