

Food Quality & Safety

FARM TO FORK SAFETY

A central illustration featuring a stylized globe with green continents and blue oceans. The globe is surrounded by various fresh produce items, including a red bell pepper, a purple eggplant, a red chili pepper, a head of purple cauliflower, a head of green lettuce, a bunch of green leafy vegetables, and a bunch of purple grapes. The entire scene is set against a background of small, light-colored dots.

How the U.S. Regulates Imported Foods



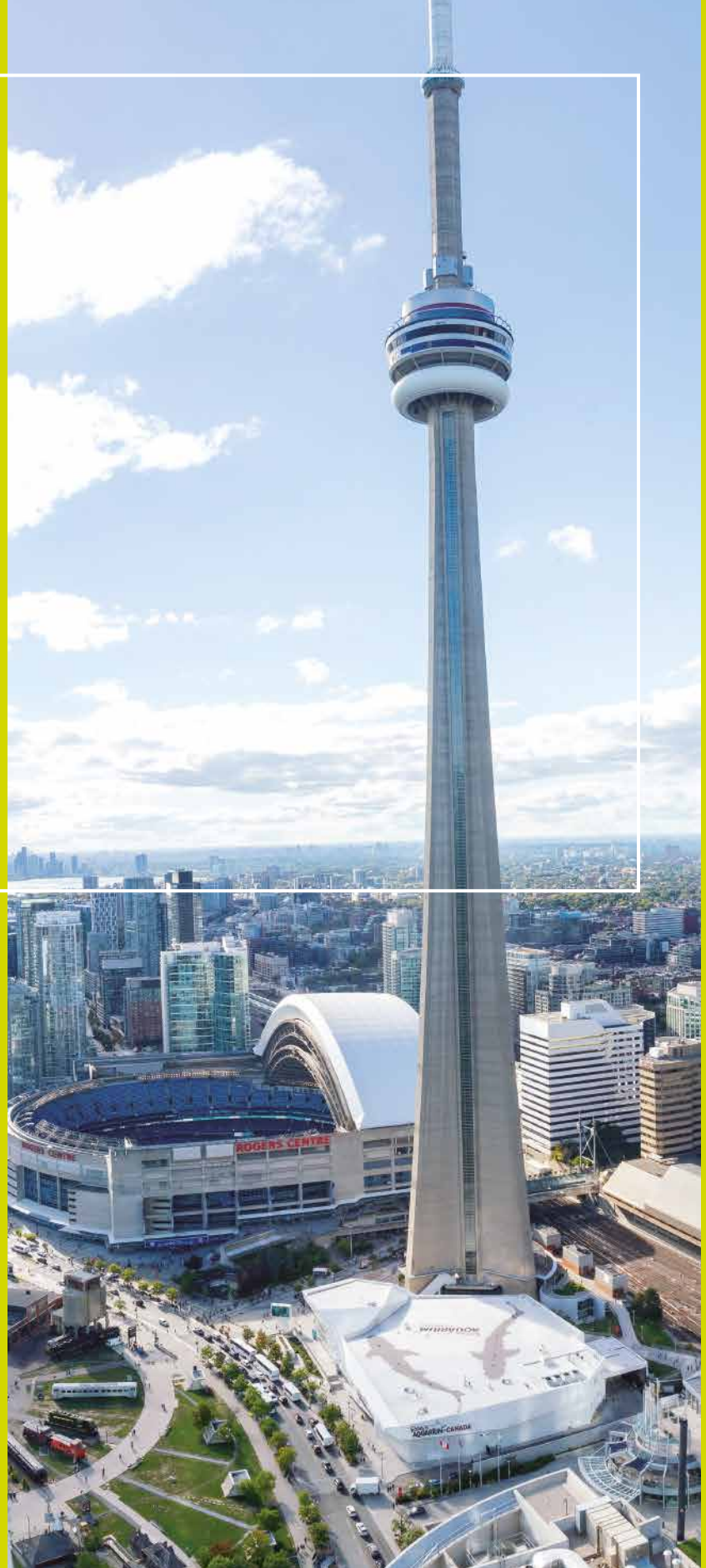
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Food Quality & Safety magazine welcomes letters to the editor on any relevant industry topic.

Letters should be no longer than 350 words.

Submit letters to: Samara E. Kuehne Professional Editor Email: skuehne@wiley.com

(Letters may be edited for space and style.)

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From The Editor

This year kicked off with the announcement that Frank Yiannas will be leaving FDA at the end of February. Frank has been an icon across the food safety sector for decades, and his legacy will impact our industry for years to come, but he holds a special place in the hearts of those of us who were IAFP members in the Florida Affiliate during his tenure at Disney.



Known for their generous donations and creative presentations they used to give their contributions to the IAFP Foundation at the annual business meeting, the Florida group always counted on Frank to announce its entrance with “The great state of Florida wishes to be recognized by the chair.” For those not familiar with this part of the IAFP annual meeting, suffice it to say that costumes were involved—one year it was the Village People, one year there were surfboards, and another year togas appeared—and chaos ensued. Often accompanied by song and even dance, these are fond memories for all who participated in the lighter side of food safety. I’m sure those involved join me in wishing Frank all the best as he decides what the future holds for him.

In keeping with the lighter tone of this column, I’m thrilled to share the details of *Food Quality & Safety’s* newest award with you. As many of you know, every year we recognize food safety and/or quality assurance teams for exceptional contributions in upholding the highest food standards at their organizations through the *Food Quality & Safety* Award. This year, we will also present an award designed especially for those in the food safety services sector—so often the unsung heroes of our industry.

The ***Food Quality & Safety Analytical Innovation Award*** will recognize testing suppliers, developers, and any organization that serves the food industry’s testing needs in chemistry and microbiology.

When the beef industry had to test carcasses before releasing them, creating huge delays in processing, these were the heroes who developed an eight-hour media to keep production lines running at speed. When testing for multiple pathogens became more and more common, they developed a platform to handle it. Now, “they” will be recognized for their innovative contributions to the improvement of food safety across all sectors.

Learn more about this new award and how to enter your organization at foodqualityandsafety.com/award. Nominations are open now!

Happy new year to all!

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NEWS & NOTES

USDA Strengthens Organic Food Label Rules

BY KEITH LORIA

On January 18, the USDA National Organic Program (NOP) released details of the Strengthening Organic Enforcement (SOE) final rule. The rule, which goes into effect on March 20, 2023, boosts enforcement of USDA's definition of "organic," which must rely on "natural substances and physical, mechanical, or biologically based farming methods to the fullest extent possible."

The new rule is the biggest update to USDA organic regulations since the original act in 1990 and offers stronger organic control systems, improves farm-to-market traceability, increases import oversight authority, and provides robust enforcement of the organic regulations, according to the agency. "Protecting and growing the organic sector and the trusted USDA organic seal is a key part of the USDA Food Systems Transformation initiative," says Jenny Lester Moffitt, undersecretary for marketing and regulatory programs for USDA. "[The rule] provides a significant increase in oversight and enforcement authority to reinforce the trust of consumers, farmers, and those transitioning to organic production. This success is another

demonstration that USDA fully stands behind the organic brand."

Among the key updates provided in the rule are:

- Requiring certification of more businesses, such as brokers and traders, at critical links in organic supply chains;
- Requiring NOP Import Certificates for all organic imports;
- Requiring organic identification on non-retail containers;
- Increasing authority for more rigorous on-site inspections of certified operations;
- Requiring uniform qualification and training standards for organic inspectors and certifying agent personnel; and
- Creating an authority for more robust record keeping, traceability practices, and fraud prevention procedures.

The Organic Trade Association (OTA), which lobbied for the rule, is pleased with the updated regulations. "This will fundamentally strengthen the oversight and enforcement of organic production worldwide," a spokesperson for OTA tells *Food Quality & Safety*. "Specifically, it mandates that more players involved in the sale and handling of organic products—like brokers, traders, stor-

age facilities of unsealed products, importers, and exporters—obtain certification and creates better oversight to prevent and detect fraud by requiring import certificates for all organic products entering the U.S."

Although most organic operations are already compliant with the provisions in the new rule, there have been some bad actors; the rule raises the bar to monitor these operations at every step in the supply chain.

"Consumer trust is paramount to the organic label," the OTA spokesperson says. "The new regulations will ensure ongoing consumer confidence in organic as the only federally enforced eco-label when looking for healthy, climate-friendly, and sustainable choices. This rule will make sure all high-risk links in the supply chain are certified. We encourage operations no matter where they are in the supply chain to look one step down, one step up, and at any third parties that handle their products to evaluate if any of their partners were previously exempt but now require certification."

Organic operations, certifying agents, and other organic stakeholders affected by the rule will have until March 19, 2024, to implement the changes. ■

(Continued on p. 8)



(Continued from p. 7)



Frank Yiannas Resigns from FDA

Frank Yiannas, FDA's deputy commissioner of food policy and response, announced that he is stepping down from the position, effective February 24, 2023.

Yiannas assumed the position in December 2018 and has been instrumental in overseeing the agency's "New Era of Smarter Food Safety," a plan that builds on foundations set down in the Food Safety Modernization Act and focuses on technology and traceability.

His resignation announcement comes on the heels of the infant formula crisis. In a letter to FDA Commissioner Robert Califf, MD, announcing his upcoming departure, Yiannas recalls how he considered leaving the agency in early 2022, until the formula incidents helped him decide to postpone his decision so that he could assist in tackling the crisis. With the Abbott facility involved in the outbreak now reopened and infant formula becoming more available, he has revisited his 2022 decision. In the letter, he notes that "the necessary monitoring, data systems, and insights are now in place through the 21 Forward platform to help address the current and any future infant formula supply chain challenges." Yiannas says he felt this was the right time to leave.

In the letter, Yiannas also urged Dr. Califf to "consider transferring the small, yet exceptional staff comprising the Office of Food Policy and Response (OFPR) to a new office of the Deputy Commissioner for Foods." ■

DOJ Opens New Investigation into Abbott Laboratories and the Formula Crisis

BY KEITH LORIA

Abbott Laboratories is under investigation by the U.S. Department of Justice (DOJ). The investigation follows the DOJ's probe into last year's deaths of two infants who allegedly consumed infant formula produced at Abbott's Sturgis plant in Michigan. The facility was shut down through June 2022 to address deficiencies, a situation that resulted in a nationwide formula shortage.

Laurie J. Beyranevand, JD, a professor of law and director of the Center for Agriculture and Food Systems at Vermont Law and Graduate School in South Royalton, says it's important to note that the DOJ has both a civil and criminal unit. "Last May, the civil unit of the DOJ filed a complaint and entered into a consent decree with Abbott Laboratories that enabled them to resume manufacturing of infant formula after having been previously enjoined from production," she tells *Food Quality & Safety*. "The complaint alleged that Abbott manufactured adulterated powdered infant formula under insanitary conditions that failed to protect it from contamination from certain bacteria including *Cronobacter sakazakii* and *Salmonella*."

Under the consent decree, the company was required to retain outside experts to bring the Sturgis, Mich., facility into compliance with the requirements under the Food, Drug, and Cosmetic Act and current good manufacturing practices.

This new investigation is a criminal investigation of the company, though the scope remains unclear. "Given the severity of the violations—including the fact that a

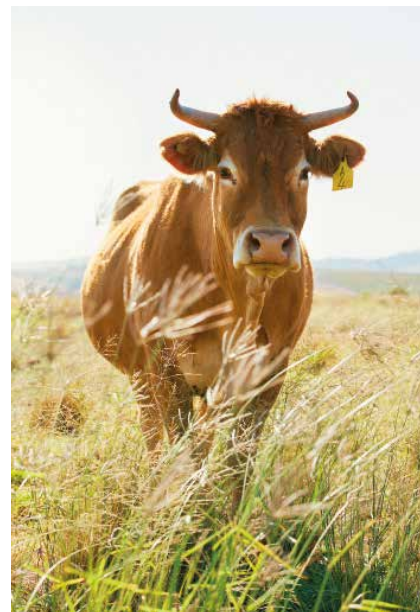


whistleblower said the company knew about the contamination and falsified records to prevent FDA officials from identifying problems related to the company's processes for monitoring the presence of bacteria in formula—in conjunction with the ongoing formula shortages, the DOJ may have determined civil penalties were not sufficient to address the issue," Beyranevand says.

Abbott Laboratories says that it is cooperating fully with the investigation. ■

APHIS Seeks Comment on Proposed Animal Disease Traceability Regulations

USDA's Animal and Plant Health Inspection Service (APHIS) is proposing to amend animal disease traceability regulations and re-



quire electronic identification for interstate movement of certain cattle and bison. The agency is also proposing to revise and clarify record requirements. These changes would strengthen the country's ability to respond to significant animal disease outbreaks, the agency says.

Interested stakeholders may view the proposed rule in the January 19 Federal Register. All comments must be received by March 22, 2023. The agency will review all comments and address them in a final rule.

Animal disease traceability is important to ensuring a rapid response when animal disease events take place. In a January 18 statement, APHIS said that it is committed to

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implementing a modern system that tracks animals from birth to slaughter and uses affordable technology that allows for quick tracing of sick and exposed animals to stop disease spread.

The proposed rule would require official ear tags to be visually and electronically readable for official use for interstate movement of certain cattle and bison. It would also revise and clarify certain record requirements related to cattle, including requiring official identification device distribution records to be entered into a tribal, state, or federal database, and available to APHIS upon request. ■

Report Finds “Dangerous” Levels of Lead, Cadmium in Some Dark Chocolate Products

BY KEITH LORIA

While a number of studies have shown a connection between dark chocolate and heavy metals cadmium and lead, a new report by *Consumer Reports* has shed more light on the issue. In its research, the organization measured levels of heavy metals in 28 different dark chocolate products and detected cadmium and lead in all of them. The tested products included chocolate from Hershey’s, Theo, Trader Joe’s and other popular brands.

These two heavy metals have been linked to several health problems for both children and adults, and FDA notes that lead is toxic to humans and can affect people of any age or health status—though it’s most problematic for children and pregnant women. By law, food manufacturers have a responsibility to implement controls that significantly minimize or prevent exposure to chemical hazards, lead included.

In January, Mars, Inc. was hit with a proposed class action in New York federal court accusing the confectionery giant of failing to disclose lead and cadmium in several of

its dark chocolate bars. A similar claim was made against The Hershey Co., which is facing a suit of its own.

In the latter case, the class action was brought by Christopher Lazazzaro, who cited the *Consumer Reports* study in the court documents, which tested a trio of Hershey’s dark chocolate bars—Hershey’s Special Dark Mildly Sweet Chocolate, Lily’s Extra Dark Chocolate 70% Cocoa, and Lily’s Extreme Dark Chocolate 85% Cocoa—and found them all to contain the heavy metals. The lawsuit is seeking \$5 million from Hershey’s, claiming the chocolate giant’s advertising and marketing campaign for the dark chocolate bars were “false, deceptive, and misleading,” because the labels said nothing about containing lead and cadmium.

A week after the suit against Hershey’s was filed, a similar claim was made against Trader Joe’s, with the plaintiff saying that the company failed to disclose that the Trader Joe’s Dark Chocolate 72% Cacao and Trader Joe’s The Dark Chocolate Lover’s Chocolate 85% Cacao both contain lead and cadmium.

Still, the National Confectioners Association (NCA), which represents most of the major chocolate companies, claims that the levels found are not dangerous. In 2019, NCA partnered with As You Sow, an organization that pushes for corporate accountability, on a three-year study on the main sources of lead and cadmium in chocolate products and what can be done to lower the amounts. This came about after a 2018 settlement between As You Sow and 32 members of the confectionery industry. “Cadmium and lead are present in cocoa and chocolate due to the soil,” says Christopher Gindlesperger, a spokesperson for NCA. “The products cited in this study are in compliance with strict quality and safety requirements, and the levels provided to us by *Consumer Reports* testing are well under the limits established by our settlement [with As You Sow].” ■

FDA Releases Data on Adulteration in Imported Honey

FDA has released data from a sampling assignment carried out in 2021 and 2022 to test imported honey for economically motivated adulteration (EMA). EMA can occur when someone intentionally leaves out, takes out, or substitutes a valuable ingredient or part of a food or when a substance is added to a food to make it appear better or of greater value.

FDA’s sampling was designed to identify products that contained less expensive undeclared added sweeteners in honey, such as syrups from cane and corn. The agency collected and tested 144 samples of imported honey in bulk and retail shipments from 32 countries and found 14 samples (10%) to be violative. The agency refused entry of violative shipments into the U.S. and



placed the associated company and product on an import alert.

FDA routinely assesses imported honey products to ensure accurate product labeling and otherwise help prevent consumer deception. The agency will continue to test honey for EMA under the agency’s import sampling and risk-based import entry screening program. Violative samples are subject to agency action, such as recall and import refusal. When appropriate, the agency may consider pursuing criminal investigations. FDA also collaborates with international counterparts to detect and combat EMA related to imported products, including honey. ■

Washington Report



Time to Split?

What a division of FDA into two agencies might mean for food safety | BY KEITH LORIA

In the summer of 2022, Rep. Rosa DeLauro and Sen. Dick Durbin introduced the Food Safety Administration Act, which essentially calls for FDA to be divided into two agencies: one responsible for food and one responsible for drugs/medical devices.

“Food safety is currently a second-class citizen at the FDA,” DeLauro said when she introduced the bill. “Right now, there are no food policy experts in charge of food safety at the FDA. That is unacceptable and contributes to a string of product contaminations and subsequent recalls that disrupt the supply chain, contribute to rising prices, and in many cases, result in consumer illness and death.”

One needs only to look at 2022’s infant formula crisis, in which Abbott Laboratories’ Sturgis, Mich., facility was allegedly responsible for producing formula contaminated with *Cronobacter sakazakii*, to understand the Senator’s concern.

This type of issue is one reason the bill is looking to create a single food safety agency, led by a food policy expert, to

ensure the safety of products that go to market.

Tyler Williams, CEO of ASI Food Safety, which oversees the certification process in more than 3,000 audits annually and has trained and consulted with numerous major food and beverage companies around the world to help improve their food safety practices, notes that longtime critics of FDA have been pushing for a split in the agency for several years. “Food safety experts argue that food safety and security is a second-hand thought after drugs and medical devices, whereas the pharmaceutical industry feels drug approvals are slowed down by the FDA being distracted by food industry recalls,” Williams says. “It feels like the food sector has been the red-headed stepchild of the FDA, or maybe the agency just simply has too much on its plate, but either way, the legislation being introduced by food policy experts calls for a division of power that will hopefully prioritize food safety and protect consumers.”

Cassandra LaRae-Perez, a food and beverage attorney at Gravel & Shea in Burlington, Vt., notes that proponents of the bill argue that a separate agency would bring leadership more focused on food safety, more accountability, and a unified and efficient structure, but it is unclear how a separate agency would perform better, and whether additional resources would be devoted to ensuring its success. “In short, the bill seeks to tighten regulation on food producers and to increase credibility and autonomy of the regulators responsible for food safety, but without a significant, perhaps outsized dedication of monetary and human resources and willing participation in the Senate to swiftly appoint a leader for the agency, it’s not clear how its aims can be achieved,” she says.

Reagan-Udall Foundation Report

Brian Ronholm, director of food policy for *Consumer Reports*, says that FDA has inadequately responded to outbreaks and missed deadlines for implementing critical food safety initiatives, which has undermined consumer confidence in the agency’s food program. “One of the big proposals that gets support is creating an empowered deputy commissioner position that would have oversight authority over the foods program at the agency,” he says. “That would put someone in charge of food, because that’s what is lacking.”

In July 2022, a few months after the infant formula crisis that was responsible for the death of at least two infants, FDA commissioner Robert Califf, MD, commissioned a review of the Human Foods Program by the Reagan-Udall Foundation, an independent group of experts. Their findings, released in December 2022, recommended a major overhaul and reform of FDA, essentially backing up the bill.

David Acheson, founder and CEO of The Acheson Group and former FDA associate commissioner for foods, notes that a split isn’t a new idea, but legislation has never gained much traction before. He

says Dr. Califf’s call for the Reagan-Udall Foundation report is a good sign—much needed—that change is possible.

The report outlined several key problems within the agency’s culture, structure, resources, and authority. “The report uncovered several issues ranging from reporting structures and clear lines of authority to a lack of a clear and compelling vision, mission, and value statement specific to the Human Foods Program,” Williams says. “While some of these issues could be fixed with an agency split, most of these issues require a cultural change from a reactive approach to food safety to a proactive approach.”

Some recommendations from the report to improve the agency included requesting records from food manufacturers

Money Matters

Currently, nearly half of FDA’s budget is funded by user fees levied on industry members, and nearly all those user fees are drawn from drug, not food producers. Specifically, according to FDA, food regulation activities account for 18% of FDA’s budget, but only 1% of that funding comes from food industry user fees, while 65% of the funding comes from the drug industry. The rest comes from the Treasury.

Therefore, LaRae-Perez says that migrating food safety regulation to a new agency would require Congress to allocate much more than half of the current FDA Treasury funding to a new food safety agency, or the new food safety agency would have to start imposing significant user fees on food producers to fill the gap.

Many argue that the bigger and probably more important issue, which needs to be addressed whether the agency is split or not, is increasing FDA’s budget. “Currently, the FDA does not have the resources to inspect every food facility every two years as required by the FDA,” Williams says. “Realistically, this is done every three to five years. If the agency does get split, I think we need to understand the impact this could have on the FDA’s budget, as some shared resources may not be able to be shared anymore after the split. This could have a serious impact on both the food and drug industries, as well as consumers.”

in advance of or in lieu of an inspection; being notified when designated food categories, such as infant formula, are likely to experience shortages or when supply chain disruptions are anticipated; expanding the criteria for suspension of registration for food facilities; invoking civil monetary penalties for various violations; and granting administrative authorities that allow FDA to use a progressive enforcement strategy that does not require a determination of serious adverse health consequences or death to humans or animals.

Additionally, the report recommended that FDA be bolder in strengthening its implementation and use of existing FSMA authority to collect user fees; use its mandatory recall authority more frequently—especially for life-sustaining products that are the only source of nutrition for certain populations; and more effectively identify opportunities to monitor both industry and consumer behavior to better understand industry implementation and consumer response to FDA’s nutrition initiatives.

Some recommendations called for radical changes within the agency, Acheson says, and now the industry is waiting for Dr. Califf to respond. “The priorities on the hill are not this, however, so, it may be more about what can be done without congressional approval, and that would mean an internal restructuring,” he adds. One example of this restructuring could involve creating a new component within FDA that would effectively contain everything that a new agency would contain, but with lower costs being and without the disruption and need for statute change, which Acheson believes is highly unlikely at the moment, despite the bill.

The Advantages of an Agency Split

While it’s hard to say whether there would be any immediate benefits for either industry or consumers without seeing a detailed action plan, Acheson believes one of the biggest potential benefits of separating FDA into two agencies is having a split leadership team. “Currently, most of FDA’s leadership comes from the drug and medical device industry,” he says. “By splitting the agency, we could see leaders with extensive knowledge in the industry they are regulating ensuring that doctors are not responsible for developing food safety pol-

icies and food safety experts aren’t weighing in on drug approvals.”

Additionally, a potential split of FDA between food and drugs could lead to a potential merger between USDA’s food safety responsibilities and those of FDA. “We’ve experienced so many issues within the food supply chain that come from the farming sector, later trickling down to manufacturing, then to retail, that it has left many food industry professionals questioning the separation of powers between the two agencies,” Williams says. “Due to the already existing overlap between the FDA and USDA, this could make regulating these products much easier in the future.”

Is a Split Really Possible?

While there are plenty of advocates for a split, making it happen would come with challenges. FDA would need to allocate team members to oversee each sector, hiring more experts to work on one side of the agency or even both, to keep things moving. Challenges within the food supply chain or the drug supply chain may also be burdensome.

Still, Williams says, “Never say never.”

“I think if the FDA is supportive of it, Congress will likely align with whatever the FDA thinks is best, as long as it’s not costing them more money,” he adds. “However, the split could mean a more immediate need for an increase to the FDA’s budget, which some members of Congress would likely not support. I also think the push from big pharma and their powerhouse of lobbyists could help push this along. The pharmaceutical industry feels that they would be able to get drugs approved faster if the agency was split, which has a direct impact on a pharmaceutical company’s bottom line.”

Ronholm agrees and expects more dialogue on the idea to happen in 2022. And even if it doesn’t, the Reagan-Udall Foundation report revealed a lot of organizational failures that validated what many food safety experts have been saying for years, and he believes FDA will take many of the ideas for betterment into consideration, which would have a huge impact on food safety going forward. ■

Loria is a freelance writer based in Virginia. Reach him at freelancekeith@gmail.com.

Legal Update



FDA's New Food Traceability Rule

The rule establishes new recordkeeping requirements for a list of foods and will likely go into effect in 2026

BY SHAWN K. STEVENS, ESQ., AND ELIZABETH PRESNELL, MS, ESQ.

In November 2022, FDA published the long-anticipated final rule addressing traceability of foods. The rule, titled “Requirements for Additional Traceability Records for Certain Foods,” establishes certain traceability recordkeeping requirements for a variety of foods. This rule continues FDA’s work to implement the Food Safety Modernization Act (FSMA), and the additional traceability requirements imposed are due to the requirements of FSMA. These additional requirements go beyond the standard “one up, one down” tracking that currently occurs to better allow FDA to respond to and investigate foodborne illnesses.

The requirements of the rule apply only to the foods identified by FDA as high risk and listed by FDA on the Food Traceability List (FTL). FDA evaluated a com-

prehensive list of foods based on historical illnesses associated with the food, the potential for contamination and pathogen growth within the food, and consumption rates of the food, among other factors. From that evaluation, FDA identified certain types of food that presented a higher risk of foodborne illness. The FTL generally includes products such as soft and semi-soft cheese, shell eggs, nut butters, fresh produce items, deli salads, and fish and shellfish. Unless an exception exists, foods that contain even a single item on the FTL are also subject to the requirements of the traceability rule.

What’s Required

Companies subject to the additional requirements must develop a traceability plan that applies to each food on the FTL

that is manufactured, processed, packed, or held by the company. The traceability plan must include procedures for maintaining the required records, procedures used to identify which foods are subject to the requirements, procedures to assign traceability lot codes (when applicable), and a statement identifying a point of contact for questions about the traceability plan. In addition, for farms or aquaculture operations, a farm map must be included showing the location and name of each separate growing area or container, including geographic coordinates and other information necessary to identify the specific growing location.

Traceability lot codes are assigned only at three points of operations: the initial packing of a raw agricultural commodity (other than food obtained from a fishing vessel), the first land-based receiving of a food obtained from a fishing vessel, and every time the food is transformed. Transformation is any point in a food’s supply chain that involves changing a food through manufacturing, processing, packing, or labeling, for example, where the output food is also on the FTL. When the processing of a food listed on the FTL results in an output food that is not on the FTL, records are required under the rule for receipt of the food, but generally speaking, the food is no longer subject to the requirements of the rule after such processing.

Records required under the rule depend on the stage of the supply chain. Generally, however, records must include the location information for the immediate subsequent recipient, for the immediate previous recipient, and for any processing that occurred. In addition, quantity and product descriptors are required. Finally, for each transfer throughout the supply chain, a specific reference document must be associated with the transfer. Reference documents are business transaction documents that reflect the transaction or process, and may include purchase orders, invoices, batch logs, or production logs.

After a request by FDA, companies subject to the requirements of the Rule must provide an electronic sortable spreadsheet with the required data. Certain companies with annual values of sales below designated levels do not need to provide the electronic spreadsheet (and can instead provide the information in any

format). After a request by FDA, the spreadsheet (or alternative data formats) must be provided within 24 hours unless FDA has agreed to a longer timeframe.

Who Has to Comply

Generally, all companies that handle a human food type on the FTL are subject to the rule; however, FDA has provided certain exceptions based on company size or company type. In addition, certain products that may otherwise be subject to the requirements of the rule are exempt from the requirements in certain circumstances. When an exemption is available and applicable, however, modified record requirements are typically triggered to demonstrate that the exemption is applicable and to ensure that the traceability chain is intact until the exemption applies. Product-based exemptions include produce that is rarely consumed raw, food that has been subjected to a kill step, and food that has been transformed such that the final product is no longer listed on the FTL.

Here, FDA has provided an example of canned spinach as a product that would be exempt from the requirements. Prior to treatment, leafy greens are listed on the FTL and, as such, spinach would be subject to the traceability requirements. However, canning acts as a kill step and transforms the product, a fresh leafy green, into a cooked, non-fresh leafy green, which is not listed on the FTL. The canning processing step would, regardless, be subject to recordkeeping to demonstrate why the exemption applies, and the canner would still need to comply with record requirements applicable to receivers of foods on the FTL, as the food was received while not eligible for an exemption.

In addition to product-based exemptions, exemptions or modified requirements exist for small producers, small retail food establishments and restaurants, and operations engaged in certain types of processing or holding of food. In addition, the requirements of the rule do not apply to transporters of food, but both intra- and

inter-company transport of food would require recordkeeping of the shipping and receiving activities.

When Do We Need to Comply

FDA has determined that a single compliance date would be best for the rule due to the interconnectedness of the food supply chain. Thus, all companies subject to the requirements of the Rule must comply by January 20, 2026.

FDA's final rule requiring additional traceability records for foods identified as high risk will require substantial changes to the information-sharing practices within the food industry but will provide FDA with the information necessary to take rapid, effective action in cases of food-borne illnesses. ■

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Allergen Control



Global Allergen Labeling

The current state of allergen regulations worldwide, plus a look at priority allergen lists

BY STEVE L. TAYLOR, PHD, AND JOSEPH L. BAUMERT, PHD

Over the past 25 years, food allergies have been recognized worldwide as an important public health issue. Specific avoidance diets remain the primary approach to the prevention of reactions among consumers with food allergies. The simple advice, for those who are allergic to peanuts or milk, for example, is just to avoid those foods or any ingredients derived from those foods. For packaged foods, ingredient statements on food labels are the key source of information for

allergic consumers wishing to avoid specific foods.

Consumers with food allergies and their caregivers are likely the most diligent label readers in the marketplace, as their health and safety depend upon careful selection of food products. But, in reality, the seemingly simple advice to avoid allergenic ingredients can become quite challenging. Consumers with milk allergies must learn that casein and whey are terms that signify the presence of milk, that gluten and semolina mean wheat, and that

tahina means sesame seeds, among many more examples.

General Labeling Regulations

Historically, many countries have stipulated general food labeling laws and regulations that served to protect food-allergic consumers to some degree. These general food labeling laws and regulations required that the ingredients intentionally used in the formulations of the foods should be declared on an ingredient list on the package label; however, these general food labeling provisions did not fully protect food-allergic consumers for a variety of reasons.

First, many exemptions and exceptions existed. Declaration of the sources of some ingredients was not required. Ingredients were often declared by using their common and usual names, which meant using technical terms (e.g., casein) that did not directly reveal the true source. Thus food-allergic consumers found that allergens were often “hidden” in packaged food products. Furthermore, they had to learn to identify technical ingredient terms such as “casein” that indicated the presence of specific allergenic foods. Vague terms such as “hydrolyzed vegetable protein” were allowed in some countries and these did not reveal the source. Some countries had regulations that did not require the labeling of ingredients in complex formulations when the ingredient comprised less than 25% of the finished food; other countries exempted labeling of minor ingredients comprising less than 2% of the formulation.

The History of Food Allergen Labeling Regulations

The plight of food-allergic consumers and their struggles in implementing specific food-avoidance diets were first recognized in the 1990s. Several Nordic countries developed a working paper on food allergens and labeling in 1993 that was submitted to the Codex Alimentarius Commission (CAC), an organization that oversees the

Food and Agricultural Organization (FAO) and the World Health Organization (WHO) to develop food standards and guidance that could be recognized and harmonized worldwide. CAC does not promulgate regulations but does provide guidance that individual countries and regulatory jurisdictions may consider and use as they develop regulations.

In response to the Nordic working papers on food allergens, a FAO Technical Consultation was formed in 1995, which led to the development of the first global list of priority allergenic foods (see Table 1, below). This list was formally adopted by CAC in 1999. The CAC list of priority allergenic foods served as guidance to all countries, but individual countries had the option to adopt this list or to modify the list as they might choose.

Several comments are appropriate regarding the approaches used by the 1995 expert panel to develop this priority list of allergenic foods. In 1995, the level of published information regarding the comparative prevalence of allergies to specific foods was rather limited and primarily consisted of information on pediatric populations of allergic individuals. These data were primarily from referral centers, which see more allergic patients so extrapolation of the prevalence of pediatric allergies to the overall population may have been slightly biased. Data were lacking on adults with food allergies and on the prevalence of specific food allergies in the general population.

Accordingly, the panel relied, in part, on expert judgment to develop the 1999 priority allergen list. The main criterion

for inclusion was comparative prevalence, although the differential severity of certain allergenic foods was also recognized. On this basis, milk, eggs, fish, crustacean shellfish, peanuts, soybeans, tree nuts, and cereal grain sources of gluten were considered the priority allergenic foods.

The existence of different priority lists in various parts of the world can lead to trade disputes and consumer confusion.

The FAO group also considered celiac disease, intolerances, and sensitivity reactions, in addition to food allergies. Thus, gluten was included because of its association with celiac disease, and sulfites were included because of the documented severity of sulfite-induced asthma, even though these illnesses are not true food allergies.

Subsequently, an International Life Sciences Institute (ILSI) Europe Task Force on Food Allergy took a more in-depth look at foods that merited placement on the priority allergenic foods list (*Allergy*, 1998;53:3-21). The criteria used by this group included clinical evidence of an allergic reaction through double-blind, placebo-controlled food challenge (DB-PCFC) and published evidence of severe and/or fatal anaphylactic reactions. Data on prevalence were considered insufficient. This task force determined that the priority list should include milk, eggs, fish, crustacean shellfish, peanuts, soy, tree nuts, wheat, and sesame seeds. Several subsequent groups within ILSI Europe have continued to develop criteria for the selection of allergenic foods of public health significance (*Regul Toxicol Pharmacol*. 2008;51:42-52; 2011;60:281-289). The criteria have been expanded to include prevalence, severity, and potency.

The adoption by CAC of the priority list of allergenic foods prompted numerous countries to develop their own regulatory lists for the labeling of priority allergenic foods. The eight foods or food groups from that 1999 CAC list were represented on the vast majority of the priority food allergen

lists recognized by specific countries; this group of allergenic foods began to be referred to as the “Big 8.”

Several countries, however, decided to include additional foods on their priority allergen lists. As a result, the regulatory framework for the labeling of allergenic foods differs from country to country. The basis for inclusion of additional foods on the priority lists for specific countries has not been clearly delineated but is based, in part, on regional differences in the prevalence, severity, and potency of specific allergenic foods. The role of scientific criteria in these judgments appears to be secondary in many cases. While the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures recognizes the 1999 CAC list, the existence of different priority lists in various parts of the world can lead to trade disputes and consumer confusion.

Global Differences in Lists of Priority Allergenic Foods

Regional differences appear to exist in the prevalence of food allergies around the world. For example, buckwheat allergy is much more common in Southeast Asian countries where soba noodles are frequently consumed but is a rare form of food allergy in North America and most other parts of the world. The identity of the most common allergenic foods differs among countries/regulatory jurisdictions (such as EU and Australia/New Zealand) in part as a result of these regional differences.

In the U.S., the priority list of allergenic foods was established by action of the United States Congress when it passed the Food Allergen Labeling and Consumer Protection Act (FALCPA) in 2004. FALCPA established a list of priority allergenic foods that was quite similar to the 1999 CAC list (see Table 2, p. 16). The only exception was that FALCPA specifically identified wheat as a cause of food allergies and does not recognize other grain sources of gluten. More recently, the U.S. Congress passed a bill that has prompted the FDA to include sesame seeds on the list of the priority allergenic foods, effective this year.

The first priority list of allergenic foods for the EU was established by EC Directive

(Continued on p. 16)

Table 1. The 1999 Codex Alimentarius Commission List of Priority Allergenic Foods: “The Big 8”

- Cereals containing gluten, i.e., wheat, rye, barley, oats, spelt, or their hybridized strains and products of these;
- Crustacea and products of these;
- Eggs and egg products;
- Fish and fish products;
- Peanuts, soybeans, and products of these;
- Milk and milk products (lactose included); and
- Sulphite in concentrations of 10 mg/kg or more.

(Continued from p. 15)

Table 2. Global Priority Allergenic Food Lists 2022

	Codex Alimentarius Commission	U.S.	EU	Canada	Australia/ New Zealand	Japan	Korea
Milk	X	X	X	X	X	X	X
Eggs	X	X	X	X	X	X	X
Peanut	X	X	X	X	X	X	X
Gluten	X		X	X	X		
Wheat	X	X	X	X	X	X ^a	X ^b
Crustacea	X	X	X	X	X	X ^a	X ^b
Fish	X	X	X	X	X		X ^b
Soybean	X	X	X	X	X		X
Tree nuts	X	X	X	X	X		
Sesame seed		X	X	X	X		
Mollusks			X	X			
Mustard			X	X			
Celery			X				
Lupine			X		X		
Buckwheat						X	X
Other					X ^c	X ^a	X ^b

a Japan: Shrimp and crab are the only crustacea on the list. Grains include wheat and buckwheat but not other cereal sources of gluten. “Other” includes foods that are on a recommended but not required labeling list including salmon, salmon roe, mackerel, abalone, squid, beef, pork, chicken, soybean, orange, kiwi, banana, peach, apple, yam, gelatin, matsutake mushroom, and walnut.

b Korea: Shrimp and crab are the only crustacea on the list. Grains include wheat and buckwheat but not other cereal sources of gluten. “Other” includes peach, pork, and tomato.

c Australia/New Zealand: Bee pollen, propolis, and royal jelly are also on the list.

2003/89 but has been subsequently expanded by more recent directives (see Table 2, above). The EU list includes sesame seeds, mustard, celery, molluscan shellfish, and lupine in addition to the Big 8. The European Commission relied upon the expert opinion of the European Food Safety Authority (EFSA) Scientific Panel on Dietetic Products, Nutrition, and Allergies for the addition of molluscan shellfish and lupine to the EU priority allergen list (*EFSA J.* 2006;327:1-25; 2005;302:1-11).

The decision on lupine appeared to be based upon the recognition that some peanut-allergic individuals will experience allergic reactions to ingested lupine. Several non-EU countries have adopted the EU priority list of allergenic foods

(Ukraine, United Kingdom, Iceland, Switzerland, Turkey, and Russia).

In Canada, the original priority allergen list included the Big 8 list with the addition of molluscan shellfish and sesame seeds. More recently, Canada has added mustard to its list. In Australia and New Zealand, the priority list has gone through a couple of iterations but now includes the Big 8 plus sesame seeds, molluscan shellfish, lupine, bee pollen, propolis, and royal jelly (see Table 2, above).

Japan has a rather unique approach to its priority list, with a short mandatory labeling list and a longer recommended labeling list. The mandatory priority list in Japan comprises wheat, milk, eggs, peanuts, buckwheat, and crustacean shellfish

(see Table 2, above). Crab and shrimp are identified as the only crustacean shellfish of concern. Japan and Korea are the only countries that list buckwheat on their priority allergen lists. Buckwheat is known to cause frequent and occasionally severe allergies in Japan (*Adv Food Nutr Res.* 2011;62:139-171; *Allergy Clin Immunol Int.* 2003;15:214-217).

The recommended priority list in Japan is extensive and includes several molluscan shellfish (abalone, squid), several fish (mackerel, salmon, and salmon roe), several fruits (orange, kiwi, peach, apple, banana), one tree nut (walnut), several meats (pork, chicken, beef), soybeans, matsutake mushrooms, yams, and gelatin. The basis for the Japanese priority list

was a survey of allergy clinics in Japan in which the causative foods in more than 1,500 cases of food allergy were compared (*Allergy Clin Immunol Int.* 2003;15:214-217).

The 1999 CAC priority list includes several food groups: tree nuts, fish, and crustacean shellfish. In most countries, fish refers to all species of finfish. The exception is Japan, where only mackerel and salmon are included on the recommended priority list for allergenic foods. Similarly, crustacean shellfish refers to all species of shrimp, crab, and lobster in most countries; in Japan, only crab and shrimp are included on the mandatory priority list for allergen labeling. In several countries including Canada, the labeling regulations refer only to shellfish and not specifically to crustacean shellfish or molluscan shellfish.

Greater differences occur among various countries as to which tree nuts are recognized as part of the group covered by allergen labeling regulations. In Europe, the tree nuts group includes walnuts, pecans, cashews, pistachios, almonds, hazelnuts, Brazil nuts, and macadamia nuts. In Canada, these same eight nuts are listed along with pine nuts; however, the U.S. Congress did not identify specific tree nuts that required mandatory labeling under the provisions of FALCPA. Subsequently, FDA issued a draft guidance document in October 2006 that included a very long list of 19 tree nuts that would need to be specifically included on U.S. food labels. Unfortunately, this list includes several foods that are not tree nuts by botanical definition (coconut and litchi).

Table 3. 2022 Recommendations on Priority Allergenic Foods from the Ad Hoc Joint FAO/WHO Expert Consultation on Risk Assessment of Food Allergens

- Cereal containing gluten (i.e., wheat and other *Triticum* species, rye and other *Secale* species, barley and other *Hordeum* species, and their hybridized strains);
- Crustacean;
- Eggs;
- Fish;
- Peanuts;
- Milk;
- Tree nuts (hazelnut, cashew, walnut, pistachio, pecan, almond); and
- Sesame.

Recent FAO/WHO Recommendations

In 2020, on request from the Codex Committee on Food Labeling (CCFL), an ad hoc Joint FAO/WHO Expert Consultation on Risk Assessment of Food Allergens was established. In the first of a series of meetings held in late 2020 and early 2021, the consultation developed recommendations relating to the priority list of allergenic foods based on updated information. Considerably more scientific and clinical information was available than had been the case in the previous FAO consultation in 1995. The expert panel based their updated recommendations on the prevalence, potency (threshold dose considerations), and severity of allergic reactions to specific foods.

As a result of these deliberations, a new, revised list of priority allergenic foods was established (see Table 3, below) that included eight foods or food groups, as before; however, the experts recommended deletion of soybeans from the priority list along with the addition of sesame seeds. This recommendation has been forwarded to the CCFL for consideration and, if approved at that level, will be forwarded to the CAC to create the basis for revised worldwide guidance on allergenic food labeling.

Soybeans were removed from the priority list of allergenic foods based on the low prevalence of soybean allergy, especially among older children and adults, the decline in soybean allergy in infancy, possibly owing to a decreased use of soy-based infant formula, the lower potency of soy protein for elicitation of allergic reactions, and an observed low degree of severity of allergic reactions to soybean reported across all Codex regions. Sesame seed was added to the priority list because of moderate levels (compared with other priority allergenic foods) of prevalence, potency, and severity of allergic reactions. Also, many individual countries had already added sesame seeds to their priority allergenic food lists based on their own assessment of risk factors for sesame seed allergy.

In the recommendation from the expert consultation, the category of tree nuts was restricted to those tree nuts for which evidence of prevalence, potency, and/or severity merited their inclusion. The tree

nut list included hazelnut, walnut, pecan, cashew, pistachio, and almond.

The expert consultation also pointed out that regional differences could exist with respect to prevalence, potency, and severity that could merit the inclusion of additional foods on the priority list of allergenic foods in certain countries. Examples might include buckwheat in Japan and Korea and celery tuber in the EU.

Ingredients Derived from Priority Allergenic Foods

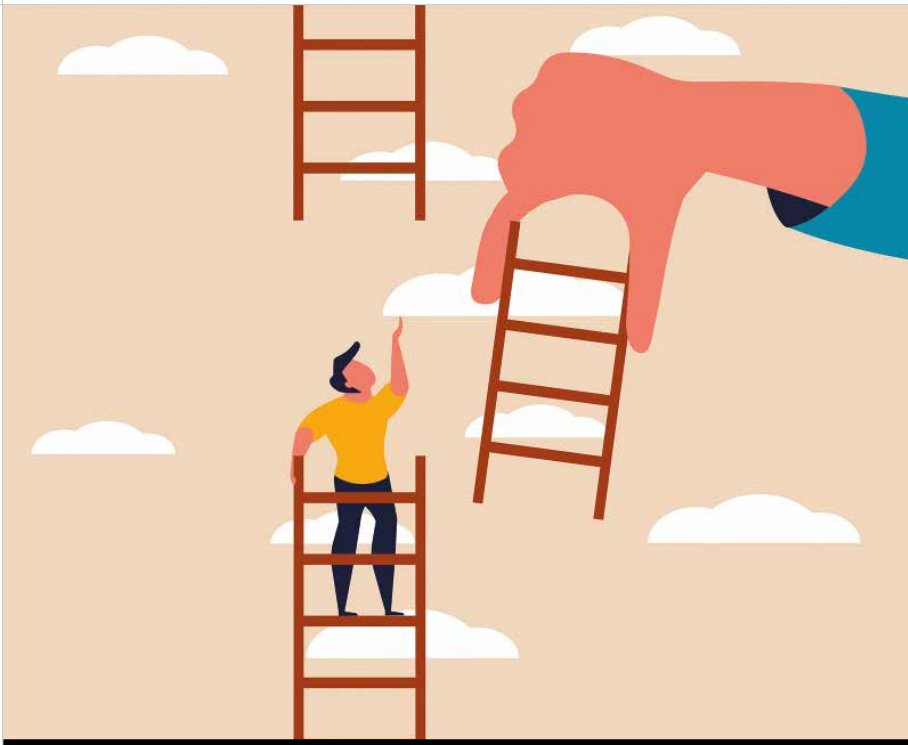
The original 1995 list of priority allergenic foods also referred to “products of” those foods. Many food ingredients are derived from the priority allergenic foods that were shown to have medium to high potency and a higher proportion of reported anaphylaxis in more than three Codex regions.

Examples of such ingredients contain large amounts of protein from the allergenic source, while other ingredients contain very low levels of residual protein from the source food. Several countries have exempted certain ingredients from their source labeling provisions. In the U.S., all highly refined oils, including those made from peanuts and soybeans, are exempt. In the EU, highly refined soybean oil is exempt but highly refined peanut oil is not. The EU has also exempted certain other derivatives from source allergen labeling, including wheat starch hydrolysates and fish gelatin for vitamin encapsulation; however, until now, no global consensus has existed to make decisions about source labeling exemptions for certain food ingredients derived from priority allergenic foods.

The ad hoc Joint FAO/WHO Expert Consultation on Risk Assessment of Food Allergens took up the topic of assessment of the allergenicity of derivatives from priority allergenic foods at its most recent meeting in November 2022. The recommendations of that consultation are not yet public, but recommendations for a framework by which labeling exemption considerations could be evaluated were made for further consideration by CCFL to create a basis for global scientific consensus on source labeling exemption decisions. ■

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Career Development



Food Safety Workforce Development

The industry has a broken career ladder. How do we fix it?

BY PATRICIA A. WESTER

In the United States, school counselors often meet with middle school students to discuss their future education plans and career objectives. Students who express an interest in advanced professional careers are given advice on an appropriate high school curriculum to follow that supports preparation for college. Those who plan to attend college but have not decided on a specific major will be directed to a general course of study while making a final decision.

Once in college, there is a grace period before a major must be declared, but eventually one must be selected so the appropriate elective courses can be com-

pleted. Students interested in obtaining an advanced degree must complete the required post graduate courses needed for a master's or doctorate.

Not all students are college bound; students who may be interested in working in the trades (electrician, plumber, mechanic, computer technician) are directed accordingly to short term programs in their chosen field. Some of these skillsets can be obtained at local community colleges or through online certificate programs. Many of these professions are overseen by licensing entities to ensure that competence requirements are met on a continuing basis. Many students enter the workforce directly

from high school, particularly in areas where large manufacturing facilities or distribution centers are located.

Until recent years, the traditional academic track was not available to students interested in a career in food safety. Even today, a mere handful of schools offer a food safety major, limiting access to the broader public and restricting the number of graduates annually available for employment. In fact, few were even aware there was such a track unless a food manufacturer was located nearby.

As a result, staffing in the field of food safety has traditionally prioritized ongoing workplace education coupled with skills development and formal external training as needed to meet regulatory requirements. Otherwise known as “workforce development,” this route allows employers to meet the job-specific needs of food safety in the absence of more traditional academic options.

Workforce development can be described as an interconnected set of solutions developed to meet employer needs for skilled workers. In food safety, this can include a wide range of knowledge, given the diversity of food manufacturing techniques and ever-increasing food hazards. The ideal goal of workforce development is to create a structure in which workers are placed in jobs where there are career development opportunities, providing an incentive for workers to systematically advance by acquiring the new skills and additional knowledge needed to achieve the goal of promotion to a management position. That's quite a mouthful, just to say that there are limited opportunities to pursue a defined career path in food safety.

Along Came FSMA

As new microbiological hazards emerged in the 1990s, external training in Hazard Analysis and Critical Control Points (HACCP) became a USDA-FSIS requirement, and the position of HACCP manager represented an advanced career step for those in the meat and poultry industry.

HACCP training was a one-time, three- or five-day course that did not typically require an exam for completion. A simple certificate of attendance was adequate to prove completion, and there was no requirement for ongoing professional development. This remained one of the most advanced food safety positions on the production floor until the Food Safety Modernization Act's (FSMA's) Preventive Controls regulations were published.

Under FSMA, the HACCP manager role in FSIS was elevated to the Preventive Controls Qualified Individual (PCQI) role for FDA-regulated producers. FSMA placed the ultimate responsibility for food safety on the "owner, operator, or agent in charge" and required all personnel to be qualified for their assigned positions. The role of PCQI expanded workforce training requirements, requiring a minimum of eight hours per year of ongoing professional development training, but still remained a single external course from an approved trainer accompanied by a certificate of completion that is applicable to all types of foods produced. From produce to cupcakes, a PCQI certificate is transferable to any FDA-regulated facility.

In other words, the majority of today's food safety employees are developed internally with limited advancement choices. In fact, most food safety team staffing typically relies on an informal career path of internal promotion based on the completion of external workforce training such as HACCP or PCQI in conjunction with other basic job performance criteria.

Workforce Development

Workplace training is often focused on a specific job or skill that is necessary to perform an employee's job. It is generally a compulsory component of employment and can be a regulatory requirement for HACCP or the PCQI role outlined in FSMA. Workforce development is different from workplace training; workforce development is considered a more long-term, ongoing strategy to help improve a workforce or build capacity.

Workforce development helps to create a culture of learning and constructive attitudes that builds a workforce's tangible and intangible abilities to manage and deal with future challenges. Research shows that skills development and op-

portunities for professional and personal growth are important aspects of employee retention, especially among millennial workers. When an employee feels like their leadership skills are being valued and nurtured, they are less likely to leave a company.

In an industry already combatting increasingly high rates of employee turnover, the need to shift from workforce training models to a workforce development model is crucial. Today it is reported that 36% of millennials and 53% of members of Gen Z would leave a job to join a new organization within two years if given the chance to advance elsewhere. In food safety, these numbers could be significantly higher.

Often, workforce development opportunities are highly sector specific, which is not a workable solution in food production. The current mandated workforce training doesn't differentiate between the relatively safe production of cupcakes and cookies and foods such as refrigerated pasta salads that can present multiple hazards, leaving a gap that will require a modified approach that combines the broader workforce development theories with the specifics of workplace training models.

Food Safety Auditors

A similar situation applies to those who perform supplier or third-party audits. In addition to the food product sector-specific knowledge needed to adequately assess a facility, auditors must also acquire the skills and knowledge needed to perform an effective audit. Ironically, one must have auditing experience to become an auditor, but without auditing experience, one can't audit. This perpetual circle creates a vacuum where auditors are receiving a wide range of initial auditing experience, with some good, some bad, and some downright awful. Unlike PCQI training, which covers all FDA foods, audit experience does take into account the types of products one is considered approved to audit, but there are still knowledge gaps to be addressed.

All Global Food Safety Initiative (GFSI) auditors must have a significant amount of auditing experience in each requested food category to be approved to perform an accredited certification audit, which helps address the experience component missing in the PCQI training; however, all food categories and prior audit experience

are often treated as equivalent. There is no distinction between the higher risk, more challenging audits of a ready-to-eat food facility and the lower risk, more simplified audits of a cracker facility. This can easily be seen when reviewing job descriptions for food auditors. Most include a complete list of skills and knowledge needed to be able to audit any type of food, yet that may be overkill if the auditor will primarily be assessing pesticide applications in orchards. In terms of career advancements, once an auditor is approved to audit, they can request additional categories in a variety of ways, but there are no formal paths to achieve this growth and no additional advancement for those who do.

On the downside, limited mechanisms exist to remove auditors delivering unsatisfactory reports from a category or from the field of auditing in general. This is especially true for auditors operating as independent contractors. One certification body may stop using an auditor, but others may be unaware of the shortcomings of the auditor until they too receive unsatisfactory results.

Are Credential Programs the Answer?

Many industries find themselves in the same predicament as the food safety sector and have turned to the use of credential programs to solve their capacity and skills gaps. Unlike workplace training models, in which attendees receive a certificate of attendance or completion, credential holders must pass an exam to participate in the program and must then complete a required amount of approved, ongoing training for each two-year cycle. These programs offer a standardized record of accomplishments that can support career advancement. Further, a credential can be withdrawn if the participant does not continue to meet the program requirements.

The dedicated staff who protect our food supply every day deserve the recognition and rewards they have so clearly earned. It's up to the industry to improve how we develop the leaders of tomorrow. These issues and potential solutions will be explored in future segments of this department in *Food Quality & Safety*. ■

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The **Safety** of Imported Food

How initiatives in place both domestically
and abroad help regulate foods imported by the U.S.

BY KAREN APPOLD

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The United States imported approximately 17% of its food supply in 2021, according to USDA's Economic Research Service. The amount of imported goods has continued to rise over the last 15 years, in both the total volume of products and the number of discreet line items submitted for import. Currently, approximately 125,000 food facilities and farms located in more than 200 countries and territories supply about 32% of the fresh vegetables, 55% of the fresh fruit, and 94% of the seafood that Americans consume annually.

"When these foods are imported, there may be a greater chance for biological, chemical, and physical hazards to occur due to agricultural practices, growing conditions, infrastructure, and transportation in foreign countries," says Ben Miller, PhD, MPH, vice president of scientific and regulatory affairs at The Acheson Group in Northfield, Minn. "Each of these food categories has experienced both domestic and international outbreaks."

In 2022, approximately 15 million imported food shipments entered the United States. "This increasingly globalized and complex marketplace has placed new challenges on America's food safety system," says Robert Tuverson, a retired international policy analyst for FDA's Center for Food Safety and Applied Nutrition in College Park, Md., and USDA's Food Safety and Inspection Service (FSIS) in Washington, D.C.

Foods imported into the U.S. are regulated by two agencies, Tuverson says. Imports of meat, poultry, and certain egg products are the jurisdiction of USDA's FSIS. FSIS regulations necessitate that imported products only come from establishments that fully comply with food safety requirements in countries maintaining foreign food safety control systems evaluated by FSIS and determined to be equivalent to that of the U.S. All other imported food products are regulated by FDA and may enter U.S. commerce from FDA-registered foreign facilities located in any country, as long as they comply with the requirements of the Food, Drug and Cosmetic Act of 1938 and, since 2011, The Food Safety Modernization Act (FSMA).

FDA Initiatives

Prior to 2011, FDA relied on physical inspections at the port of entry to screen imported foods for product safety. Years of budget limitations to hire inspectors, along with the increase in imported goods, resulted in an inspection rate of lower than 2%. To increase oversight without significantly increasing inspection staff, FDA has taken many other steps to ensure the safety of foods that enter the U.S. A series of large multi-state outbreaks in the U.S. during the early to mid 2000s also contributed to the passage of FSMA. Its rules specify that foreign companies that export food into the U.S. must meet the same regulatory requirements as companies that produce food domestically, Dr. Miller says. Until the passage of FSMA, compliance to U.S. laws and regulations was not required or verified, a gap that surprised many.

The U.S. Congress tasked FDA to develop specific regulations for food importers to improve oversight and prevent future outbreaks. The FSMA final rule on Foreign Supplier Verification Programs (FSVP), published by FDA in 2015, the rule applies to both human and animal food. "FSVP is in place to protect consumers and to prevent a problem from arriving at the port of entry," says Tracy Fink, MSc, PCQI, director of Scientific Programs and Science and Policy Initiatives at the Institute of Food Technologists in Chicago. "U.S. importers that haven't developed or implemented

"[Global Food Safety Initiative programs] are helping to raise the food safety bar globally, by promoting the adoption of best practices and standards, supporting the development of food safety systems in developing countries, and encouraging collaboration and knowledge sharing among food safety experts and major food companies

—BEN MILLER, PhD, MPH

FSVPs for their products to meet the FSVP regulation are subject to warning letters, import alerts, and other regulatory actions by the FDA."

By requiring U.S. food importers to ensure their overseas suppliers' compliance with FSMA's preventive controls for food safety requirements, FSMA legislation has shifted the burden to importers and producers to ensure that food products are safe before they're shipped, rather than relying exclusively on port-of-entry inspection to ensure food safety. "Product-by-product inspection of import shipments is not possible given FDA's finite resources and the current volume of food imports," Tuverson says.

With FSMA in place, FDA can better allocate its limited resources to audit-based verification of producer compliance, including risk-based foreign facility inspections, FSVP audits, and the Accredited Third Party Certification program, Tuverson adds. In this voluntary program, FDA recognizes the accreditation bodies responsible for third-party certification bodies. The certification bodies conduct food safety audits and issue certifications of foreign food facilities. Certification audits can be used to demonstrate compliance by multiple importers, thereby reducing the number of audits necessary.

Regulatory Partnerships

Systems Recognition (SR), a partnership between FDA and a foreign government agency, is a tool used to support FSMA initiatives. The agencies operate comparable regulatory programs that yield similar food safety outcomes. Currently, three countries—New Zealand, Canada, and Australia—have SR arrangements in place with the U.S. that were put in place in 2012, 2016, and 2017, respectively. "These partnerships give consumers increased confidence in the safety of the foods regulated by participating agencies because the FDA has determined that these agencies have strong food safety controls," Dr. Miller says. SR is a voluntary program; it isn't required for access to the U.S. market.

Because the food safety agencies in these governments agree that their regulatory programs will yield similar food safety outcomes, certain foods imported from these countries to the U.S. qualify for modified verification requirements from the FSVP rule, Dr. Miller says. Specifically, the food importer doesn't have to assess the product's safety by conducting a hazard analysis, evaluating the foreign supplier's performance to define the risk posed by the

(Continued on p. 22)

(Continued from p. 21)

food, or determine the required oversight actions needed, which includes conducting the foreign supplier verification activities.

Since 2020, the failure to develop a required FSVP plan has accounted for more than 43% of FDA's citations, according to the agency. "This suggests that many importers and food companies are still unaware of FSVP requirements, when these requirements apply, and how to comply," Dr. Miller says. "This is important from a food safety standpoint, because unless someone is importing certain foods from countries with SR, the importer is required to



Helping Food Producers in Foreign Countries

The food industry, consumers in developing countries, and non-governmental organizations can play important roles in helping food producers to develop sustainable and safe foods, says Ben Miller, PhD, MPH, vice president of scientific and regulatory affairs at The Acheson Group in Northfield, Minn.

Some ways to achieve this include:

- Providing technical assistance and training on good agricultural and fishing practices, food safety, and quality control that can help producers improve product safety and quality.
- Offering capacity building by investing in infrastructure, equipment, and facilities to improve the safety and quality of food production can help farmers and the fishing industry meet international food safety standards.
- Encouraging partnerships between foreign food producers and private sector companies can provide producers with access to markets and technical assistance to improve food safety.
- Providing financial and technical assistance to farmers and the fishing industry to help them comply with international food safety standards.
- Encouraging governments in exporting countries to work with international organizations, such as WHO, to develop and implement food safety regulations that align with international standards and provide a framework for food safety management.
- Supporting local food safety programs and organizations in foreign countries can help to improve the safety and quality of food production.
- Encouraging participation in food safety schemes and certifications, such as Hazard Analysis Critical Control Point (HACCP) and Good Agricultural Practices (GAP), can help producers meet international food safety standards.—KA

conduct a hazard analysis, evaluate the foreign supplier's performance and the risk posed by the food, or determine and conduct foreign supplier verification activities. If these activities don't occur, then the importer hasn't documented that they've determined what biological, chemical, or physical hazards could be associated with the food they're importing into the U.S."

Announced by FDA in 2020, The New Era of Smarter Food Safety harnesses the power of technology and data to further improve the safety of imported and domestic food. "It aims to create a new, smarter, and more digital food safety system that will be more effective, efficient, and resilient in preventing foodborne illnesses," Dr. Miller says. The initiative is focused on four elements, including tech-enabled traceability, smarter tools and approaches for prevention and outbreak responses, new business models and retail modernization, and food safety culture.

Collaboration Worldwide

The Global Food Safety Initiative (GFSI) is a collaboration between some of the world's leading food safety experts and major retail food companies. Since 2000, the private organization has aimed to improve food safety standards and practices globally, Dr. Miller says. By working as a coalition of action, GFSI is helping to address challenges facing food safety systems in supply chains and the emerging markets they operate in several ways:

Benchmarking food safety standards: GFSI benchmarks food safety standards against a set of rigorous criteria, which helps to raise the bar for food safety globally. "By benchmarking food safety standards, GFSI helps to ensure that food safety systems in different countries and regions are equivalent in terms of their level of protection for consumers," Dr. Miller says.

Facilitating collaboration and sharing best practices: GFSI facilitates collaboration between food safety experts and major food companies, which helps them to share best practices and knowledge about food safety. This can help to improve food safety systems in different countries and regions.

Improving supply chain traceability: GFSI encourages the use of traceability systems that can help to quickly identify and respond to food safety incidents, which can help to minimize the impact of any food safety incidents that occur.

Enhancing food safety culture: GFSI helps to enhance food safety culture by encouraging companies to adopt a risk-based approach to food safety, which can help to identify and mitigate potential food safety risks.

Supporting food safety in developing countries: GFSI supports the development of food safety systems in developing countries, helping them to improve food safety and reduce the burden of foodborne diseases.

"All of these initiatives are helping to raise the food safety bar globally, by promoting the adoption of best practices and standards, supporting the development of food safety systems in developing countries, and encouraging collaboration and knowledge sharing among food safety experts and major food companies," Dr. Miller said.

In 2020, GFSI launched its "Race to the Top Framework" to improve the effectiveness of its food safety certification and audit programs, Tuveson says. This initiative emphasizes four areas of investment:



U.S. Imported Food By the Numbers

- 17%** of the U.S. food supply is imported
- 32%** of fresh vegetables are imported
- 55%** of fresh fruit is imported
- 94%** of seafood is imported
- 15 million** imported food shipments entered the U.S. in 2022
- 200** countries and territories supply imported goods to the U.S.

- **Feature 1:** Develop harmonization and benchmarking requirements for providers of food safety auditor training and ongoing continuing professional development. A pilot program to test new benchmarking requirements for validating food safety auditor credentials was launched in March 2022.
- **Feature 2:** Deliver a process of ongoing assessment and continuous alignment to the GFSI requirements for Certificate Program Owners (CPOs).
- **Feature 3:** Develop a collaborative approach to managing certification bodies among CPOs, accreditation bodies, and GFSI.
- **Feature 4:** Develop a certificate platform enabling access to certificate data of all food business operators who are certified in a GFSI-recognized program.

World Health Organization Efforts

The World Health Organization (WHO) is also at the forefront of ensuring food safety worldwide. The WHO Global Strategy for Food Safety 2022-2030 aims to reduce the burden of foodborne diseases by fostering a coordinated, multi-sectoral approach to food safety. “The strategy is designed to guide countries in strengthening their food safety systems and to enhance collaboration among countries, international organizations, and other stakeholders to improve food safety globally,” Dr. Miller says. It focuses on key areas such as strengthening food safety governance, improving risk assessment and risk communication, enhancing food safety capacity and surveillance, and promoting research and innovation.

In addition to this, WHO is employing several initiatives to ensure food safety in developing nations, such as providing technical assistance and capacity building to countries to help them develop and implement food safety policies, laws, and regulations, Dr. Miller adds. This includes providing training for food safety officials and other stakeholders, as well as offering guidance on risk assessment and risk management.

WHO also works closely with other international organizations, such as the Food and Agriculture Organization (FAO) and the World Trade Organization (WTO), as well as with the private sector,

to improve food safety in developing countries. This collaboration includes supporting research on food safety issues in developing countries, with the goal of developing new tools and approaches to improve food safety, Dr. Miller says.

Investing in Foreign Countries

In December 2022, USDA, the U.S. Agency for International Development, and FDA announced the Food Safety for Food Security Partnership (FS4FS). The initiative includes a \$15 million investment over the next five years to support the availability and trade of safe food products to reduce poverty, hunger, and malnutrition in low- and middle-income countries, Tuverson says.

The Foreign Agricultural Service maintains several fellowship and exchange programs, which provide training and development programs to researchers, policymakers, and other low- and middle-income country professionals to help promote food safety and security, as well as agricultural development and economic growth, Tuverson says.

Emerging Technologies

Some newer technologies show promise in improving food safety. One recent development is the White House’s September 2022 “Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy.” This order calls for increased international cooperation to advance the use of biotechnology and bio-manufacturing in addressing climate change, supporting supply chain resiliency, and increasing food security, Tuverson says.

The order calls for U.S. engagement with developing countries, international organizations, and non-governmental organizations through joint research projects and expert exchanges, regulatory cooperation and sharing of best practices, and open sharing of scientific data, Tuverson says. USDA already supports a wide range of activities that connect biotechnology and bio-manufacturing to climate goals, including the BioPreferred Program.

Using emerging technologies such as low- or no-cost traceability solutions breaks down financial barriers and improves response time to food safety-related issues, says Kari Barnes, regulatory standards manager at TraceGains, a supply chain solutions company in Westminster, Colo. The use of whole genome sequencing (WGS) technology, for example, also improves response time to foodborne illnesses by providing an organism’s DNA fingerprint and linking it to other cases.

Blockchain technology is a digital ledger system that can collect blocks of information throughout the supply chain, with the potential to improve traceability, deter fraud, and improve responses to contamination and incidents of foodborne illness, Barnes says.

Currently, emerging technologies are limited to developed countries with more mature physical and information technology. Importantly, many developing nations also lack the needed public health infrastructure to quickly identify foodborne illness outbreaks using WGS technologies. Likewise, the use of technologies for traceability remains limited in most developing countries outside of some specific vertically integrated supply chains, Dr. Miller says. ■

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Safety & Sanitation



nearly 50% of industrial fires and explosions between 2018 and 2021, according to the “Combustible Dust Incident Report 2021,” available at dustsafetyscience.com.

A dust collection system is used to prevent the buildup of dangerous dust in the facility as a whole and inside enclosed areas such as silos, conveyor systems, batch mixers, and other production equipment. But the dust collector and ductwork also provide many of the ideal conditions for a dust-based fire or explosion:

- The dust collector generates a lot of airflow, guaranteeing a ready supply of oxygen for a combustion reaction;
- The dust and filter media supply fuel;
- Dust inside the system is dispersed in a cloud during collection; and
- The dust cloud is contained in an enclosed area (ductwork or the dust collector filter chamber) where pressure can build up.

Under these conditions, only one more element is needed to start a combustion reaction: an ignition source, which may come from a spark from machinery or processes, an open flame or heat source, friction, or even static electricity. (Some highly combustible dusts can even self-ignite under the right conditions.) A dust collector fire may start when a spark hits a flammable filter media that is loaded with dust. If a combustion reaction starts within an airborne dust cloud inside the dust collection system, the result will be an explosion. The fire triangle and explosion pentagon show the difference (see figures 1 and 2, p. 25).

Once a fire or explosion starts in the dust collection system, it can rapidly spread to other parts of the facility, leading to widespread damage or a dangerous secondary dust explosion. For these reasons, dust collector fire and explosion safety are essential.

Five Essential Dust Collector Safety Elements

Fortunately, most dust collector fires and explosions are preventable. By removing any of the legs of the fire triangle or explo-

Dust Collector Safety

How to prevent fires and explosions in your food facility

BY RICK KRECZMER

Fires and explosions are a serious safety concern for food processing facilities, especially those working with dry powdered ingredients. An effective dust collection system is an essential element of plant safety—and also one of your biggest fire and explosion risks. Here’s what food processors should know about dust collector safety, National Fire Prevention Association (NFPA) compliance and safe system design.

How Dust Collector Fires and Explosions Occur

According to dustsafetyscience.com, dust collectors are responsible for nearly 15%

of industrial fires and explosions in North America, resulting in 25 fires and four explosions in 2021 alone. Many of these were in the food and bakery industries.

The food industry is at high risk for dust collector fires and explosions due to the nature of the dust being collected. Dry, powdered organic materials such as sugar, flour, starch, cocoa, dehydrated milk products, and other food ingredients are combustible—sometimes, highly so. The Imperial Sugar factory explosion in 2008 in Savannah, Ga., is still a cautionary tale for the industry; it resulted in 14 deaths, 36 injuries, and widespread facility destruction. Food and agriculture were responsible for



Figure 1. The Fire Triangle. Fires require fuel, oxygen, and heat or ignition.

sion pentagon, it is possible to prevent a combustion reaction from starting or stop one in its tracks. There are several critical elements to dust collector fire and explosion safety:

1. Fire/smoke detector. Every dust collector should be equipped with some type of smoke/fire detector. For dust collection systems, an ionization/thermal dual sensor is recommended; these types of detectors can respond to either smoke or heat. The detector should be wired to the control system so that it can stop the dust collector and cut off the supply of air if a fire is detected.

2. Fire suppression system. A fire extinguisher or suppression system is required for dust collectors working with flammable or combustible material. Fire suppression methods include:

- Water sprinkler system;
- Chemical foam extinguishers;
- Carbon dioxide (CO₂) gas fire suppression system;
- Clean agent gas fire suppression system; and
- Dry chemical fire suppression systems.

An internal water sprinkler system, hooked up to the facility water supply, is a simple method of extinguishing flames; however, it can also be very messy and disruptive if it goes off. Likewise, chemical foams are very messy if deployed and can contaminate the facility with toxic chemicals. For this reason, a CO₂ or clean agent gas system is often recommended as fire suppression for dust collection within a food production environment. Clean agent chemicals such as argon and nitrogen are non-toxic and do not leave any residue behind if deployed. They work by disrupting the combustion process.

Fire suppression may be passive, active, or a combination of both. A passive system—such as temperature-sensitive tubing that bursts when temperatures rise—automatically deploys the agent. An active system uses sensors to deploy agent from fixed nozzles inside the dust collector. A combination system offers the best of both worlds.

3. Oxygen dampers. A damper system shuts off the flow of air if a fire is detected. These systems can slow the progression of the fire by reducing the availability of oxygen. They can also prevent the spread of fire back into the ductwork.

Under OSHA regulations, bakeries and food processing facilities must have a combustible dust plan in place and take steps to control dust in their facilities to reduce fire and explosion risks.

4. Ignition control. Most food production activities (silo fill, conveyance, batch mixing, packaging, etc.) do not create sparks or take place near spark-producing processes. Still, ignition control is an important element of dust collector safety for food processing.

- Inspect and maintain all machinery and conveyor systems to reduce the



Figure 2. The Explosion Pentagon. A combustible dust explosion requires fuel (combustible dust), oxygen from the air, and an ignition source, PLUS dispersion of the dust in a cloud and confinement of the dust cloud. In the absence of confinement, ignition of a cloud of combustible dust will result in a flash fire.

risk of sparks created by friction of poorly lubricated parts, engine shorts, or other mechanical problems.

- Keep the dust collector away from sources of heat, sparks, or open flames.

A spark control system may be needed if there are spark-producing processes near the dust collector or intake. Spark control options include:

- Spark plates, baffle systems, or wire mesh/screen-type spark arrestors that block spark intake.
- Centrifugal spark arrestors, which strip the thermal envelope off the spark using centrifugal force.
- Active detect-and-suppress systems, which use sensors and a water or chemical extinguisher.

5. Deflagration system. An NFPA-compliant deflagration system is required when collecting combustible food dust. The system design will depend on the explosive potential of your dust and specific risks of your facility but will typically include the following elements.

- **Explosion vents** (standard or flameless) are designed to safely release pressure when it starts to rise inside the dust collection system. A flameless vent will also contain flames.
- **Isolation valves** are used to prevent the propagation of a pressure wave back into the facility.
- A **rotary airlock** is installed in between the hopper and the collection bin to prevent collected dust in the bin from becoming added fuel in an explosion.

Meeting Regulatory Requirements for Dust Collector Safety

Food processing facilities and bakeries in the U.S. must meet stringent requirements for dust collector fire and explosion safety governed by the Occupational Safety and Health Administration (OSHA). OSHA requires facilities handling combustible dust to follow guidelines developed by the NFPA for dust collection system design. Currently, there are several NFPA standards relevant to dust collection in food processing facilities or bakeries.

- NFPA 61 *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities* (2020 latest version).

(Continued on p. 37)



Infestation Investigations

Top signs of rodent infestations at food processing facilities, and tips to prevent infestations

BY JIM FREDERICKS, PHD, BCE

Many parts of the United States are in for a blistering cold winter season this year, which brings new challenges for pest management in food processing facilities. One of the most notable challenges these facilities face is increased pressure from rodents who seek out food and shelter in extreme weather. These issues are amplified by erratic weather and extreme snow, to which many areas have become accustomed. A rodent infestation could shut down a food processing facility and lead to a loss of product and profit. Additionally,

these pests can transmit diseases to employees.

Rodent infestations are extremely dangerous to the health and safety of employees who work in the facilities, as these pests can transmit *Salmonella*, which can also contaminate food manufactured in the facility. In fact, rodents are known to contaminate or consume about 20% of the world's food supply.

To prevent infestations, it's very important for facility managers and their employees to have some baseline knowledge of the different rodent species they could be facing. The most frequent invad-

ers found in the U.S. are deer mice, house mice, Norway rats, and roof rats.

- **House mice.** These are the most commonly encountered rodent in the U.S. and, despite their name, they are the most common invader of commercial facilities. They usually nest in dark, secluded areas such as storage rooms and basements. These pests can cause serious property damage by chewing through drywall and wires, which can then spark electrical fires. House mice also pose a significant threat to food processing facilities, contaminating food products and spreading disease. House mice have been implicated in the spread of *Salmonella* through their feces.
- **Deer mice.** These mice typically live in rural, outdoor areas and are less common in urban areas; however, this does not reduce the risk they pose to food processing facilities located in more rural settings. They will often prepare their nests in old fence posts, tree hollows and log piles but will also seek shelter in commercial buildings, storage areas or vehicles. Deer mice present serious medical concerns as they can be carriers of hantavirus, a characteristically influenza-like illness which can be accompanied by kidney, blood, or respiratory ailments and is potentially fatal.
- **Norway rats.** Similar to house mice, Norway rats often nest in basements, in piles of debris, and in other undisturbed areas and materials. They especially like burrowing into soil underneath sidewalks, slabs, or low-growing shrubs. Norway rats have a propensity to gnaw through almost everything, including plastic and lead pipes, which can damage food processing machinery and spark dangerous electrical fires. Norway rats are also carriers of serious diseases including rat-bite fever, leptospirosis, trichinosis, and salmonellosis.
- **Roof rats.** Named for their tendency to find shelter in the upper parts of buildings, roof rats not only damage materials by gnawing through them, but they also contaminate stored food

and serve as vectors of dangerous diseases. Roof rats are willing to eat practically anything available to them; however, their preference to feed on seeds, nuts, fruits, and berries which may draw them to food processing facilities. Roof rats secured their place in history by spreading the highly dangerous bubonic plague. Though transmission is rare today, there are still a handful of cases in the U.S. each year.

Signs of an Infestation

To keep their facilities safe, food processing facility managers need to regularly inspect the building and machinery for signs of an infestation. Here are the top signs of a rodent infestation facility managers should keep an eye out for:

- **Droppings:** Mouse or rat droppings found around the facility are some of the most common signs of rodent infestation. These pellets are often left behind in places where food is stored, as well as under sinks, inside chewed cardboard boxes, along baseboards, and on top of wall beams.
- **Gnaw marks:** Rodents can cause serious property damage by chewing through almost any type of material—including plastic and lead pipes—to obtain food or water. House mice and

Norway rats are also known to gnaw on wires behind walls, sometimes causing fires.

- **Nests:** Rodents prefer to nest in dark, secluded areas where there is little chance of disturbance. House mice, specifically, like to build their nests out of shredded paper products, cotton, packing materials, wall insulation, and fabrics. If facility managers find these materials scattered around guest rooms or common areas, it might be a sign that rodents are nearby. Norway rats typically nest in underground burrows, often near building foundations, while roof rats may nest in ceilings or attics.
- **Tracks or rub marks:** Rats tend to leave dark grease or dirt marks along walls and floorboards as they follow a trail through the building between their nest and food sources. Facility managers should keep an eye out for these rub marks, which are caused by the rat's oily fur.
- **Strange noises:** Getting complaints that employees are hearing strange noises in the walls? Chances are these sounds can be attributed to rodents scurrying about the facility, between the walls and up in attics. Rodents are especially fond of storage spaces because they prefer dark, secluded spots.
- **An actual rodent:** Mice can breed rapidly, so if a facility manager or a customer spot one mouse in the building, it's likely there are others playing hide and seek. In fact, a female house mouse can give birth to a half dozen babies every three weeks, producing up to 35 young per year.

Rodent Prevention

Food processing facilities are likely required to work with a licensed pest control company for ongoing pest inspections, routine maintenance visits, and treatments as needed. Working with a qualified pest control company is essential to ensuring your food processing facility remains pest-free. Your pest control partner will work with

you to implement an Integrated Pest Management (IPM) plan. An IPM plan is a comprehensive pest control method that focuses on three basic techniques: inspection, identification, and treatment by a pest control professional. This method will

To keep their facilities safe, food processing facility managers need to regularly inspect the building and machinery for signs of an infestation.

help to ensure that pests are properly controlled and deterred as well as to ensure that your facility is clean and compliant.

In addition to working regularly with your pest control partner, facility managers should implement these prevention tips to avoid unwanted rodent run-ins:

- Trim back trees and foliage close to the foundation;
- Seal any cracks or holes on the outside of the building;
- Repair any broken vent covers, loose siding, or shingles;
- Keep storage areas clean and organized to eliminate any potential nesting grounds;
- Properly ventilate storage areas and machinery to prevent moisture buildup that can attract pests;
- Keep food products sealed and stored properly in air-tight containers;
- Clean high-volume areas often, including employee break rooms, bathrooms, and lobby areas where crumbs and trash accumulate daily; and
- Dispose of garbage regularly and store in sealed receptacles placed at a distance from building entrances.

Rodents will be a continued threat to food processing facilities, but facility managers can ensure they're prepared through proper education, prevention, and—most importantly—a partnership with a reliable pest control professional. ■

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During testing, manufacturers should insert FDA-approved test pieces in various locations and orientations within products—for example, in the front, center, and back—and run consecutive tests.

Safety and Sensitivity

The science behind using metal test spheres to measure metal detection performance

BY ERIC GARR

Metallic inclusions are the No. 1 contaminant in food products, causing product quality and consumer safety issues; however, the orientation of a metal contaminant can affect a metal detector, as the size, shape, and symmetry of metal contaminants cannot be controlled.

As an odd-shaped piece of metal passes through a machine in different orientations, the response to each one will be different. For this reason, we use spheres to test a metal detector: A sphere does not exhibit orientation effect and will always produce the same signal when passed through the same position within a metal detector's aperture. But if you flatten out the metal or roll it into a needle or wire shape, there will be a significant difference in signal, depending on how it passes through, due to the physics of disturbing the electromagnetic field.

The general rule for like metals is that if any of the dimensions are less than the detectable metal's sphere size, the machine may have trouble detecting it in the hardest-to-detect orientation. Depending on the orientation in which it passes through, the signal will likely be much larger than that of the sphere.

These spherical test samples showcase advances in sensitivity and provide machine suppliers and buyers with a comparative benchmarking tool. They provide a solid and reliable gauge to measure machine sensitivity against. So, when a supplier reports a sensitivity improvement of 0.5 mm, this is a major concern.

Overcoming Orientation Effect

Orientation effect is a result of asymmetrical metal contaminant shards being more easily detected if they pass through the metal inspection system in one direction

rather than another. Often, it's easier to detect stainless steel and nonferrous wires when they pass through the aperture space sideways or upright, rather than in alignment with the conveyor. The reason for this is related to the magnetic permeability of the metal, which for stainless steel is much lower than for other metals.

One solution could be to position several metal detectors at various angles along the conveyor; however, this often results in a significant increase in aperture size, which diminishes the performance and sensitivity of the metal detector. Placing systems upstream throughout the process is usually more advisable.

Reducing the aperture size is another simple and effective way to increase metal detector sensitivity. Because sensitivity is measured at the geometric center of the aperture, the ratio of the aperture to the size of the product should be considered. Maximum sensitivity occurs when the contaminant is closest to the aperture walls where the electromagnetic field is strongest. It therefore makes sense that as the size of the aperture decreases, the performance of the metal detector improves.

During regular testing of food metal detectors, manufacturers should insert

FDA-approved test pieces in various locations along the product—for example in the front, center, and back—and then run consecutive tests in which the metal sphere is travelling as close to the geometric center of the aperture as possible. These tests should be performed for all package sizes and configurations. This provides extra assurance that metal detectors are performing as they should, picking up the test contaminants, regardless of metal type, size, or product masking.

Know Your Metals

The type of metal contaminant also needs to be factored into the equation. All industrial metal detectors will exhibit a different level of sensitivity for the three main groups: ferrous (such as iron or steel), nonferrous (including aluminum foil), and stainless steel. Because metal detectors work by spotting materials that create a magnetic or conductive disturbance as they pass through an electro-magnetic field, stainless steel (300 series) is typically the most difficult to detect.

Widely used in food preparation and production areas, stainless steel comes in various grades. The 300 series stainless steel is recommended for performance verifications, as it is non-magnetic and a poor electrical conductor, making it the hardest to detect. Consequently, a sphere of stainless steel hidden in a dry product typically needs to be 50% larger than a ferrous sphere to generate a similar signal size. This disparity can rise to 300% in wet

products, such as fresh meals, meat, fish, sauces, preserves, and bread, because moisture in these products creates a conductive signal, and the metal detection can be swamped by product effect, which resembles the stainless steel product effect phase characteristics.

Conversely, any product that is iron enriched, such as fortified cereals, supplements, or breakfast bars, creates a large magnetic signal that the detector must overcome in order to detect small pieces of metal. These are referred to as “dry” products and tend to be a lot easier in terms of detection capability, because there’s less worry about the product effect.

To identify a metal contaminant within conductive products, a metal detector must eliminate or reduce this product effect. The solution is to change the frequency of operation to minimize the effect of the product; however, when a metal detector’s operating frequency is altered, there’s usually a trade-off in performance.

Simultaneous frequency is the most reliable way to remove product effect without compromising the sensitivity of a metal detector.

Finding Flat Flakes

Depending on how a metal flake is lodged within a product, there is also the potential for it to completely evade a metal detector by sneaking perfectly through the electromagnetic flux without causing a disturbance in the field. Inspection systems that use multiple oriented elec-

tromagnetic fields can cover each fields’ respective weakness; this technology is especially beneficial for upstream premium applications, such as confectionery and chocolate, and has proved to be reliable at detecting very thin flakes and foils that could be introduced in the mixing, rolling, scoring, molding, or baking processes.

Sphere Size Test Thresholds

The metal detection industry has general sphere size guidelines for food producers. These are based on whether the product being inspected is wet or dry, as well as the overall size of the product. For a wet block of cheese measuring approximately 75mm high, the sphere size parameters are currently ferrous 2.0 mm, nonferrous 2.5 mm, and stainless steel 3.5 mm.

In summary, many variables that can affect a metal detector’s performance, including orientation of contaminants, the type of product passing through the detector, product size, and even at times, the surrounding environment. Machine sensitivity remains a solid and reliable gauge, however.

As with any aspect of food safety, there’s always a cause and a consequence. The value of deeply rooted experience about how different food applications behave and change, about the conditions that cause these reactions, and about the relearning limits of inspection equipment, should never be underestimated. ■

Garr is a regional sales manager at Fortress Technology Inc.



Stainless steel detection signals can be swamped by product effect in wet or salted products.



The ratio of the aperture to the size of the product is an essential consideration, as sensitivity is measured at the geometric center of the aperture.



Use Color Coding to Ensure Food Safety

A color-coding system in a food facility can help prevent cross-contamination from allergens, chemicals, and unwanted foreign bodies | BY ADAM SERFAS

As of January 1, 2023, sesame became the ninth allergen required by FDA to be labeled on packaged foods in the United States. The update came as a part of the Food Allergy Safety, Treatment, Education, and Research (FASTER) Act, which outlined the agency's approach to identifying and evaluating food allergens. In addition to updating product labels, food processors and manufacturers who work with sesame need to review their handling of the ingredient—and that's where color-coding plans come in.

Color-coded tools and color-coded cleaning rely on a system in which colors are used to designate specific sets of tools for sensitive products in a food-safe or hygiene-sensitive facility to prevent product cross-contamination from allergens, chemicals, and unwanted foreign bodies. There are several different types of basic color-coding plans: zone color coding, assembly process color coding, shift color coding, and allergen color coding. The allergen plan type is going to be the one most relevant for producers that use sesame.

A color-coding-by-allergen plan, in its most basic form, designates two colors: one for all the handling and cleaning tools and food-safe wearables that come into contact with the identified allergen

ingredient, and a second color for those that don't. Facilities that handle multiple allergens or use special chemicals might add additional colors and will often designate a separate color for use in places like restrooms or on floors and drains.

The Benefits of Color Coding

Generally speaking, a color-coding plan has many benefits: a safer staff and product, a more hygienic facility, better tool longevity, and a stronger food safety culture. A color-coding-by-allergen plan doubles down on some of these benefits in a unique way.

For all the audit components and checklists, food safety inspections boil down to one thing: safety. The reason allergens are treated differently in food processing and handling stems from the possible risk associated with the ingredient. Allergies of all kinds are on the rise and affect millions of people in the U.S. For some, unintended exposure can be life-threatening.

A food safety inspector entering a facility with an allergen present wants to see that it's being handled in a way that acknowledges and accounts for that risk. A color-coding plan demonstrates that understanding and helps satisfy documentation requirements for brand reputation

through compliance to global standards and U.S. regulations including FSMA's Preventive Controls food safety plans, HACCP plans, and GFSI criteria.

The Dos and Don'ts

While it's a best practice to keep a color-coding plan as simple as possible, there are some very important dos and don'ts for ensuring that it has been set up for success. For allergen plans specifically, there are some special considerations.

Most often, color-coding plans with allergens in the mix will designate bright colors, such as orange, pink, purple, and lime, for allergen contact. These hues are immediately eye-catching should anything be out of place. As with any color-coding plan, it's best that they contrast with other colors in the plan. Additionally, many processors will choose an allergen color assignment that contrasts with the product itself to ensure that a tool or tool piece that may have found its way into the food product can be spotted easily.

Because of the importance of preventing cross-contamination with allergens—especially in a facility that produces multiple allergen-containing products—it's vital that you have the right tool storage, training materials, and facility signage. Suppliers should be able to work with you to verify that you have the best tools for your specific needs, whether that means customizing tool storage materials and design to fit your facility environment and cleaning methods, creating multilingual signage to fit the makeup of your team, or maybe adding your color-coding plan to employee badges for easy reference. Take your time with this step and incorporate whatever might make your color-coding plan functional and easy to follow in your unique facility.

Finally, if you are in a facility with an existing color-coding plan that now needs modification, it's important to roll out the update in one complete sweep to avoid any confusion. As always, train, train, and train on the plan—as you roll it out, as you gain new employees, and over time to ensure that it works well for everyone and is second nature for your team. ■

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Quality



Artificial Intelligence in the Food Industry

How AI can help food manufacturers meet consumer expectations

BY EVA MARIA HANSON

Artificial intelligence (AI) is a term used to describe a computer-generated intellect that can learn to think, plan, comprehend, and analyze natural language. It's the study and development of computer systems capable of doing things that would normally require human intelligence, such as vision, speech recognition, decision making, and language translation.

In other words, it's an area of computer science that focuses on developing machines to act like humans.

In the food industry, where developing standard, reliable procedures to control product quality is a major goal, the search for new ways to reach and serve customers while keeping costs low has necessitated the use of AI. Today, the food industry uses AI to improve customer experience, supply chain management, operational efficiency,

warehouse management, and vehicle activity minimization.

Here, we take a look at how AI is helping the food industry to better meet consumer expectations.

AI and the Food Industry

Here are some of the most important ways that AI is helping the food industry to reshape its approach toward consumer expectations.

1. Automation during Food Sorting.

Many food processing facilities today use manual sorting to sift and separate food items such as vegetables, resulting in decreased efficiency and higher prices. These facilities can achieve substantial automation during this process with AI, which uses a mix of cameras, scanners, and algorithms to enable more efficient food sorting. For example, by using AI with sensor-based optical sorting technologies, the time-consuming processes for sorting fresh produce can be eliminated, resulting in higher yields with better quality and less waste. The same applies to optimizing portion control cutting in the meat industry: AI assesses the primary product for the optimal yield of cut sizes. The technology is also used to better calibrate machines to manage several product sizes while reducing waste and expenses.

2. Organized and Quick Supply Chain Management. Efficient supply chain management is a critical responsibility for all food producers. Food safety monitoring and testing at every level of the supply chain can help guarantee compliance with industry standards. Now, cost and inventory management can be made much easier with more precise predictions, which is where AI comes in: AI-based picture recognition solutions allow for more efficient and effective product procurement, and many companies have started to adopt them. AI also aids in efficient and transparent product tracking all the way from farms to the consumer, increasing customer confidence in a product.

3. Compliance with Food Safety Protocols. Many food facilities today use AI-enabled cameras to ensure that food employees comply with safety regulations. These cameras use image recognition and object identification algorithms to detect whether workers are following food

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safety regulations for personal hygiene. If a breach is discovered, the screen pictures are extracted for examination, and the mistake can be corrected in real time.

4. Self-Optimizing Cleaning Systems. Traditional periodic cleaning systems are set up to clean equipment in scheduled cycles, but they operate blindly and are not very resource efficient. With the use of AI-enabled technologies, food processing facilities can clean equipment more efficiently. One example is the self-optimizing clean-in-place system (SOCIP), which uses ultrasonic sensors and optical fluorescence imaging to analyze food residue and microbiological debris in a piece of equipment, enhancing the cleaning process. SOCIP saves water, time, and energy; the cleaning time can be reduced by more than half.

5. Predicting consumer preferences. Food producers today also employ AI-based solutions to anticipate and model their target consumers' flavor preferences, as well as to forecast their reactions to novel flavors. For example, in 2017, Kellogg introduced AI-enabled technology that assists customers in choosing which granola to use from a list of 50 components when creating a personalized product. The AI gives suggestions for what items to use in the granola and tells the consumer whether or not the ingredients will work well together. Customers aren't the only ones who benefit from this technology. The data generated from flavor combinations, the selections people really make, and the variations they reorder is highly useful to any manufacturer when creating new products. Similarly, Coca-Cola has put self-service soft drink fountains at many restaurants and other venues, allowing customers to create their own beverages. Customers can make hundreds of different soda cocktails using these self-service devices by mixing different flavors into their basic beverages. Thousands of drink fountains, each pouring a multitude of new beverages every day, generate a vast quantity of consumer preference data, which Coca-Cola can then use AI to analyze.

6. AI-Based Revenue Predictions. Predicting sales production is an important aspect of any food business. For greater business growth and profit, food chain or restaurant owners must develop

solid business strategies for their future operations. Finding an appropriately fitting algorithm for sales forecasts in the food sector, whether it's one for five months of sales predictions or one for 14 months, is typically time-consuming work. But in this age of data science, it's

By using AI with sensor-based optical sorting technologies, time-consuming processes for sorting fresh produce can be eliminated, resulting in higher yields with better quality and less waste.



now possible to acquire sales forecasts at the touch of a button. Data science allows businesses to discover the optimal algorithm for predicting sales and achieve the rapid deployment of that algorithm within the organization with the help of an expert AI development team.

How AI Helps Consumers Directly

But what about consumers in the food industry? Can AI help them as well? Here are four ways AI does just that:

1. Food Discovery and Recommendation Engines. Food discovery and recommendation engines based on AI are now assisting consumers in making educated decisions about what to eat by learning about consumer taste preferences and then recommending you curated dishes.

2. AI-Powered Chatbots. Food establishments can now use AI-powered virtual assistants and chatbots to guarantee that clients do not have to wait too long while making inquiries or customizing orders. These bots have come a long way from the days of their inception and have now been optimized to a great degree, resulting in a better client experience.

3. AI-Based Kiosks. Self-ordering robots powered by AI are now providing a better experience by lowering customer wait time and eliminating the need to stand in line to pay. That's because AI can take consumer orders and process payments can be made using integrated card readers, eliminating the need for human intervention.

4. AI Robots. Robots are commonly accepted in the food processing industry due to their sterile nature, a characteristic that is critical in reducing the number of food-borne illnesses. This is especially useful now that The Food Safety Modernization Act (FSMA) has developed more stringent sanitary requirements that apply to whole supply chain systems. AI-based robots are incapable of transmitting certain diseases in the same way that humans are, but must be maintained at an appropriate level of cleanliness to prevent transmission of contaminants such as *Salmonella*, *Listeria*, or *E. coli*. Plus, the upkeep of an AI-based system is basic and straightforward. According to a forecast issued by Technavio, the use of robots in the food processing industry increased by 29% from 2015 to 2019. Robots are also making an appearance in restaurants, boosting the speed and capacity of food preparation as well as reducing the time it takes for meals to be delivered.

AI is improving the efficiency and quality of the food sector in many ways, and the technology promises to bring about many more improvements in the near future. Due to its potential to decrease waste, anticipate product markets, enable around-the-clock efficient and effective monitoring, improve sanitation, control costs, and increase revenue, AI's position in the food sector is becoming increasingly robust.

The earlier you adopt it, the more future-proof your business will become. ■

Hanson is digital food safety specialist for FoodDocs.

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Manufacturing & Distribution



Navigating the Complexity of Cold Chain Logistics

4 considerations when partnering with a third-party logistics company to move temperature-controlled foods and other commodities | BY CHRIS BAHR

Most people don't consider the daily convenience of freezers and refrigerators in their day-to-day lives; however, products that are kept cool and frozen must also be transported at precise temperatures, whether it be less-than-truckload (LTL) frozen ecommerce with direct doorstep delivery or full truckloads (FTL) for retail destinations such as grocery stores. Temperature-controlled transportation maintains cargo climate in transport through temperature-controlled shipping trailers, and cold chain logistics plays a role in just about every product we consume.

Refrigerated freight and goods are a growing industry these days. In fact, according to *Business Wire*, the industry is projected to reach more than \$59 billion by 2025, up from \$47.5 billion in 2020. With

such a substantial market jump, many companies with perishable, frozen foods must focus on finding a cold chain logistics solution to get products to end customers in a safe and compliant fashion.

Luckily, outsourcing shipping operations to a third-party logistics (3PL) company saves you time and money, while allowing you to focus on other areas of your business, such as marketing and product innovations. Here are four things to consider when looking to invest in a 3PL partnership to move cold and frozen food products:

1. Find a 3PL with Temperature-Controlled Experience

Experience is important when outsourcing any aspect of your business, and a 3PL partnership for your temperature-sensitive shipping needs is no different. Having

specialty freight needs such as temperature-controlled products and choosing the right 3PL provider can be an overwhelming process, but the right expert partner will not only take the anxiety and frustration out of your shipping processes, they'll also save you money and time.

Experienced 3PLs have the wisdom to overcome regularly occurring challenges and will embrace new technologies such as:

- Remote, real-time, off-site temperature monitoring;
- Smart packaging;
- Cold blankets; and
- Special containment units like portable chiller and freezer boxes.

2. Keep Cost Variations in Mind

Have you ever tried to move a refrigerator by yourself? If so, you know how difficult it can be due to the weight and design of thick, insulated walls and doors; however, this design is necessary to keep food cold and prevent waste through spoilage. Refrigerated trucks are also heavier and bulkier, leading to higher shipping costs at times.

Dry van freight can reach up to 110 degrees F, so, while they may be more efficient to move, the heavy refrigerated design elements are necessary in temperature-controlled freight. Reefer trailers are heavier than dry van, and are therefore naturally more expensive to purchase and operate.

The weight of the equipment is not a major factor in increased costs for refrigerated equipment. Temperature-controlled trailers themselves are more expensive to purchase, so there is more capital expenditure required for a reefer fleet versus dry van trailers. Experienced reefer drivers require higher compensation as well, as those types of shipments need an additional level of driver knowledge to limit the possibility of potential product damage claims or regulatory challenges.

Because most refrigerated shipments are considered perishable, they have a

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Winterizing Your Food Distribution Fleet

In the last 10 years, winterizing has become an annual process built around seasonal preparation | BY BRIAN ANTONELLIS

The practice of winterizing any food distribution fleet today has changed drastically from just five or 10 years ago. Gone are the days of adjusting each truck based on historical perceptions or just going on experience.

Today's advanced maintenance data analytics and technology have equipped progressive distributors with the tools and resources to make more informed winterizing decisions, eliminating the need for guesswork. Furthermore, while many fleets must begin to make adjustments in October and November, winterizing today is actually an annual process built around seasonal preparation.

This is especially critical during the holiday season when grocers need on-time deliveries for the increase in seasonal shopping, and can even extend into January and February, for large gatherings such as the Super Bowl.

Everything Begins with a Comprehensive Plan

To effectively manage the program, food distributor fleets and their maintenance/technician departments must have a plan—not just for the winter, but for the entire year. Setting the appropriate annual plan will be vital to establishing the proper preventive maintenance (PM) checklist at different times of the year. Everything starts with PM and the ability to calendarize the plan. Maintenance prepared for and performed in the spring and summer will have a different focus than that of winter, and must incorporate the full distribution range. Food distributor fleet managers must be able to identify the trends and areas that are affected more in colder climates than in warmer ones.

Setting the appropriate annual plan will be vital to establishing the proper PM checklist at different times of the year.

Pay Close Attention to Fuel Systems

Another critical area to focus on is your fuel system. Many maintenance professionals and technicians still look at it as just a fuel filter, but today it's a complete system. In the winter months, trucks move into higher idle applications. For many of today's trucks, we talk about using a five-minute idle set. Still, the reality is that the truck already allows a five-minute idle after it reaches normal operating temperature. The increased idle during the winter months is going to cause additional soot to enter the diesel particulate filter (DPF) and can impact the entire fuel system if not considered and replaced in a timely manner.

More specifically, the seventh injector, which inserts additional fuel for the engine burn, must be considered. There is also the fuel filter, which includes the crossover pump, as well as the fuel blend, which merits great consideration in the plan. Food distributors can see as much as two- to three-tenths reduction in miles per gallon (MPG) during the winter months from the changes in fuel blends, as well as from other factors such as cold tires, cold transmissions, and cooler fluids. Therefore, a truck that typically reaches 7.3 MPG may drop to 7 MPG, even if you're doing everything correctly.

Changing Tires

In addition to fuel, tires are a major expense for food distribution organizations, and preparing your winter plan can have a significant impact here. As winter approaches, many distributors may consider running their rear tires back to 4-32 treads. There is a this perception that, because there will be snow and ice on the road, technicians must hurry and change the tires. The reality is that the traction between 4-32 and 8-32 is very minimal; however, each tire change can bring additional expenses, and distribution fleet managers must be cognizant of this. It's essential to leverage sophisticated PM and tire data analytics, along with solid KPI metrics from the original equipment manufacturer and dealer, to ensure that tires are only changed under the right circumstances and with seasonal timing

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Food Service & Retail



Food Safety for Restaurants

How to generate an effective and consistent food safety management system in your establishment | BY CHRIS BOYLES

The COVID-19 pandemic was the start of an influx of challenges for food retail and restaurant establishments, with lingering effects leading to labor shortages, supply chain disruptions, and inflationary pressures. This operational shift has forced these establishments to reassess current food safety standards and procedures and adjust where needed.

According to the World Health Organization, nearly 600 million people fall ill after consuming contaminated food every year. A single outbreak can cost a restaurant business upwards of two million dollars and, with at least 31 different types of foodborne pathogens to worry about, food safety protocols should be at the top of every priority list for restaurant establishments.

To better protect customers, employees and restaurant owners and operators need to have confidence in their food safety programs. A proper food safety program doesn't just "pass the test." A solid food safety program ensures proper food safety practices happen every day, focuses on high-risk issues, and has buy-in from all employee levels, including from senior leadership.

To achieve this, restaurant owners and managers should be able to answer "yes" to the following three questions:

1. Is Food Safety Practiced Consistently?

According to Steritech assessment data, restaurant brands consistently experience a higher number of food safety issues on particular days of the week. The specific days of the week vary by brand, but virtually all brands have at least one day of the week when their issue count is consistently and significantly higher.

The data revealed that the location's worst day often corresponded with the days when more personnel were present. This indicates that the issue is not always caused by a labor gap, but a leadership gap. The common factor seems to be that leadership is focused on something other than food prep on certain days: delivery days, inventory shifts, manager meetings or other tasks. It also correlates to the experience level of the leadership present; for example, issue counts often rise on the general manager's regular day off.

The difference between a restaurant's best day of the week and their worst day is typically between 12% and 18%, but for some brands, that variance is more than 30%. Restaurant owners and managers need to recognize and pay close attention to those "opportunity days" to ensure that proper and consistent food safety practices are being executed at every shift.

2. Is There a Plan in Place to Handle High-Risk Activities?

High-risk activities will be different for every establishment, but it's likely that every brand has a few. Being able to identify which activities have the strongest links to foodborne illness for a particular restaurant is the first step toward handling those concerns. Some common high-risk activities include, but are not limited to:

- Cooling, reheating, and hot and cold handling;
- Cross-contamination during storage and handling practices;
- Cleaning, sanitizing, and handwashing; and
- Date marking and timely disposal of expired products.

Once a restaurant's specific high-risk activities have been identified, the next step should be to implement documented food safety management systems for each critical process. A documented food safety management system should cover three parts: the procedures for each critical risk, the training to implement those procedures, and defined monitoring of the implemented procedures.

At first, creating a food safety management plan for each critical issue may appear to be a daunting task, but it's a task that will better protect employees, customers, and the restaurant. When creating this food safety plan, take it one step at a time. Start with a task that will generate immediate success to get the ball rolling, and then use that positive momentum to further expand the plan.

3. Do Leadership and Management Understand Food Safety Protocols?

Building an effective restaurant food safety program requires engagement and buy-in from all stakeholders. Recent FDA studies found approximately 60% fewer critical issues cited when the person in charge could knowledgeably discuss their food safety management systems.

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When food safety programs focus exclusively on location-level employees, the senior leadership team is left out of a crucial part of business operations. In successful organizations, senior company leaders drive processes and programs that keep the entire organization continuously improving.

Food retail and restaurant operators should train leadership and management teams to support food safety programs by practicing “S.A.F.E.” measures.

- **Say:** What managers say can provide vital reminders to keep food safety in everyone’s awareness every day. Managers and leaders can take simple food safety reminders a step further by also communicating the “why” behind each job. This will help to reinforce the importance of each task to front-line staff.
- **Act:** The way managers act is also a critical component of effective food safety programs. What leaders do—or fail to do—sends a message to every-

one who sees them about the establishment’s food safety values. Simple actions such as hand washing when an employee enters the kitchen, wearing hair restraints, checking temperature logs, or reviewing recent inspection reports will illustrate the importance of those daily tasks to front-line staff.

- **Feedback:** Leaders are also responsible for being receptive to feedback from those they lead, but this is often overlooked. When leaders and managers can both provide feedback and be open to receiving feedback from their team members, it opens the door to positive two-way communication, which also helps foster a self-sustaining culture of food safety.
- **Encourage:** There is great power in encouraging positive behaviors. Traditional food safety programs typically focus on the bad findings. Instead, use positive recognition to reinforce good behaviors and send the message that

excellent food safety will be rewarded. Positive recognition boosts morale and creates pride, which ultimately embeds itself into the culture. It also creates a platform for employees to receive constructive feedback when it becomes necessary.

Whether managing a single, family-owned restaurant, or a multi-location franchise establishment, creating a positive food safety culture is essential. In this new era of limited staff, high turnover rates, consistent supply chain demands and various other challenges impeding the restaurant industry, owners and operators certainly have a tough job ahead.

A system of strong procedures, training, and monitoring can ensure consistent food safety every day. Pair this with S.A.F.E. food safety practices by leadership at all levels to help build a solid food safety culture for everyone involved. ■

Boyles is vice president of food safety at Steritech.

Navigating the Complexity of Cold Chain Logistics *(Continued from p. 33)*

higher probability of resulting in a claim in comparison to a dry shipment; this can impact insurance costs for the carrier. The reefer unit also requires fuel to operate the temperature controls, which further adds to higher costs for reefer carriers versus dry carriers.

Peak season also greatly impacts the circumstances—namely the price—of temperature-controlled equipment. The basic functions of supply and demand mean that spring and summer deliver a huge demand for cold chain logistical solutions. A limited number of reefer trailers are in circulation, and peak seasonal demands increase rates and makes capacity swings more dramatic compared with those that occur with dry freight.

3. Communication Is Key

It’s essential to communicate the product temperature needs to your freight carrier in advance and in detail. For example, ice cream must be kept at extremely cold temperatures to prevent melting and spoilage. Some frozen loads require continuous cooling, while others can be less prone to temperature sensitivity and can withstand

slight temperature differentiations that can be maintained with a cycled reefer.

Successfully understanding the commodity entails knowing precisely how products need to be pre-cooled, loaded, shipped, and delivered. Effective and clear communication on temperature necessities helps avoid severely costly shipping mistakes and ensures quality products for end customers.

4. Hyperfocus on Food Safety

Food is a commodity that automatically comes to mind when it comes to cold chain logistics. But other products like sensitive technology equipment, pharmaceuticals, personal care products, flowers and growing bulbs, candles, paint, hazardous materials, and even products that are sensitive to humidity changes are often shipped with reefer trailers; however, not all products that require temperature-controlled solutions can be shipped together in the same container for a variety of reasons including the potential of cross contamination and differing temperature needs.

Reefer trucks are not intended to cool products, but are designed to help

products retain constant temperatures. Regulations like the Food Safety Modernization Act (FSMA) and the necessary yet strenuous oversight from entities like FDA make moving refrigerated and frozen food products a tricky and precise process. For example, the legislative extension of FSMA in the 2016 Sanitary Transportation Rules details requirements like sanitation and temperature recording throughout transit for both human and animal food products and is intended to be a “modern, risk-based framework for food safety.”

Partnering with a 3PL who prioritizes regulatory compliance to ensure safe products for both human and animal consumption is a safe business decision and a logistical relief for any shipper looking to transport temperature-sensitive products.

Transportation and logistics evolve rapidly, and the embrace of new technologies is critical to success. From farm to freezer to table, the right 3PL provider will alleviate your shipping stress by fulfilling your delivery needs. ■

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Dust Collector Safety *(Continued from p. 25)*

- NFPA 652 *Standard on the Fundamentals of Combustible Dust* (2019 latest version).
- NFPA 654 *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids* (2020 latest version).

Currently, NFPA is in the process of combining and updating these and other industry-specific standards into all-encompassing combustible dust standard: NFPA 660. The new standard is expected to be finalized in the fall of 2023 and to go into effect in the fall of 2024.

Under these standards and other OSHA regulations, bakeries and food processing facilities must have a combustible dust plan in place and take steps to control dust in their facilities to reduce fire and explosion risks. In addition, the dust collection system

must be designed in accordance with NFPA guidelines. Compliant system design includes the use of fire suppression and deflagration system elements appropriate for the application. These guidelines are outlined in NFPA 654 and in two specific standards for deflagration systems:

- NFPA 68 *Standard on Explosion Protection by Deflagration Venting*; and
- NFPA 69 *Standard on Explosion Preventing Systems*.

All facilities must also complete a dust hazard analysis, which includes dust analysis, process hazard analysis, and mitigation recommendations. Laboratory testing of dust samples in the facility may be advised to determine the explosion potential of the dust. The DHA provides a starting point for the design of a compliant fire and explosion prevention plan, including dust collection system design.

It is often advisable to work with a qualified engineering partner when designing a dust collection system for combustible food dust. These firms can help you conduct a process hazard analysis and make the right choices in system design, including:

- Deflagration system design;
- Selection of an appropriate fire suppression system; and
- Reduction in ignition risks, including spark control (if necessary).

A proactive approach to dust collector fire and explosion safety will go a long way toward preventing an expensive or tragic accident at your facility. It makes sense to work with an engineering expert for the design of a safe and compliant dust collection system. ■

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Winterizing Your Food Distribution Fleet *(Continued from p. 34)*

in mind, instead of just going on perception or a hunch.

In addition to accurate data, distributors and their maintenance departments must have the appropriate technology to properly and continually make assessments in accordance with their annual PM plans. Years ago, the first thing a technician would do when inspecting a truck would be to change the oil. However, today's technicians are plugging a laptop into the diagnostic portal, checking critical areas of the truck that may show certain areas in the fuel system or tires to identify areas that could have a problem and performing more preventative work, even before a check engine light appears.

Communicate Cost Breakdowns to the C-Level

All of these decisions can potentially cost companies several thousands of dollars per truck each year. Multiply this by 40 to 60 trucks, and a significant amount of money is eroding the organization's bottom line. Fleet managers and maintenance crews must have an open line of



Food distributor fleets and their maintenance/technician departments must have a plan—not just for the winter, but for the entire year.

communication with the executive suite to facilitate discussions about planning and expenses.

A solid plan and detailed line-item visibility can make all the difference in the world in front of the executive team. Distributors and their fleet personnel should be able to address leadership and say, 'Here's what we foresee happening; this is why maintenance costs have seasonality; this is why our tire cost is rising in the fall; this is why our fuel cost is rising; and here's what we plan to do about it.' What's more, today's analytics and data technology can help to demonstrate these cost changes in great detail.

When food distributors combine a comprehensive annual plan with today's sophisticated data analytics and maintenance technology, they can keep their trucks on the road more and keep drivers safe during the winter months while helping the executive suite preserve the bottom line. ■

Antonellis is senior vice president of fleet operations at Fleet Advantage. Reach him at bantonellis@fleetadvantage.com.

NEW PRODUCTS

Capacitance Level Switch



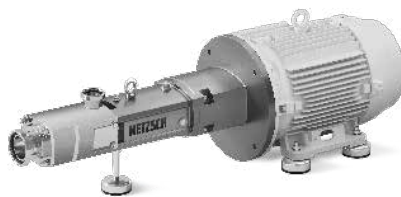
Krohne, a manufacturer and supplier of solutions in industrial process instrumentation, has released the Optiswitch 6700 capacitance level switch. The switch's double output can be individually programmed to monitor different processes or media, making it a solution for adhesives and difficult products, as detection is not affected by product build-up, foam, or condensation. With the ability to monitor CIP and SIP cleaning processes, media separation, clogged or blocked pipes, moisture levels, and offer dry run protection, this level switch works for point-level detection of food products. The switch is customizable, offering a wide range of available hygienic adapters, the potential to add a sliding connection for tanks with thicker walls and insulation, and an alternate sensor version, enabling low-level detection from the top of the tank. **Krohne, info@krohne.com, krohne.com.**

Sealing Solution for Tubular Heat Exchanger

The tubular heat exchanger from Tetra Pak features a specially developed seal from Freudenberg Sealing Technologies. The objective of the development cooperation between Freudenberg and Tetra Pak was to develop a cost-effective, hygienic sealing solution that would connect the stainless-steel components of the new tubular heat exchanger. Tubular heat exchangers are used in food industry process lines wherever liquid products with different viscosities and



solid contents are to be heated to achieve a longer shelf life. To prevent product contamination, all components of the new tubular heat exchanger that come into contact with the product must meet industry-specific requirements. **Freudenberg Sealing Technologies, fst.com.**



Twin Screw Pump

NETZSCH Pumps North America, LLC, has released the NOTOS Sanitary 2NSH Twin Screw Pump to meet the requirements of the food and beverage industry. Working at both low- and high-working pressures, the pump maintains product integrity and natural properties, without any quality loss. The FDA-compliant pump meets 3-A sanitary standards and can be disassembled quickly for easy maintenance. The pump features a pump housing with a full service-in-place design. Made of AISI 316L stainless steel and polished according to international standards, the pump is easy to clean-in-place and sterilize-in-place. There is no contact between the rotating parts, so pump speed can be increased, and cleaning fluid can be carried out without the need for an auxiliary system or a separate CIP pump. The flexible pump covers a wide capacity and pressure range, with flow rates of up to 880 gallons per minute and pressures of up to 230 pounds per square inch. It can fit in small spaces, in horizontal or vertical positions, and is offered with both foot- and flange-mounting options. **NETZSCH Pumps and Systems, pumps-systems.netzsch.com/en.**



PTFE-Lined Hoses for Fluid-Transfer

FaBLINE, a new food-grade flexible hose from Aflex, part of Watson-Marlow Fluid Technology Solutions (WMFTS), was developed to meet current hygiene standards. The PTFE-lined hose with standard 316 stainless steel braid ensures efficient product transfer and handling while offering longer life than rubber hose alternatives, reduced maintenance, less CIP downtime, and lower processing costs, the hose offers liner flexibility in a kink-resistant design that requires less force to bend than smooth bore products. Further, the product carries up to twice the flow of similar-sized convoluted delivery hoses. The hose's low-friction construction minimizes back-pressure to avoid downtime and material losses. Both PTFE-lined and non-lined end fittings are available with a laser-etched ferrule for traceability. A range of braid, cover and external protection options complete the offer. **Watson-Marlow Fluid Technology, wmfts.com.**



Stainless Steel Gold Bearings

Sealmaster Stainless Steel Gold Bearings are specifically engineered for long-lasting performance and contamination resistance in caustic and washdown environments for poultry processing. The bearings feature an IP69K-certified dust-tight construction capable of withstanding high pressure and steam cleaning, which minimizes contamination ingress while retaining internal lubricants for more efficient, safe, and sanitary operation. **Regal Rexnord Corporation, regalrexnord.com.**

Sustainable Packaging and Foodservice Products

TekniPlex Consumer Products, has introduced an expanded selection of its GeoPack sustainable packaging and foodservice products. The line comprises a broad spectrum of product families meeting defined criteria for sustainability. The goal is to deliver solutions tailored toward customers' sustainability metrics, including providing information on specific products' environmental impact. **TekniPlex Consumer Products, tekni-plex.com/consumer.**



Pouches for Recycling

Diversey has launched fully recyclable SafePack pouches. These pouches aid customers in lowering carbon emissions, reducing plastic waste, and meeting the standards for recyclability. Pouches with concentrated products are one of the most efficient cleaning and hygiene propositions. They allow users to refill reusable spray bottles, thus improving plastic reuse and minimizing waste. The pouches are made from monolayer Polyethylene and just one pouch holds enough concentrated cleaning solution to fill many spray bottles once diluted. **Diversey, diversey.com/en.**

UV-C and Ozone Light

SmartWash Solutions has introduced the EPIC Panel Sterilight, a product designed to safely and automatically kill *Listeria* and other pathogens inside control panels, an often-overlooked source of cross-contamination. The light destroys *Listeria* hidden in control panels and mitigates further growth and spread. By automatically administering UV-C light and ozone, the light helps daily pathogen abatement and mitigates cross-contamination from control panels, while minimizing impact or degradation on sensitive plastic or electronic components. Available in 120- or 230-volt models, the light is designed for universal retrofit installation in any food processing facility. **SmartWash Solutions, epicpanelsterilight.us.**

SCIENTIFIC FINDINGS

For access to the complete journal articles mentioned below, go to “Food Science Research” in the February/March 2023 issue at foodqualityandsafety.com, or type the headline of the requested article in the website’s search box.

Pulsed Light Treatment Can Improve Microbial Safety in Packaged Cherry Tomatoes

The microbial safety of produce continues to be a real concern. The objective of this study was to investigate the efficacy of high intensity short time pulsed light (PL) application on survival of *Salmonella* in packaged cherry tomatoes. Treatment effects on reduction of native microbiota and quality were also evaluated. Stem scars of cherry tomatoes, inoculated with a three serotypes cocktail of *Salmonella enterica*, was treated with PL for up to 60s. Polyethylene (PE) films of 25.4, 50.8, and 76.2 μm thickness were used for packaging treatment. Treatment significantly reduced the initial populations of aerobic mesophilic bacteria, molds, and yeast. Packaged tomatoes were softer after treatment, but not significantly. Storage time did not affect fruit firmness. No significant



change in the visual appearance of fruits were observed after treatment and during 14 days of storage. Overall, the results of this study demonstrate that high intensity, short time PL treatment may be used to enhance microbial safety and reduce postprocessing contamination of packaged cherry tomatoes. *Journal of Food Safety*. Published January 12, 2023. doi: 10.1111/jfs.13035.

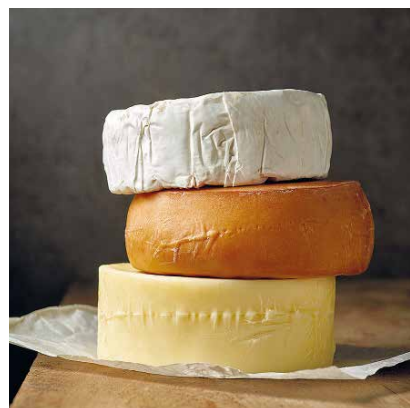


Technical Solutions for Sodium Reduction in Food

In many parts of the world, sodium consumption is higher than recommended levels, representing one of the most important food-related health challenges and leading to considerable economical costs for society. Therefore, there is a need to find technical solutions for sodium reduction that can be implemented by food producers and within food services. This review discusses the barriers related to sodium reduction and highlight a variety of technical solutions. Existing technical solutions include inhomogeneous salt distribution, coated salt particles, changing particle sizes and forms, surface coating, multisensory combinations, sodium replacements, double emulsions, adapted serum release by microstructure design, and adapted brittleness by microstructure design. These solutions, their implementation, and the associated challenges and applicable product categories are described. Some of these solutions are ready for use or are in their early development stages. Many solutions are promising, but in most cases, some form of adaptation or optimization is needed before application in specific products, and care must always be taken to ensure food safety. *Journal of Food Safety*. Published online ahead of print on January 19, 2023. doi: 10.1111/1750-3841.16433

Hyperbaric Storage Can Improve the Shelf Life of Fresh Cheese

The changes in microbiological, physiochemical, and textural properties in fresh cheeses made from either cow or goat milk were observed under hyperbaric storage (HS) at room temperature (RT) and compared with refrigerated storage under normal atmospheric pressure for 60 days. An initial microbial growth inhibition was observed for both cheese types, as well as a considerable inactivation of all endogenous microbiota under HS/RT. This contributed to a higher stability of pH and color values, especially at the higher pressure at room temperature throughout 60 days of storage. A compression effect occurred during HS/RT, resulting in higher whey loss, reduction in moisture content, and textural changes. Such changes tended to decrease over time and, overall, HS/RT reduced the microbial populations load during storage with minimal effects on most of the evaluated quality parameters. These results point to a considerable shelf-life extension of HS fresh cheeses, without temperature control, pinpointing HS as a more sustainable preservation strategy than refrigeration, with great potential for industrial application. *Journal of Food Science*. 2023; 88:391-402.



Sustainability Issues Along the Coffee Chain

The coffee industry is one of the most important commercial value chains worldwide. Nonetheless, it is also associated with several social, economic, and environmental concerns that impair its sustainability. This review focuses on these sustainability concerns as well as on strategies that are being developed and/or implemented to attain sustainability and circular economy principles in the different chain segments. In this context, distinct approaches have been ap-

plied, such as sustainable certifications, corporate sustainability initiatives, direct trade, relationship coffee concepts, geographical indication, legislations, waste management, and byproducts valorization, among others. These strategies are addressed and discussed throughout this review, along with their advantages and limitations. ***Comprehensive Reviews in Food Science and Food Safety*. 2023;22:287-332.**



Smart Packaging

Smart packaging provides one possible solution that could reduce greenhouse gas emissions. In comparison with traditional packaging, which aims to extend a product's useful life and to facilitate transport and marketing, smart packaging allows increased efficiency, for example, by ensuring authenticity and traceability from the product's origin, preventing fraud and theft, and improving security. Consequently, smart packaging may also help to reduce pollution, food losses, and waste associated with the food supply chain; however, some questions must be answered to fully understand the advantages and limitations of its use: What are the most suitable smart packaging technologies for use in agro-industrial subsectors such as meat, dairy, fruits, and vegetables, bakery,



and pastry? What are the opportunities from a perspective of life extension, process optimization, traceability, product quality, and safety? What are the future challenges? This review attempts to answer these questions. ***Journal of the Science of Food and Agriculture*. 2023;103: 986-1003.**

Trends in Food Factory Design

Food factory design (FFD) affects production costs, production safety, and food quality. Moreover, as consumer demand, product planning, policies and legislation, raw material supplies, manufacturing philosophies, and environmental consciousness change, FFD should also change. In this study, the authors examined articles covering a wide range of topics related to FFD to achieve the following objectives: summarizing the annual changes in the number of publications; detecting influential countries and institutions, major research areas, context and history and representative studies at different times; and identifying frontiers and forecasting development trends in terms of factory construction and new production modes, new processes and product manufacturing technology, optimization of production systems and processes, intelligent manufacturing, environmental protection, and sustainable development. The findings of this study may help enterprises and researchers to identify important trends in FFD and provide support for decision making and policy formulation, and determine future directions for research and teaching activities. ***International Journal of Food Science and Technology*. 2023;58:520-534.**



Egg Pasteurization and Disinfection Processing Technologies

Salmonella enteritidis is a pathogen related to many foodborne outbreaks involving eggs and egg products. Regulations about whether eggs should be pasteurized are very different and inconsistent worldwide. In the United States, eggs are not required to be pasteurized. Hence, fewer than 3% of the eggs in the country are pasteurized. The standard pasteurization method (57°C, 57.5 min) uses a long thermal process that increases the cost of the product and affects its quality. Foodborne outbreaks can be reduced if eggs are properly pasteurized to inactivate *Salmonella* spp. However, the technology to pasteurize eggs needs to offer a faster and more reliable method that can be scaled up to industry settings at a low cost and without affecting product quality. Several novel technologies have been tested for eggshell disinfection and egg



pasteurization. Some thermal technologies have been evaluated for the pasteurization of eggs. Microwave has limited penetration depth and is a technical challenge for egg pasteurization however, radio frequency can penetrate eggshells effectively to inactivate *Salmonella*, considerably reduce processing time, and maintain the quality of the product.

Nonthermal technologies such as ultraviolet, pulsed light, cold plasma, ozone, pressure carbon dioxide, electrolyzed water, and natural antimicrobials have been explored for surface cleaning of the intact egg as alternatives without affecting the internal quality. This review presents some of these novel technologies and the current challenges. ***Comprehensive Reviews in Food Science and Food Safety*. Published December 20, 2022; doi: 10.1111/1541-4337.13088.**

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 Chicago, Ill.
 Visit nationalrestaurantshow.com.

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