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Volume 24 Number 5
OCTOBER/NOVEMBER 2017

Food Quality & Safety

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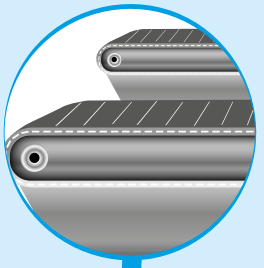

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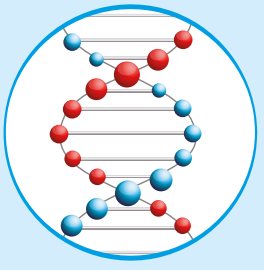

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The FDA issued a revised draft guidance for Control of *Listeria monocytogenes* in Ready-To-Eat Foods on January 13, 2017. It reflects the FDA's good manufacturing practice (CGMP) requirements as well as new requirements consistent with the FDA Food Safety Modernization Act (FSMA). The FDA stated in multiple public forums that the draft guidance represents their current viewpoint and they expect it to be implemented.

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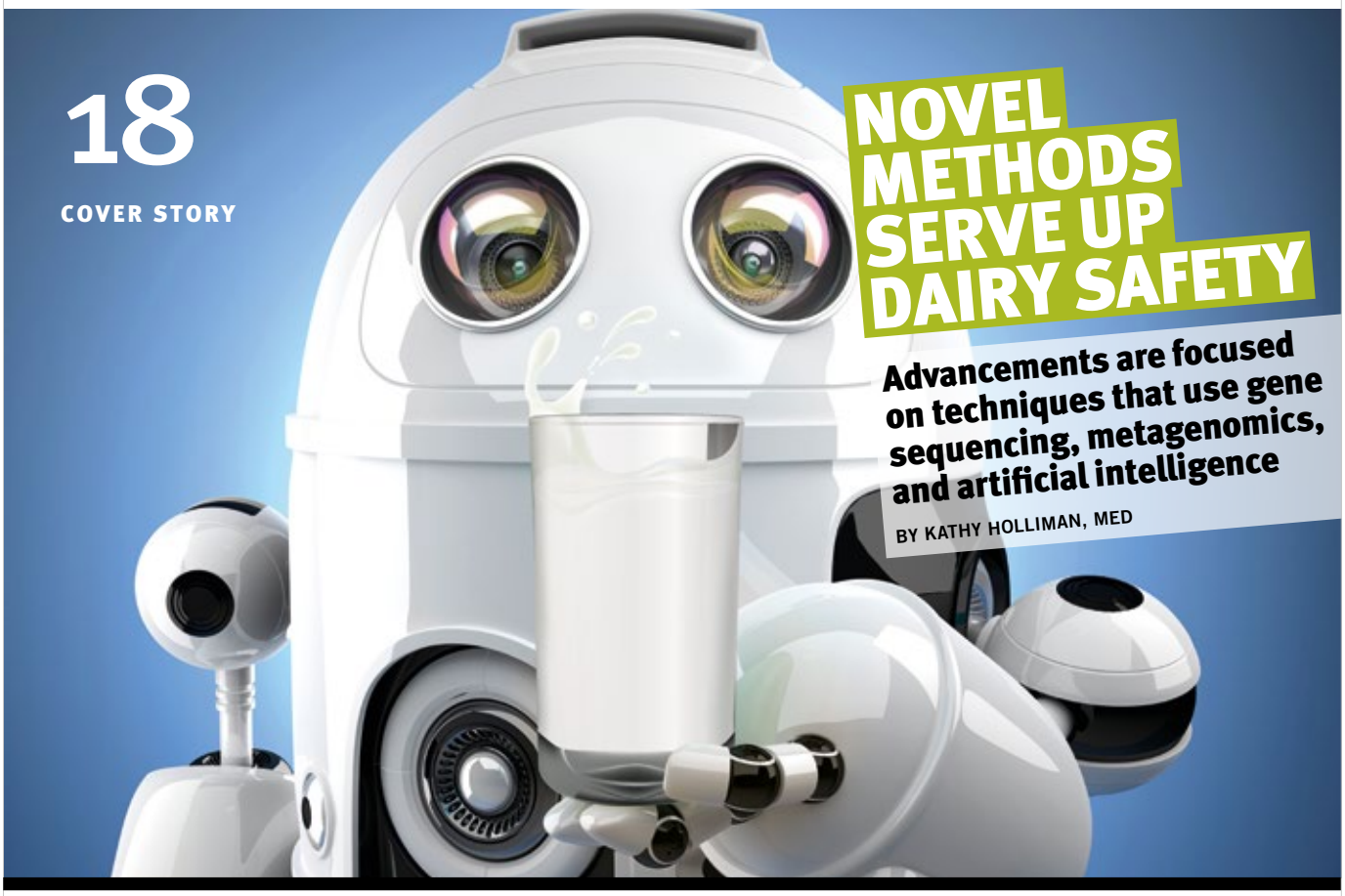

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From The Editor

The 2017 hurricane season has been extremely destructive, starting with Hurricane Harvey. Hitting Texas on August 25, estimates in damages from this major storm range $150 billion to $200 billion.

Amidst the destruction, massive storms like Harvey do shine light on the everyday heroes lending a helping hand, whether it's aiding with rescues, providing medical assistance, or donating goods to those who lost everything. And amongst those stepping up to support relief efforts is the food and beverage industry. The following are just a few instances where organizations are serving as heroes for those in need.

An Anheuser-Busch brewery in Georgia shipped canned drinking water to the American Red Cross to help hurricane relief efforts in Texas and Louisiana. More than 155,000 cans of water were sent in total. (The company says it periodically stops beer production throughout the year in order to can drinking water at the Georgia facility so it can be ready in times of need.)

With more than 100 volunteers, the grocery store chain H-E-B dispatched its Disaster Response Units and mobile kitchens to deliver relief supplies and assist residents with food, water, ice, dry goods, and medicine.

The newly formed partnership of Amazon and Whole Foods Market announced they were matching cash donations made via the Amazon website to the American Red Cross hurricane relief efforts—up to $1 million.

PepsiCo and the PepsiCo Foundation also pledged $1 million to the American Red Cross to provide vital resources to hurricane victims.

Super-store Walmart sent more than 1,000 truckloads of supplies to affected areas—most trucks were filled with much-needed drinking water.

In addition, Chobani loaded up trucks with its products to distribute to those in need.

Thank you to these organizations, and the many others not listed here, that are helping victims of natural disasters. It is nice to see the food and beverage industry making headlines for all the right reasons!

Marian Zboraj
Editor

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FARM TO FORK SAFETY

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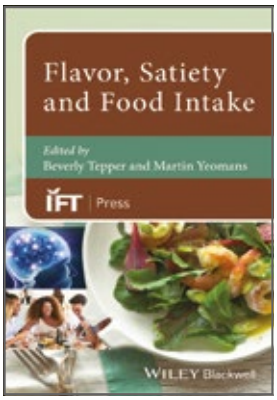
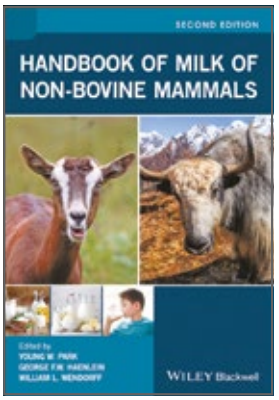


Flavor, Satiety and Food Intake



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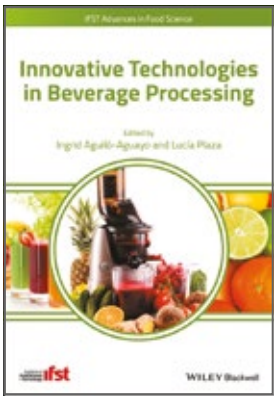
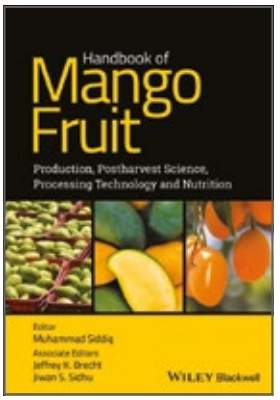
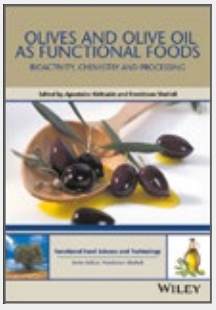
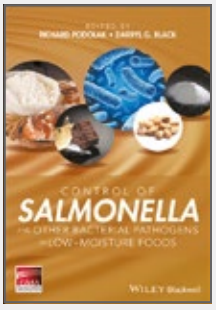


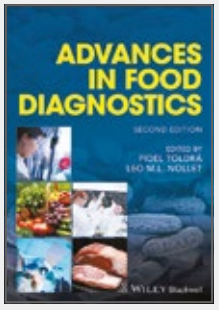
Innovative Technologies in Beverage Processing

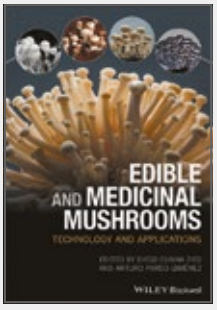


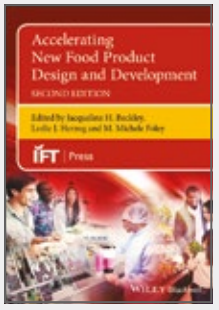
Handbook of Mango Fruit:
Production, Postharvest Science, Processing Technology and Nutrition











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NEWS & NOTES

Contaminated Eggs Cost Dutch Chicken Farmers $39 Million

According to Reuters, Dutch chicken farmers have suffered around $39 million in damages as a direct result of culls and other measures carried out after their eggs were found to be tainted with a toxic chemical. Investigators in early August detected fipronil, a flea poison, in slightly higher than acceptable levels on Dutch chicken farms, leading quickly to culls, quarantines, and other measures to prevent further production of contaminated eggs. In the following days, millions of Dutch chicken eggs and products containing egg were recalled in countries around Europe and as far away as Asia. Two Dutch men who ran the cleaning company Chickfriend were arrested on suspicion of threatening public health for using the chemical on chicken farms. Belgian authorities are investigating whether the Belgian firm that sold Chickfriend a cleaning product containing fipronil was also aware, complicit, or responsible for it entering the food chain.

Costs of Menu Labeling Rule Delay

An independent economic analysis finds that the FDA decision to delay the national menu labeling law for one year (from May 5, 2017 to May 7, 2018) could end up costing consumers $15 for every $1 saved by industry. According to study, delaying implementation increases costs through increased health care and loss of productivity. The finding is in contrast with FDA's benefit-cost analysis, which conceded the cost to consumers was greater than any savings to industry by 2-to-1. Calorie labeling allows consumers to make informed decisions, which can lead to lower-calorie choices. The study says that changing the requirements could cost food service hundreds of millions of dollars. And since the vast majority of establishments have already incurred the initial costs of compliance, delaying the law is unlikely to result in any cost savings for them. Study was funded by the Center for Science in the Public Interest and Consumer Federation of America, and prepared by Mark Cooper, PhD.

In FDA News...

Three new guidances help producers of food commodities covered by FDA's regulations for low-acid canned foods (LACF), juice HACCP, and seafood HACCP understand which parts of the FSMA rules apply to them and how the rules may affect their operations. FSMA recognizes that FDA has previously-established regulations that are specific to seafood, juice, and LACF and so some exemptions have been made in the FSMA rules for these products. However, there are still some requirements in the FSMA regulations that apply to processors of the seafood, juice, and LACF products.

The agency's new Small Entity Compliance Guides (SECG) help small and very small businesses comply with FSMA's Intentional Adulteration Rule and the Produce Safety Rule. They provide recommendations on such topics as developing a food defense plan and records management, and advice for farmers to determine whether they are eligible for qualified exemptions, which would modify the requirements they are subject to under the Produce Safety Rule.

In addition, the FDA completed a large-scale sampling study to learn more about potential contamination in these products. The agency collected 825 samples from 37 states, Puerto Rico, and the District of Columbia, and found that most of the positive samples came from a small number of sprouting operations: A total of 14 positive samples were found at eight of the 94 growers, and 10 of these samples came from just four growers. FDA found *Salmonella* on 2.35% of seed samples, *Listeria monocytogenes* on 1.28% of finished sprouts, and none of the finished sprout or spent irrigation water samples tested positive for *E. coli* O157:H7.

Business Briefs

Blue Pacific Flavors opens the Flavor Creation and Culinary Innovation Center, a new research and development lab.

Savour Food Safety International purchases **Sherwin Food Safety** and renames it as **Savor Safe Food.**

Growth equity firm **TCV** acquires **EtQ.**

3M acquires **Elution Technologies,** a manufacturer of test kits.

Covance acquires analytical testing services business of **ChromaDex Analytics.**

Hygiena acquires **Pruebas Microbiologicas Rapidas.** The newly acquired company is now known as **Hygiena Mexico, S.A. de C.V.**

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TAKE YOUR PICK!

Washington Report

Blockchain to the Rescue

Can the Bitcoin-related technology eliminate global food fraud?

BY **TED AGRES**

Several major food companies and retailers, including Tyson Foods, Nestlé, Dole, Kroger, and Walmart, are partnering with IBM to test whether blockchain technology, the tamper-proof, cryptography-based record-keeping system behind Bitcoin and other cyber-currencies, can be used to ensure the integrity of the global food safety distribution chain.

Because production and distribution records maintained by blockchain cannot be falsified without leaving an evidentiary trail, food producers and regulators could use it to quickly trace food products back to their source, allowing for fast recall and removal in case of contamination or fraud.

For example, it took FDA more than two months to identify the source of Salmonella-tainted Maradol papayas, which have thus far sickened more than 200 people in 23 states, resulting in 65 hospitalizations and one death. Had blockchain been used to create a digital ledger of the distribution chain, the farm in southern Mexico could have been identified within a matter of seconds.

"In the case of the global food supply chain, all participants—growers, suppliers, processors, distributors, retailers, regulators, and consumers—can gain permissioned access to known and trusted information regarding the origin and state of food for their transactions," IBM said in a statement announcing the food safety collaboration in August.

In addition to Tyson Foods, Nestlé, Dole, Walmart, and Kroger, other companies in the collaboration include Driscoll's, Golden State Foods, McCormick and Co., McLane Co., and Unilever. They will work with IBM to identify new areas where the global food supply chain can benefit from blockchain.

"Unlike any technology before it, blockchain is transforming the way like-minded organizations come together and enabling a new level of trust based on a single view of the truth," says Marie Wieck, general manager of IBM Blockchain.

This "single view of the truth" refers to the digital ledger of transactions that is available to all participating members, but which cannot be altered without leaving a record of who changed what and when. Bitcoin and other similar cryptocurrency applications use an open-source, peer-to-peer network of decentralized computers to process the complex blockchain algorithms and maintain system integrity. Corporate blockchain applications, on the other hand, including IBM's and those of large financial institutions, are closed and use their own centralized computer systems and private networks.

New Era of Transparency

"Blockchain technology enables a new era of end-to-end transparency in the global food system—equivalent to shining a light on food ecosystem participants that will further promote responsible actions and behaviors," says Frank Yiannas, Walmart's vice president for food safety. "It also allows all participants to share information rapidly and with confidence across a strong trusted network. This is critical to ensuring that the global food system remains safe for all," he adds.

This is not Walmart's first foray into blockchain. As part of a $25-million, five-year initiative, the company last year partnered with IBM and Tsinghua University to collaborate on ways to improve the way food is tracked, transported, and sold to consumers in China. (Walmart has more than 400 stores in Mainland China, which has become notorious for food fraud and other food-related scandals.)

China is the world's largest producer and consumer of pork, and Walmart created a pilot blockchain project involving the distribution of pork from Chinese farms through every stage of the supply chain to retail stores. Blockchain allowed specific pork packages to be traced in seconds or minutes instead of days or weeks, Walmart announced earlier this year.

In a separate but parallel pilot project in the U.S., Walmart said it took six days, 18 hours, and 26 minutes using conventional recordkeeping to trace a package of mangoes back to the farm in the U.S. where they were grown. But using blockchain, the same trace took only a few seconds to complete.

"To put food safety to work, we need the whole industry to collaborate—from the suppliers to the distributors to the retailers," Walmart spokesperson Rebecca Lui said of the blockchain pilot last year.

While a blockchain record may be immutable, creating it requires honest input from all participants. In other words, blockchain may be great for identifying *who* is in the system, but it does not capture the accuracy of *what* they did or did not do.

And this may be the chink in blockchain's armor.

"Blockchain is dependent on individuals in the supply chain entering accurate and current information," explains David Acheson, MD, president and CEO of The Acheson Group and a former FDA associate commissioner for foods. "What blockchain will not do is determine if a person in the supply chain caused the problem or followed proper procedures," Dr. Acheson tells Food Quality & Safety magazine.

John Spink, PhD, assistant professor and director of the food fraud initiative at Michigan State University in East Lansing, concurs. "Considering a food fraud incident such as the U.K. horsemeat, how exactly would blockchain have helped reduce food fraud? In some cases, it would seem the fraudsters are trusted with entering authentication information into the system," he tells Food Quality & Safety.

Countering Food Fraud

The need to prevent food fraud is becoming increasingly compelling, not only from the standpoint of public health but also from legal and financial concerns. Food fraud costs the global food industry about $40 billion each year, according to Dr. Spink. In addition, poor standards of food safety, antibiotic use, and environmental mismanagement in the Asian meat, dairy, and seafood sectors could lead to "financial food poisoning" in global investments. A new report from the investor network FAIRR warns that global pension and savings funds are at financial risk due to "dangerous factory farming practices" in Asia.

The report notes that in 2014, McDonalds and Yum! Brands lost $10.8 billion in market capitalization following reports that their restaurants in China had received and served expired meat products. "Simply put, a failure to reform the Asian meat and dairy industries in areas like food safety, could spell a nasty bout of financial food poisoning for global investors," said Jeremy Coller, founder of the FAIRR Initiative and CIO of Coller Capital. "Investors must step up to the plate."

While seafood fraud is a global issue, it is particularly worrisome in the U.S. where more than 90 percent of the consumed seafood is imported from other countries, with an estimated value of about $9 billion annually. In December 2016, the Obama administration announced a program to help prevent illegal fishing and seafood fraud. Effective Jan. 1, 2018, the Seafood Import Monitoring Program will require importers of record to report data from the point of harvest to the point of entry into U.S. commerce on certain fish and fish products that are vulnerable to "illegal, unreported, and unregulated" fishing practices.

A number of seafood traceability programs are being tested, including blockchain, to help comply with the regulation, which earlier this year survived a legal challenge by the National Fisheries Institute and eight seafood companies.

Other Blockchain Initiatives

IBM is far from being the only player to be experimenting in the blockchain food safety arena. A company called Ambrosus claims to have combined "high-tech sensors, blockchain protocol, and smart contracts" to build a "universally verifiable, community-driven ecosystem" to assure the quality and safety of food products, "from farm to fork," according to Stefan Meyer, PhD, the company's chief technology officer.

> This "single view of the truth" refers to the digital ledger of transactions that is available to all participating members, but which cannot be altered without leaving a record of who changed what and when.

In addition, Chinese online retail giant JD.com, that country's second-largest e-commerce platform after Alibaba, has been using blockchain technology to track production and delivery of frozen beef from Inner Mongolia Kerchin Cattle Industry, a beef producer. Consumers are able to access data stored by JD.com and Kerchin through their blockchain systems. Alibaba itself is developing a "Food Trust Framework" with AusPost, Blackmores, and PricewaterhouseCoopers (Australia) to explore the use of blockchain technology to combat food fraud.

The Chinese Ministry of Science and Technology is participating in the EU's Horizon 2020 project by helping fund a food safety initiative called the EU-China-Safe project. Its goal is to reduce food fraud and improve food safety by focusing on traceability and authenticity. A Belfast company called Arc-net will be using blockchain technology to combat food fraud in the two trading regions.

Perhaps as a sign of things to come, GS1, the global business standards organization, is urging early blockchain adopters to incorporate its track and trace standards into their systems. Blockchain "industry leaders have an opportunity to avoid divergence of internal systems and data formats and to accelerate their adoption of blockchain technologies for enterprise by leveraging the GS1 and ISO open standards EPCIS and CBV, which are global multi-sector standards that enable the exchange of traceability data and serial-level (or item-level) track-and-trace," GS1 said in a recent position paper.

Efforts to enhance the safety of food from China will likely become more pressing following the Trump administration's deal with Beijing in May to allow imports of cooked poultry from China in exchange for exports of U.S. beef and rice. The deal has been praised by U.S. farm and beef producers but criticized by consumer groups due to China's poor food safety reputation.

The move "will put U.S. consumers at risk for illnesses from potentially unsafe food imports," Food & Water Watch complained. In July, Rep. Rosa DeLauro (D-CT), a vocal food safety proponent, introduced legislation that would ban Chinese-produced or processed meat and chicken from being served in national school lunch and other federal food programs.

"Given China's demonstrably poor food safety record, it is unacceptable to take any unnecessary risks with the health of American school children—our most

(Continued on p. 49)

Innovative Tech

A snapshot of the fully immersive virtual reality tour of DogStar Kitchens.

From the Ground Up

Advancements in building design, construction, and technology energize the food industry

BY **LINDA L. LEAKE, MS**

Imagine touring your new, fully furnished food manufacturing plant before construction and equipment installation are complete.

Executives at Champion Petfoods, LP, Edmonton, Alberta, Canada, did just that relative to their first U.S. facility, called DogStar Kitchens, in Auburn, Ky., which became operational Jan. 4, 2016. DogStar produces 220 million pounds annually of freeze-dried and kibble pet food under its Acana and Orijen brands.

Champion employed Gray Construction, Lexington, Ky., to provide engineering, architectural design, and construction for the project, a 371,000-square-foot state-of-the-art masterpiece on 85 acres.

While Gray Construction has been providing design-build and construction management services for the U.S. food and beverage market for nearly 60 years, DogStar Kitchens was its first pet food facility project, according to Stephen Gray, the firm's president and CEO.

It was Gray Construction's use of virtual reality (VR) that allowed Champion to "step into their facility" before it was finished. VR is a computer technology using head-mounted goggles with a screen in front of the eyes that generates realistic images to simulate one's physical presence in a virtual environment.

"Providing a fully immersive experience, the quality and accuracy of the virtual environment gave Champion an unprecedented understanding of what their kitchens would look and 'feel' like, even in the earliest phases of design," Gray says. "VR is really an extension of building information modeling (BIM) to show customers how their facilities will function."

According to the U.S. National Building Information Model Standard Project Committee, BIM is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility, forming a reliable basis for decisions during its life-cycle, from earliest conception to demolition.

"By creating a VR walk-through of the proposed facility in the early stages of a project, manufacturers can engage with equipment suppliers and vendors, which allows them to better plan how operations will be conducted in the facility," Gray elaborates. "VR also enables processors to prepare for food audits well in advance of the first one ever occurring, thus ensuring the highest level of food safety. By enabling the manufacturer to experience engineering functions firsthand in the design process, VR prompts a conversation between the manufacturer and engineer that previously didn't exist."

"The VR technology helped us visualize the layouts and the movement throughout the Kentucky kitchen so that adjustments could be made to accommodate people and product process flows," says Frank Burdzy, Champion's president and CEO. "It was also a powerful tool to engage our customers in envisioning our commitment to food safety and excellence in food making."

"While still a relatively new technology, the visual enhancement to BIM that VR provides could become increasingly valuable in the food processing industry given the growing complexity of projects," Gray adds.

Burdzy is quick to point out that DogStar Kitchens was designed and built to comply with the Food Safety Modernization Act (FSMA) and to operate beyond the human food safety standards, and therefore beyond the European Pet Food Industry Federation standards. "We use the highest level of food safety practices in our kitchens, including zone controls to separate our fresh and cooked ingredients," he relates. "Gray Construction's understanding of the importance of food safety, processes, and flow of ingredients was corroborated by our DogStar Kitchens' ability to achieve the Safe Quality Food certification within our first year in operation."

In 2016, Gray Construction won a prestigious Design-Build Institute of America Team Award for DogStar, the first pet food facility in the world to be so honored.

DogStar also topped organizations in both human and animal food industries to capture the Global Food Safety Initiative's inaugural 2017 Global Markets Award.

Improved Floor Coatings

Sherwin-Williams Protective & Marine Coatings (S-WP&MC) now offers water-based floor coatings featuring improved hot-tire staining resistance and no hot-tire pickup.

Introduced commercially Aug. 1, 2017, these products, AquArmor WBU Water-Based Urethane Floor Coatings, are the next generation of water-based, aliphatic urethane coatings designed for industrial venues, according to Casey Ball, S-WP&MC's marketing director for resinous flooring.

Ball says that the new coatings, which work on poured concrete floors and any type of walls, deliver high-performance application and aesthetic characteristics that rival solvent-based products, with the added benefit of lower volatile organic compounds than solvent-based formulations.

"The coatings' wet edge application properties help to minimize the potential for roller lap marks, ensuring a consistent gloss sheen for GP4410 and a consistent satin sheen for GP4411, the two finishes available in the line," Ball explains. "After curing, the coatings offer the best resistance to hot-tire pickup and hot-tire staining compared to other water-based floor coatings, preventing tires from leaving excessive, permanent stains.

"The products also offer superior chemical-resistance properties, helping to enhance the aesthetics of food and beverage manufacturing facilities and warehouses," Ball adds.

Reflective Insulation

Reflective insulation is one of the fastest growing technologies in the world, including in the food industry, says Bruce Wester, director of sales for Fi-Foil Co., Auburndale, Fla., a manufacturer of reflective insulation systems and radiant barriers.

While first introduced for commercial applications about 15 years ago, Fi-Foil has only recently started marketing its Retro-Shield System to the food industry as a viable insulation solution to meet some FSMA requirements, Wester relates.

Explaining reflective insulation technology, Wester says that heat is transferred by three methods: conduction, convection, and radiation. "Traditional insulating products resist heat transfer by slowing down conduction through materials such as fiberglass, recycled paper, or foam," he notes. "Key to traditional insulation is the small air spaces within those products, since air is a tremendous insulator."

Reflective insulation works differently, Wester says, by incorporating highly reflective foils or metalized films, either alone or as part of an engineered product structure, to reduce the most dominant of the three forms of heat transfer, radiant energy, through high reflectance and low emissive surfaces that block more than 90 percent of radiant energy transmission.

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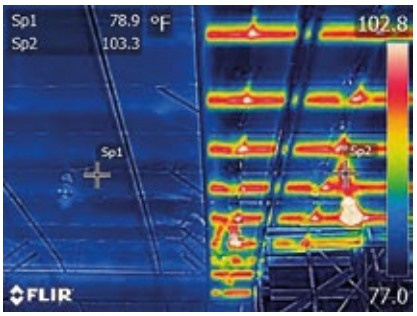
"Reflective insulations also incorporate air as an insulator by creating air cavities within a product and/or in conjunction with the building structure around them to reduce the convective component of heat transfer," Wester explains. "In the case of our RetroShield system, it addresses conduction, convection, and radiation plus



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Thermal image shows how Fi-Foil's RetroShield stopped the transmission of heat through a building's roof and the metal beams.

© SHERWIN-WILLIAMS

The wet edge application properties of S-WP&MC AquArmor WBU Water-Based Urethane Floor Coatings help minimize the potential for roller lap marks, ensuring a consistent sheen.

© ESBELT, S.A.

Esbelt's Metal Detectable Conveyor Belt POLER 0802MD helps address the issue of plastic contamination of food products.

creates a continuous insulation barrier to stop that transfer of heat or cold. Reflective insulations can also be combined with traditional insulations to help them perform better and create an optimized solution."

It is widely accepted by building scientists that heat transfer can be substantially minimized by controlling the radiant energy passing through the ceilings and walls, Wester points out. "The RetroShield System is designed to virtually eliminate radiant heat transfer," he says.

Roofing Diagnostics Tools

There haven't been any major innovations in roofing products of late, says Fred Sitter, marketing manager for Royalty Roofing, Seymour, Ind., a company that serves the food industry. "Although there have been modifications to product formulations and roof membrane thickness, most commercial roofing materials in use today have been around for decades," Sitter relates. "However, a recent development relative to roofs is the use of infrared technology to identify problem areas."

Since its wavelength is too long to be detected by the human eye, thermal energy, also known as infrared energy, is light that isn't visible. Thus, it requires a thermal imaging device or infrared camera that detects infrared energy, converts that energy to an electronic signal, and then produces a thermal image on a video monitor.

Thermal imaging is non-invasive and allows for quick evaluation of a large area. "Thermal imaging shows temperature variations on the rooftop, which in turn can indicate the presence of problematic moisture under the roof surface," Sitter relates.

While a roof represents only about 5 percent of the cost of a commercial building, 70 percent to 80 percent of lawsuits associated with commercial buildings, including food processing facilities, are centered around failures in the integrity of the roofs, Sitter notes.

"Roofing failures impact the whole environment of a building, so timely, accurate detection of roof leaks and moisture penetration is critical to the food industry because water damages insulation and other building components, including drywall, ceiling panels, etc., and can cause mold growth and create an environment for pests to breed," Sitter emphasizes. "Such a setting would threaten a company's objective to process food safely. Ensuring rooftop watertight integrity should be a part of any food manufacturer's safety strategy.

"To that end, cameras that detect infrared radiation are being used with increasing frequency to inspect roofs and pinpoint leak locations," Sitter adds. "And drones are being used to carry the cameras, which can provide a safe alternative to humans climbing on a roof."

Conveyor Belt Innovation

Conveyor belts can get jammed, break, or wear down, sometimes resulting in bits of plastic entering the food production line, notes Donald Harvey, business development manager in the U.S. and Canada for Esbelt, S.A., Barcelona, Spain, a manufacturer of conveyor belts.

In November 2016, Esbelt introduced in the U.S. an innovative new conveyor belt that is helping to address this issue of potential plastic contamination.

Esbelt's Metal Detectable Conveyor Belt Poler 0802MD incorporates a unique formulation of DuPont Hytrel TPC-ET thermoplastic polyester elastomer (Hytrel), which is detectable in metal detection and X-ray inspection machines, according to Franco Marabelli, global business consultant, development material handling, for DuPont Performance Materials.

"A special food grade Hytrel has been enriched so that it can be detected by metal and/or X-ray detectors and offer the flexibility of rubber with the strength and processability of thermoplastics to produce conveyor belts," Marabelli elaborates.

"It's important to keep in mind that the Poler 0802MD's metal detectable and X-ray inspection qualities are dependent on the capacities of the specific metal detector that is utilized and its setup by the end user," Harvey adds. "There are three variables facing metal detection and X-ray inspection today, namely the product type to be inspected, environmental noise, and setup, so it's important to conduct tests with each product to determine detectable size." ■

Leake, doing business as Food Safety Ink, is a food safety consultant, auditor, and award-winning journalist based in Wilmington, N.C. Reach her at LLLeake@aol.com.

For bonus content, go to October/November 2017 on FoodQualityandSafety.com and click on "From the Ground Up."

FSMA Update

Top 10 Points to Know for Anniversary of Preventive Controls

Factors to consider as FDA is expected to start more actively enforcing the requirements | BY **RANDY FIELDS**

It has been one year since the Food Safety Modernization Act's (FSMA) Preventive Controls rule went into effect, so it's time to check on progress being made by retailers and their suppliers. The FDA is expected to start more actively enforcing the provisions, auditing companies that are most likely to incur food safety challenges due to the volume of food produced or the character of the product made and sold.

With that in mind, here are 10 critical points you need to understand about the Preventive Control rule right now.

1. All covered facilities must now have a food safety plan in place. The plan must contain several key sections, including a hazard analysis, preventive controls to minimize those hazards, and an oversight and management program. The oversight and management program monitors the flow of product through the internal supply chain and is used to identify corrective actions that need to be taken on problems that occur during food production.

2. All covered facilities must now have a preventive controls qualified individual on staff. A preventive controls qualified individual, or PCQI, has successfully completed training or has job experience in the development and application of food safety programs.

3. Preventive controls rules are different from HACCP. While there are similarities between the FSMA preventive controls requirements and Hazard Analysis and Critical Control Points (HACCP), many provisions are different. HACCP systems apply controls at critical control points, for instance, but preventive controls include all control points appropriate for food safety.

4. Preventive controls plans must cover any food material processed or sold. Each facility must have a risk-based preventive assessment supply chain program for all ingredients and products, unless it either institutes preventive measures to deal with the hazard itself or passes the ingredient on to a customer who will implement their own preventive measures.

5. All foods must now be received from approved suppliers that have gone through hazard analysis for that particular food. Foods may be brought in temporarily from unapproved suppliers, but these products or ingredients are then subject to verification before they can be used.

6. Preventive controls are not required if any hazard will be controlled by another entity in the supply chain. The facility must disclose that the product or ingredient has not been processed to control its associated risk and must obtain written assurance that the trading partner will do so.

7. Other organizations, including brokers or distributors, can conduct supplier verifications. Any receiving facility must, however, review and assess that organization's documentation of the verification.

8. Good Manufacturing Practices are constantly being updated. The FDA's best practices mandate education and training on hygiene and food safety for employees and management, as well as addressing food allergy concerns.

9. Exemptions include farms that engage in low-risk on-farm activities and are small or very small businesses, plus operations already subject to HACCP requirements. There are also exemptions for companies that process low-acid canned foods, producers of dietary supplements, alcoholic beverages, or cosmetics and facilities that store raw agricultural commodities or packaged foods.

10. The date for compliance with Preventive Controls was last year for large businesses and now it applies to smaller ones with less than 500 employees. Small businesses with less than $1 million in sales have until September 2018.

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FDA's New Software Helps Businesses Comply

To help businesses meet the requirements of the FSMA Final Rule for Preventive Controls for Human Food, the FDA's new software tool, Food Safety Plan Builder, helps owners and operators of food facilities create a food safety plan specific to their facilities.

This free software application, developed by FDA, can be downloaded from the FDA's website to guide businesses, step-by-step, through the creation of a food safety plan, as required by FSMA. Once businesses have completed the information, the file may be saved or printed, and the firm will have a food safety plan to use in its operations and to provide when the FDA conducts an inspection.

While the Food Safety Plan Builder was primarily designed for use by small manufacturers, which may have limited resources, any size manufacturer can opt to use it. Download directly at https://www.accessdata.fda.gov/scripts/foodSafetyPlanBuilder/. *—FQ&S*

NOVEL METHODS SERVE UP DAIRY SAFETY

Advancements are focused on techniques that use gene sequencing, metagenomics, and artificial intelligence

BY **KATHY HOLLIMAN, MED**

The safety of dairy products relies on good farming, processing, transport, and storage practices, along with accurate screening for pathogens and drug residues. Continued advancements in dairy safety are now focused on novel techniques that use gene sequencing, metagenomics, and even image analysis and artificial intelligence (AI) to provide early warning signals of potential problems in an industry that produces one of the safest products in the country.

In 1938, milk-borne outbreaks were responsible for 25 percent of all disease outbreaks attributed to infected foods and contaminated water. By 2015, milk and fluid milk products were associated with less than 1 percent of reported outbreaks, according to the U.S. Public Health Service and FDA Grade "A" Pasteurized Milk Ordinance [PMO] 2015 Revision.

Reducing Residues

Drug residues in milk have been a concern, and sensitive and accurate analytical methods have been developed to detect and measure the presence of antibiotic residues in dairy products. Under the National Conference on Interstate Milk Shipments (NCIMS) Grade "A" program, state regulatory agencies report milk testing activities to the National Milk Drug Residue Database. In 2012, more than 3.7 million tests were reported to the database, and any milk containing illegal drug residues were not allowed to enter the human food supply.

PMO requires that a milk sample be tested from every bulk tank of raw milk collected at each farm, as well as a sample from every truckload of raw milk arriving at a dairy plant. Samples from every arriving truckload of raw milk are tested for the presence of at least four of six specific beta-lactam drugs: penicillin, ampicillin, amoxicillin, cloxacillin, cephapirin, and ceftiofur. If any test positive, raw milk samples from each farm that supplied the sample for that truckload must be tested.

In addition, the FDA Center for Veterinary Medicine conducted a Milk Drug Residue Sampling Survey, published in 2015, which analyzed raw milk samples from individual dairy farms that had been previously identified as having a drug residue violation in tissues from culled dairy cows at slaughter. These samples were compared to a control group of samples from farms that had not been identified with a previous residue violation. The milk samples were analyzed for antibiotics, non-steroidal anti-inflammatory drugs, and an antihistamine, a total of 31 different drug residues. A positive residue was defined as being at or about 50 percent of the established safe level/tolerance.

Out of the 1,912 total samples, there were 11 confirmed positive milk samples out of 953 (1.15 percent) targeted milk samples, representing 12 confirmed drug residues in the targeted sample group. One sample contained two confirmed drug residues. Among the 959 non-targeted samples, or the control group, there were four confirmed drug residues (0.42 percent). According to the FDA Center for Veterinary Medicine report about this sampling and testing, "the small number of positives in both the targeted and non-tar-

(Continued on p. 20)

geted groups is encouraging and the FDA continues to be confident in the safety of the U.S. milk supply."

Additionally, the FDA report called for strengthening the NCIMS drug residue testing program to educate dairy producers on best practices to avoid these residues in both tissue and milk; to utilize the data to, if necessary, include testing for more diverse drug classes in milk; and to consult with state milk regulatory agencies to consider (on a case-by-case basis) collecting milk samples in conjunction with investigating illegal drug residues in tissue involving cull dairy cattle.

Labeling Ultrafiltered Milk in Cheeses

The U.S. FDA recently released guidance for industry that entails how it will exercise enforcement discretion on the use and labeling of fluid ultrafiltered milk (UF milk) and fluid ultrafiltered nonfat milk (UF nonfat milk) to make certain cheeses and related cheese products.

According to FDA, UF milk is milk that is mechanically filtered to concentrate large compounds, like proteins. In the process, smaller compounds, like lactose, are removed, along with water and mineral salts. The resulting protein concentrate is less expensive to ship than milk.

The agency is taking this action due to recent changes in some export markets that have caused the U.S. dairy industry to experience an oversupply and pricing challenges with domestically produced UF milk. This enforcement discretion is intended to mitigate the impact on U.S. companies producing UF milk while the FDA considers rulemaking concerning the issues about UF milk and UF nonfat milk in certain cheeses and cheese products.

The FDA is encouraging manufacturers of standardized cheeses and related cheese products to identify fluid UF milk and fluid UF nonfat milk when used as ingredients as "UF milk" and "UF nonfat milk" when feasible and appropriate. However, the FDA does not intend to take action against companies that manufacture standardized cheeses and related cheese products that contain fluid UF milk or fluid UF nonfat milk without declaring them in the ingredient statement, as long as their labels declare milk or nonfat milk.

To read the FDA's complete guidance, go to http://ow.ly/tLDH3of5OnY. *—FQ&S*

Sequencing DNA and RNA means that the microbiomes can be profiled all along the milk supply chain.

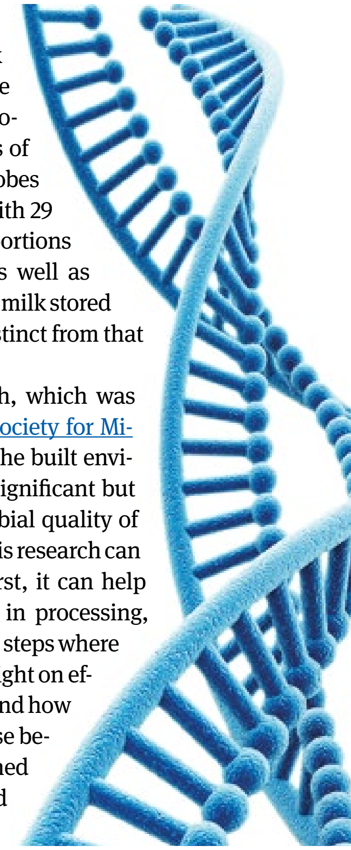
Analyzing the Microbiome

Investigators at the University of California, Davis, are taking dairy safety another step forward by identifying the raw-milk microbes, or the level of bacterial diversity that is found in shipments of raw milk that arrive at participating processing facilities in California. The researchers sampled and analyzed milk from 899 tanker trucks on arrival and then shortly after storage at two dairy processors in California's San Joaquin Valley during the spring, summer, and fall.

Gene sequencing was used to analyze the samples, the same method already being used to study the gut microbiome and soil, according to researcher Maria L. Marco, PhD, an associate professor in the department of food science and technology at UC Davis. "The method has been revolutionary in medicine, agriculture, and many other fields where microbes can be either beneficial or detrimental," she says.

Using DNA sequencing, Dr. Marco and her team found that the communities of milk microbiomes are highly diverse, with a core microbiota showing distinct seasonal trends. Milk collected in the spring had the most diverse bacterial communities, with the highest total cell numbers and highest proportions of *Actinobacteria*. A core community of microbes was found in all the raw milk samples, with 29 different bacterial groups and high proportions of *Streptococcus* and *Staphylococcus*, as well as *Costridiales*. The bacterial composition of milk stored in some silos at processing plants was distinct from that in the tanker trucks.

According to Dr. Marco, the research, which was published in a 2016 issue of American Society for Microbiology's mBio, demonstrated "how the built environment in processing plants can have significant but still unpredictable impacts on the microbial quality of foods." There are three major ways that this research can impact the dairy industry, she notes. First, it can help identify probable contamination points in processing, such as the pieces of equipment or precise steps where contaminants enter. Second, it can shed light on effective cleaning protocols, such as when and how to clean and how much time should elapse before a piece of equipment should be cleaned again. "Contaminant bacteria can build up over time, so our work is focused on



helping processors refine their cleaning procedures," she says. And third, using DNA sequencing will help increase the ability to predict spoilage. Understanding how to predict which milk would most likely result in a defect in cheese or other dairy product can improve the treatment and handling of milk and thus ensure consistently high-quality products, Dr. Marco emphasizes.

This type of testing is not intended to replace the widely used diagnostic assays that effectively identify pathogens such as *Listeria* or *Salmonella* and *Campylobacter* in milk. Instead, it is an additional approach that can help identify a potential safety risk. "This has shown that we have to be mindful that frequent sampling is needed and that, by using methods we never had before, we can really monitor the equipment to keep the contaminants down," Dr. Marco says.

Genomics Tools

Metagenomics and metatranscriptomics have moved food safety, including dairy safety, into the arena of nontargeted screening to give early warning signals of deviations that could indicate a safety issue. The use of genomics also provides a more precise method of detecting, characterizing, and identifying pathogens in foods such as milk, according to Martin Wiedmann, DVM, PhD, Gellert Family Professor in Food Safety at Cornell University. Sequencing DNA and RNA means that the microbiomes can be profiled all along the milk supply chain.

People who consume raw milk are 838.8 times more likely to experience an illness and 45.1 times more likely to be hospitalized than people who consume pasteurized dairy products.

Cornell is collaborating with IBM Research as part of the Consortium for Sequencing the Food Supply Chain (the university is one of several members). The goal of the consortium is to categorize and understand microorganisms and the factors that influence their activity in a normal, safe environment, and to develop the science and the tools that can be used for analysis. Researchers at Cornell are using the university's own approved and licensed dairy farm and processing facility as a "model system for how we can implement on a routine basis these types of tools," Dr. Wiedmann says.

Another focus of the program is defining the baseline for "normal" raw milk, and then being able to define "abnormal" milk, he points out. "We have started developing the knowledge to detect some of these abnormalities earlier and trace them back to identifying the cause and,

(Continued on p. 22)

therefore, more effectively and more rapidly address or further characterize the abnormalities."

One example of how these techniques can be applied has been the identification of certain bacteria that can make refrigerated, pasteurized milk in partially filled containers turn gray or be streaked with gray, as discussed in a July 2017 article in the Journal of Dairy Science. "We found that there are organisms that required oxygen to make the color compound, and we were able to identify which genes are responsible. So if you have these genes and they are expressed and they have enough oxygen, then you are going to get this defect. It was a microbial contaminant that causes the problem, not a disgruntled employee tampering with the product, as had been suspected," Dr. Wiedmann says.

Other applications include individualized troubleshooting to identify the likely cause of a defect, such as a taste defect, so that intervention can begin to eliminate that cause. Using the tools for genomic sequencing, it is now possible to quickly take a bacterial isolate and accurately identify the microbes involved. "We want to get to the point where individual dairy processors can do this type of testing. As futuristic as it may sound, I think it is feasible that it will probably happen in three to five years in more sophisticated plants," Dr. Wiedmann notes. Metagenomics testing is likely to supplement traditional dairy testing methods, not replace them, and will allow for more risk-based testing, he says.

U.S. dairy products are "probably some of the safest products around, and the countries where we export pay premium for U.S. dairy products because of the excellent safety record," Dr. Wiedmann elaborates. "Anything we can do to show that we use cutting-edge tools will hopefully improve that ability for the U.S. to export some of these products."

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Image Analysis

A team of researchers at Osaka University and Rakuno Gakuen University, both in Japan, have developed a technique that uses a camera and AI to monitor lameness among dairy cows. Lameness, if untreated, can result in declining quantity and quality of dairy production. The researchers waterproofed and dustproofed a camera-based sensor capable of measuring distance to an object and set it in a cowshed. Based on the large number of cow gait images taken by the sensor, the researchers could characterize cow gaits and detect cows with lameness through machine learning.

Professor Yagi Yasushi at Osaka University says this research "will mark the start of techniques for monitoring cows using AI-powered image analysis. By showing farmers cow conditions in detail through automatic analysis of cow conditions, we can realize a new era of dairy farming in which farms can focus entirely on health management of their cows and delivering high-quality dairy products."

Raw, Unpasteurized Milk

One dairy product that continues to be associated with disease outbreaks is raw, unpasteurized milk and cheese. The FDA does not regulate the intrastate sale or distribution of raw milk, leaving that up to each state. Thirty-one states allow consumers to pur-

(Continued on p. 24)

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(Continued from p. 22)

chase raw milk directly, although in many states it can only be purchased at the farm, at farmers' markets, or through a cow-share program. Twelve states allow its purchase at retail stores. Raw milk cannot be sold across state lines or internationally. In Canada, it is illegal to sell or buy raw milk.

Research published in 2017 of the CDC's Emerging Infectious Diseases reported that unpasteurized dairy products are responsible for almost all of the 761 illnesses and 22 hospitalizations in the U.S. that occur each year because of dairy-related outbreaks attributed to Shiga toxin-producing *Escherichia coli*, *Salmonella* spp., *Listeria monocytogenes*, and *Campylobacter* spp. People who consume raw milk are 838.8 times more likely to experience an illness and 45.1 times more likely to be hospitalized than people who consume pasteurized dairy products. The cause of most of these outbreaks is pathogen contamination at the dairy farm, according to the report.

Understanding how to predict which milk would most likely result in a defect in cheese or other dairy product can improve the treatment and handling of milk and thus ensure consistently high-quality products, Dr. Marco emphasizes.

Dr. Marco describes raw milk as a "microbial zoo." The soil, gut, and aerosol bacteria found in raw milk means that it is a product "that should not be considered probiotic. It has the wrong kind of bacteria, the kind that can make you sick, particularly children and people who are immunocompromised or are recovering from an illness."

Dr. Wiedmann grew up drinking raw milk as a child, but does so no longer. "I would not let my kids drink raw milk or my friends or pregnant friends, elderly people, or people with weakened immune conditions," he says. "There are too many risks, and the benefits are anecdotal at best. The risks are very clear, very well described, and ironclad with regards to the science." ■

Holliman is a freelance writer/editor with 20 years of experience. Reach her at kathy.holliman@gmail.com.

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Dream House TreeHouse

Strength abounds from the roots to the treetop for this 2017 Food Quality & Safety Award winner in the large business category

BY **LINDA L. LEAKE, MS**

Producing snacks at the TreeHouse Robersonville, N.C. facility.

In the TV show "Treehouse Masters" featured on Animal Planet network, one Pete Nelson, principal of Nelson Treehouse and Supply, and his talented crew create spectacular, jaw-dropping custom treehouses all around the county and the world. Nelson's treehouses, all anchored on a solid, strong, specially selected tree, or sometimes group of trees, are nothing short of exemplary and inspiring dream house treehouses.

The same can be said about TreeHouse Foods, Inc., Oak Brook, Ill. So exemplary and inspiring are TreeHouse Foods' quality and safety initiatives, the enterprise is being honored with a coveted 2017 Food Quality & Safety Award in the large business category. This prestigious Award from Food Quality & Safety magazine recognizes the dedication and achievement of an organization that upholds the highest food standards supported by quantifiable results.

TreeHouse, a publicly traded, globally-minded company, is best known for a myriad of food and beverages produced by its two largest businesses, the solid anchor Bay Valley Foods, LLC and a 2016 branching out acquisition, TreeHouse Private Brands (formerly the ConAgra Private Brands business).

Bay Valley Foods is one of the nation's leading suppliers of pickles, salsa, peppers, relishes, aseptic sauces, powdered products, salad dressings, marinades, sauces, and jams/jellies/preserves/fruit spreads to major retail, food service, bulk, ingredient, and international customers. Bay Valley claims the distinction of being the nation's number one packer of private label pickles for the retail market, the number one supplier of private label salad dressing, and the number one supplier of private label broths and stocks for the retail market.

TreeHouse Foods was established in 2005 by Sam Reed, E. Nichol McCully, David Vermylen, Harry Walsh, and Tom O'Neill, seasoned executives who previously served as the senior management of Keebler Foods Co. from 1996 through its sale to the Kellogg Company in 2001.

Under the solid oak strong leadership of these five company founders, in just 12 years TreeHouse Foods has grown as a seedling comprised of 11 plants spun off from the predecessor company Dean Foods to some 52 manufacturing facilities across the U.S., Canada, and Italy, according April Bishop, the firm's senior director of food safety.

Serving retail grocery and food away from home customers across North America, TreeHouse operates under five divisions, Beverages, Baked Goods, Condiments, Snacks, and Meals.

With seven plants in the U.S. and Canada, the Beverages Division produces single serve beverages, including coffee and tea, plus drink mixes, non-dairy creamers, and smoothies.

The Baked Goods Division creates crackers, cookies, pretzels, candy, pita chips, refrigerated dough, frozen waffles, and in-store bakery at 17 U.S. and Canadian plants.

Cooking up dressings, dips, gravies, jams, mayonnaise, pickles, salsa, and sauces, the Condiments Division oversees 10 plants in the U.S. and Canada.

Operating five plants in the U.S., the Snacks Division is responsible for snack nuts, trail mixes, dried fruits and vegetables, and baking nuts.

The Meals Division, 13 facilities strong in the U.S., Canada, and Italy, makes dry dinners, macaroni and cheese, side dishes, hot and cold cereals, aseptic soups and broths, pie filling, and pudding.

It's no surprise that TreeHouse, a leading supplier of shelf stable foods with a broad range of national and regional brands, bills itself as "one of the largest private label manufacturers in the world."

Focus on Continuous Improvement

"We're committed to continuous improvement, as demonstrated by our manufacturing expertise, innovative products, superior research and development, strong regional brands, and state-of-the-art manufacturing facilities and technology," says Brian Perry, TreeHouse's senior vice president of food safety and quality.

To say that TreeHouse continually embraces cutting-edge technology would be an understatement. "As technology changes, we change and strive to be a leader in the industry," Bishop relates.

"Each year during the capital planning process, management identifies the latest food safety and quality improvement technologies available. TreeHouse feels that putting money towards these improvements gives us a competitive advantage and is necessary to meet and exceed customer demands."

One key example is implementation of X-ray technology to improve food safety. "In recent times, we have enhanced our existing

protocols with additional X-ray on many product lines as a primary foreign material screening process, and many times as a last point of detection on the line," Bishop notes.

This is no small undertaking, since TreeHouse offers finished products in many different packaging materials, including flexible pouches from individual size to food service size, metal cans from retail size to food service size, glass of varying sizes, paper for aseptic products, rigid poly containers, tubs, totes, pails, clam shells, fiber tubes, laminated films, plastic jars, single serve beverage pods, tea bags, and fiberboard, just to name a few examples.

Using the latest pest control technology also greatly benefits TreeHouse, Bishop mentions. "Many of our facilities are dry facilities and have stored product pest prevention as one of their largest sources of fumigation costs," she points out. "Installation of Indian meal moth mating disruption technology reduced fumigation costs by more than $100,000 in just one facility."

Solid vulcanized belting material has replaced most fabric-back belting materials in TreeHouse's agricultural product facilities. "While there are no cost savings associated with this, sanitation effectiveness results improved by a substantial 10 percent," Bishop relates. "Also, relative to sanitation, we strive to implement the most up-to-date technologies as new chemicals come to the market each year. Chemical technology opportunities identified by our sanitation partners have delivered more than $22,000 in savings in the Bay Valley sector of the company."

The use of pulsed-field gel electrophoresis (PFGE), a molecular fingerprinting technique used to classify bacteria based on restriction sites within the bacterial genome beyond the species level, has been an effective prevention tool for TreeHouse.

"Through PFGE sequencing we have been able to make decisions regarding our environmental program, leading to pathogen prevention," Bishop explains. "We have been able to identify areas that needed capital funding like flooring and drain replacements, elimination of trench drains, and roofing refurbishment—all driving pathogen prevention in our facilities."

Bishop says the older TreeHouse equipment that was not designed with cleaning in mind has been redesigned to facilitate cleaning. "New equipment goes through a full sanitary design review before it is ever placed in a facility," she notes.

The TreeHouse Food Safety Team has created a list of sanitary standards for the engineers to use when planning projects, Bishop adds. "Facilities have installed floor foaming devices, dry shoe treatment mats, and broadcast spraying devices for dry sanitizer in high-traffic areas to also aim at prevention," she relates.

TreeHouse Foods also recognizes the potential risks of having raw versus ready-to-eat processing in the same building, Bishop continues. "While there has not been any cross-contamination within our facilities, we have put capital funding behind projects to ensure separation," she says. "Instead of relying on items like control of traffic patterns or temporary barriers, we have chosen to modify rooms and place actual brick and mortar walls for physical separation."

As a result, dedicated raw and cooked causeways have been established between plant and warehouse in these same facilities. "This minimizes the risk of cross-contamination from raw to ready-to-eat areas, eliminating a potential food safety risk," Bishop points out. "Add to these measures roofing refurbishment and new flooring, plus water filters to prevent foreign material contamination from main city water lines."

TreeHouse Training

Having more than 16,000 employees catapults the importance of training for TreeHouse to the stars and beyond. Perry emphasizes that training for all team members is ongoing at TreeHouse plants. Internal training includes documented programs for quality, sanitation, and food safety.

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TreeHouse Foods pickles are made with farm-fresh produce for every customer.

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"Two of our staff members have become certified trainers," he relates, "one for HACCP (Hazard Analysis and Critical Control Points) training and one for Preventive Controls Qualified Individual (PCQI) training. Our in-house HACCP trainer is certified by the International HACCP Alliance. Our in-house PCQI trainer is certified with the Food Safety Preventive Controls Alliance (FSPCA) and conducts a 2.5-day course several times per year."

"We invest in continuously educating our employees about HACCP and FSPCA Preventative Controls to ensure our employees are knowledgeable and capable of writing, reviewing, and implementing these plans," Perry elaborates.

Annual employee food safety training is required for plant team members. "Through computer-based training, each employee has to successfully complete assigned modules for re-certification," Bishop explains. "Topics covered include foamer use, sanitation chemical safety, sanitation overview, foodborne pathogens, basic Good Manufacturing Practices (personal hygiene), allergen control, facility security, microbiology, HACCP, and maintenance and sanitation.

"Our cleaning and sanitation company's food safety and sanitation professionals provide in-house hands-on training for the TreeHouse sanitation employees across all production facilities," Bishop continues. "This includes chemical safety, titration, pre-operational reviews, cleaning in-place systems, and adenosine triphosphate use. This training is customized for our specific plants and our chemical and pest control needs."

Additional external training for TreeHouse personnel includes FSPCA-PCQI, HACCP, Lean-Greenbelt, Better Process Control School, food defense, risk assessment and food safety, Safe Quality Food auditor/systems, and sanitary design.

All of this training has impacted TreeHouse food safety initiatives in a positive and measurable way, Bishop says.

"Sanitation effectiveness and pathogen monitoring have improved overall in our facilities due to sanitation, sanitary design, and annual refresher training," she relates. "Score-carding of sanitation effectiveness and environmental monitoring has demonstrated the concerted effort put forth by the plants to improve the cleanliness of our facilities. Many capital projects at our plants were driven by the results of scorecard meetings. Sanitary design changes and facility infrastructure upgrades to improve clean-ability led to these key improvements."

The production line in the Buckner, Ky., facility.

The research and development facility at E.D. Smith, Medina, Ontario.

52 GFSI Certifications

Each TreeHouse plant is GFSI (Global Food Safety Initiative) certified. "In addition, there are many customer food quality and safety audits routinely conducted at all 52 of our facilities that cover all areas of quality and food safety, and these audits help drive continuous improvement," Perry points out. "This drives home the point that, in all of our facilities, we have strong HACCP and preventive control measures that are reviewed annually by a trained cross-functional team and are all verified by GFSI third-party certification."

Without question, quality and food safety are core seeds firmly planted in the TreeHouse culture, Perry emphasizes. "This culture originates with a commitment from our executive team through monthly CEO food safety reviews, and it translates down to every employee on every line through weekly quality meetings," he elaborates. "With quality as a strategic goal for the company, we have successfully made meaningful impact in driving down key consumer complaints, mitigating potential hazards, and minimizing quality incidents in our plants year over year though continuous training, technical research, and investments in capital and integrated quality systems. This enables us to meet and often exceed our customers' expectations, while enabling top line growth for the company. Our TreeHouse promise fully embraces the importance of food safety and quality, as we work diligently to protect the TreeHouse legacy and all of our customers' brands."

According to Perry, the company's vision, which one might say was developed by "TreeHouse masters," says it all:

May our TreeHouse stand straight and true, rising above branded ancients as the towering symbol of the best in customer brands and custom products.

May our TreeHousehold of many cultures expand and prosper through all seasons, united in uncommon customer devotion and unlimited resolve to win.

May our TreeHouse endure the test of time, ever growing strong and standing tall.

Leake, doing business as Food Safety Ink, is a foood safety consultant, auditor, and award-winning journalist based in Wilmington, N.C. Reach her at LLLeake@aol.com.

Swirling with Excellence

Family-owned and operated bakery captures a 2017 Food Quality & Safety Award in the small business category

BY **LINDA L. LEAKE, MS**

5 Generation Bakers manufactures Jenny Lee Cinnamon Swirl Bread.

If your travels take you by 1100 Chartiers Avenue in McKees Rocks, Pa., prepare to be overcome by the tantalizing aroma of fresh baked cinnamon swirl bread emanating from the building.

This particular address in this historic borough just north of Pittsburgh is home to 5 Generation Bakers, LLC (5GB), a company that bills itself as "the premier manufacturer of gourmet cinnamon swirl breads in the country."

5GB makes six varieties of swirl bread, including the classic cinnamon, plus those named for their additional ingredient: raisin, apple, cranberry, pumpkin, and chocolate chip—all sporting the Jenny Lee label. The Jenny Lee savory line includes Parmesan Garlic and Herb, Italian Olive Focaccia, and California Tomato Basil.

A total of 10,000 to 15,000 loaves are baked per workday (depending on client demand), 24/5, on two production lines, during two shifts. So how could 5GB's neighborhood not smell like heaven?

"Welcome to your new obsession," 5GB proclaims enthusiastically.

Not surprisingly, consumers' obsession with Jenny Lee breads is directly related to 5GB's obsession with food quality and safety. So fervent is the company's devotion to these two outcomes, 5GB's efforts have been rewarded with a 2017 Food Quality & Safety Award, offered in a new category created this year to recognize small enterprises. This prestigious honor from Food Quality & Safety magazine recognizes the dedication and achievement of an organization that upholds the highest food standards supported by quantifiable results.

Not bad for a family-owned and operated company just 7 years old.

However, 5GB has roots going back to 1938, when cousins Paul Baker and Bernard McDonald founded Jenny Lee Bakery in McKees Rocks. Paul Baker's paternal uncle, Frank, chose the name, inspired by a 1930 song titled "Sweet Jenny Lee."

At its peak in the 1970s, the thriving business had 14 retail locations in the Pittsburgh area, along with its 25,000-square-foot headquarters. Among its repertoire of some 200 to 300 different products, including sweet breads, donuts, pastries, cookies, pies, and cakes, the company's most popular product by far was its cinnamon swirl bread.

A catastrophic Thanksgiving Day fire in 2006 that nearly wiped out the second-floor offices and candy production area ultimately led to Jenny Lee Bakery closing its doors on Aug. 16, 2008.

2010 Revival

Inspired to continue his family's legacy, Scott Baker, Paul Baker's grandson, brought the family business back to life in 2010. As an homage to his German immigrant ancestors and their professional baking tradition that dates to 1875 in the U.S., Scott named the revival enterprise 5 Generation Bakers. As company president, he purchased and renovated a 20,000-square-foot grocery store, which serves as the 5GB manufacturing facility and also features about 600 square feet of retail grocery space.

5GB now specializes in its signature cinnamon swirl bread, which is sold frozen and wholesale, currently available at 4,000 stores in 20 states, the Republic of Trinidad and Tobago, and even Japan.

"Five generations of the Baker family have contributed to the quality standards and recipes for success that we enjoy today," Scott Baker relates. "Our passion to create only the finest products available has grown into a business that strives to be ahead of the curve when it comes to both a quality and safe food experience for our customers."

Food safety has been the driving force 5GB has embraced to ensure success in "building a better bakery," Baker emphasizes.

"We continually strive to blend excellence with cutting-edge technology and prevailing knowledge," he says. "This mindset makes it possible for us to build a team superior in skills, talent, and confidence in order to grow the Jenny Lee brand while producing the highest quality product. Our management team supports this vision and has created a tenacious food safety culture that our 45 employees embrace."

Baker says this exemplary food safety culture has resulted in a strong market position and brand recognition. "5 Generation Bakers has established a reputation for controlling risks, which

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ALL IMAGES: BOB GELSTON

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has attracted investors to support our expansion plan to create a state-of-the-art commercial bakery," he notes.

"To achieve these goals, we are consistently looking for the best, freshest, all-natural ingredients," Baker elaborates. "We strive to continually improve our process with up-to-date technology and equipment. We educate our employees on current food safety laws and requirements with our ongoing training program. And we have committed tens of thousands of dollars to developing a food safety program that emphasizes documentation and accountability."

Baker is quick to boast that 5GB has embraced food quality and safety initiatives with enthusiasm. "In doing so, we have created control and consistency," he says. "Through well-defined processes we have established a resilience to internal and external risks. This allows us to react quickly to change in customer requests and develop new products."

Numerous financial investments in food quality and safety amenities have significantly impacted 5GB in a positive way.

For starters, the entire facility is equipped with energy efficient LED (light-emitting diode) lighting. "Unlike incandescent bulbs, which release 90 percent of their energy as heat, LEDs use energy far more efficiently with little wasted heat," Baker points out. "The reduced heat, ease of maintenance, and resistance to breakage provide benefits conducive to food safety while providing a reduction in time needed to maintain or replace bulbs."

Motion detection lighting has been installed in all areas of the 5GB facility except for the main production area. This includes the offices, training and conference rooms, breakroom, restrooms, and locker rooms.

"Forty-two surveillance cameras have been strategically placed both inside and outside the facility to support our food defense program," Baker relates. "Our key fob system prohibits access to restricted areas and limits access for production areas to coincide with a team member's work schedule, reducing the potential of product adulteration and also supporting our food defense system."

Production Software and Equipment

Food safety and quality initiatives are addressed by 5GB's high-tech production software and equipment, says Denice Beccard, 5GB's director of human resources and QA officer.

She explains that SG Systems Traceability Matrix, a multifaceted software application, provides 5GB with advanced technology for ingredient control and production traceability. The various modules include: 1) formula control, which eliminates paper traceability, 2) Mobile WMS, which keeps track of ingredients, packaging, and products; and enables order processing and shipping, 3) process control, which ensures each element of the final product is correctly proportioned without waste and unnecessary financial loss, and 4) label printing, which links batches to finished products for traceability.

"A high-performance stainless steel Diosna mixer features floor clearance for optimum hygiene, complementing our HACCP program," Beccard says. "With this sanitary design, less time is required for sanitation. The speed ratio mixing tool guarantees highly homogeneous mixing and intensive kneading, which provides the best possible result for our specific sweet fermented dough, thus producing a more consistent product."

The dough processing assembly line.

An employee reworks sweet fermented dough to produce bread products.

5GB's Rondo Smartline dough band former features a unique adjustable satellite head, making it universal. "This item's flat angles for firm dough and steep angles for soft dough provide flexibility for development of new products," Beccard explains.

According to Beccard, 5GB's four multi-rack Sveba Dahlen I-62 ovens provide increased baking surface, offering alternate rotation of the racks for faster, more even, baking on all sides of the product. "Double fans provide a large airflow distributed evenly in the oven chamber," she adds. "These features are adjustable through an SD-Touch panel for programmable and effective control of the oven, resulting in a consistent bake for each variety of the product."

5GB employs an LVO RW rack washer modified to fit the company's ovens and cooling racks. This rack washer is constructed of 14-gauge stainless steel, which is designed for use in bakeries to clean racks, pots, pans, bowls, and utensils. "The heating elements in the rack washer's rinse tank boost the rinse water to a sanitizing 180 degrees Fahrenheit at the inlet of this machine," Beccard notes.

A Knight ControlGuard FCS, a concentration control and pump system engineered specifically for chemical feed applications,

Dough rollers are used on all-natural ingredients.

Ovens provide a consistent bake for each product variety.

compliments 5GB's rack washer. "By utilizing flow meter technology, the advanced chemical concentration system measures high concentrations of caustic, acid rinse water with an extremely high degree of accuracy (+/- 2 percent), thereby ensuring precise chemical feed control," Beccard relates.

Nitco's Hyster motorized hand lift trucks offer 5GB the key advantage that a load can be picked up, moved, and dropped gently into position quickly, safely, and efficiently. This minimizes slowdowns in production, Beccard says. "Another benefit is that the motorized hand trucks minimize employee fatigue, and thus play a role in preventing injuries," she adds.

When it comes to keeping the 5GB floor clean, Beccard says Tennant ec-H20 NanoClean technology converts water into an innovative cleaning solution, through creation of microscopic nanobubbles via an on-board e-cell that cleans effectively, saves money, and reduces environmental impact eliminating daily floor cleaning chemicals.

Sanitation Upgrades

"After an in-depth review of our sanitation program in January and February 2017, we determined that our sanitation chemicals for cleaning manufacturing equipment were not meeting the stringent standards we had established," Baker says. "Based on our program review, we chose to partner with Rochester Midland Corporation (RMC) for our sanitation needs effective March 1, 2017. RMC was selected for their ability to provide solutions across all aspects of food safety, including brand protection and sustainable solutions."

Because of this partnership, Baker relates, 5GB made an investment in a new foaming system to clean its ovens and large mixing bowls. "The foaming system is designed to enhance chemical adhesion and retention time to improve the sanitation process," Baker elaborates. "The foam adheres to the surface and allows a longer time for the chemical to do its job."

Clothing is not overlooked in 5GB's sanitation program. "Essential to our Good Manufacturing Practices is the proper sanitation of our employee garments," Baker emphasizes. "A recent evaluation of this program led to our investment in Total HACCP Solution from Aramark Uniform Services to deliver hygienically clean uniforms. We believe this investment will play a critical role in reducing the potential of cross-contamination and enhance the integrity of our food safety program."

Customer Satisfaction is Everything

For the 5GB team, the success of the company's investments in QA and food safety tools and technology is measured in large part by customer satisfaction, Baker relates. "We take pride in our consistently low number of complaints," he says. "In 2016, we were faced with a total of five consumer complaints in comparison to the 54,780 cases of bread sold from January through May 15, 2016. The same time frame in 2017 resulted in just two complaints compared to 66,980 cases of bread sold."

Each complaint to 5GB is addressed immediately and a full investigation is completed to determine the root cause. Once the issue has been determined and a resolution been put into place, the consumer is contacted personally by Beccard or Baker.

"We understand that losing or retaining a customer depends on how we respond to a complaint," Baker says. "We view each complaint as an opportunity to create a greater consumer trust. We make it a priority to thank the individual for their time and efforts in assisting in identifying the issue at hand. The timing and personal attention to each consumer expressing dissatisfaction is critical to rebuilding consumer trust."

Customer retention is 5GB's primary focus, Baker points out. "We believe that successful retention results from not taking unethical shortcuts," he says. "Providing an open and honest response in a timely manner demonstrates our genuine interest in our customers. This approach has been common practice throughout the five generations and has provided long-time loyal customers.

"Paramount to all other business concerns is our dedication to product quality and food safety," Baker emphasizes. "This is a commitment we make to our customers every day. The food safety culture that permeates our organization has encouraged management and staff to work together on a guided path that drives improvement and efficiency while expanding business capabilities. Food quality and safety is not just something we do, it is who we are."

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Exploring the Secrets of CIP

Did I wash? Did I wash correctly? Did I wash optimally?

BY **JOE CURRAN**

To succeed today, food and beverage producers know they must meet four objectives: 1) produce safe, high-quality products, 2) operate efficiently, 3) increase profitability, and 4) reduce water, energy, and waste.

They also know that to achieve these objectives, they can't overlook clean in place (CIP). If CIP is not done well, producers risk contaminated products, production downtime, higher costs, and increased natural resource consumption. Further, poor quality and product recalls can damage brand reputation, lead to litigation and undermine hard-earned customer, consumer, and shareholder trust.

However, the challenge with CIP is evaluating how—and how well—it cleans at each wash. It's like an old friend who, after years of friendly give and take, still holds tight to his secrets.

The industry has certainly tried to peer beneath the surface to learn what's really going on during the CIP process. Periodic manual evaluations have provided helpful snapshots of CIP performance, but they could not be used to validate effectiveness across all washes. Increasing the frequency of manual evaluations to truly meaningful levels has simply not been practical.

In addition, when Programmable Logic Controllers (PLC) coupled with field instrumentation, advanced Human Machine Interfaces, and electronic Historian Databases became the standard of control within CIP operations, the industry expected greater insight into CIP performance. These technologies did generate reams of data. But developing platforms that could translate it into actionable insights required special expertise and considerable expense. In the end, the data offered limited practical value for understanding CIP performance.

With no good way to assess each clean, QA and plant operations teams have taken it largely on faith that CIP activities are being performed as intended. When Ecolab, which has partnered with fluid flow processors to enhance this sanitation technology for over 55 years, asks customers what percentage of the time they believe their CIP washes are done correctly, they usually answer "around 100 percent."

Such assumptions can be risky. For instance, when Ecolab installed an automated CIP monitoring system at several customer locations, only 30 to 50 percent of washes were running optimally. So far, the absolute best rate of conforming washes the company found has been between 60 and 70 percent. Nonconforming washes suggest trouble on one of two fronts: either resources are being wasted (too much water and/or chemical) or food safety is at risk (too little water and/or chemical.) Of the two, the impact on quality has been far and away customers' top concern. Resource use and associated costs have been a distant second.

Recently, the quest for effective, comprehensive CIP monitoring has taken a promising turn, thanks in large part to the Internet of Things and big data. The marriage of these two thoroughly modern inventions has led to systems capable of monitoring CIP washes 24/7 and providing specific insights into current and emerging CIP performance problems.

These advanced automated monitoring systems collect real-time CIP process data from the customer's industrial network (PLC and/or Historian Database), encrypt it, and transmit it to data centers where the data is aggregated. Sophisticated algorithms then scour the data for patterns and deviations that indicate compliance or non-compliance with prescribed wash protocols. Importantly, these algorithms are designed to translate

the data in a CIP context to help ensure the relevance of the output.

Data analytics experts provide further interpretation of the data to discern problems that need immediate attention—and opportunities for future improvement. Ultimately, the analysis separates the "critical" from the merely "interesting." With such clarity, recommendations can be developed to address immediate and long-term challenges.

> Increasing the frequency of manual evaluations to truly meaningful levels has simply not been practical.

Armed with actionable recommendations, internal and external technical teams can waste no time getting to the most urgent issues. In fact, for greatest impact, all data analysis should lead to action plans that can be incorporated in the plant's service platform.

From Transparency Comes Impact

Food and beverage producers who have implemented these 24/7 automated CIP monitoring systems report positive impact on quality and operational metrics, as seen in the following examples.

Over 12 months, the Kemps fresh milk plant, Rochester, Minn., using Ecolab's 3D TRASAR for CIP Technology, reported improvements in the following:

- Product quality as monthly variability in percent passing decreased by 55 percent from 2013 to 2014 and average percent passing end of code increased by 1.1 percent from 2013 to 2014;
- 1,295 hours of cleaning time saved;
- 963,750 gallons of water used for cleaning conserved;
- 1215 kWh electricity saved and 1,847 pounds of carbon dioxide emissions avoided (Calculated from www.epa.gov/cleanenergy/energy-resources/calculator.html); and
- 3,000 gallons of CIP chemical usage reduced.

Over three months of 24/7 CIP monitoring, another large beverage producer found a flow imbalance during the cleaning of its fillers. After making needed improvements identified by monitoring one line, the plant reported annualized efficiency benefits, including:

- 200 hours reduced cleaning time;
- 875,000 gallons reduced water consumption for cleaning;
- $8,000 cost avoidance through reduced pump and valve maintenance; and
- $369,000 total estimated benefit gained from identifying problems with 24/7 monitoring.

In addition, over a three-month period in which just 20 percent of its CIP activity was monitored, a large food producer identified opportunities to realize savings valued at $230,000. More important, round-the-clock monitoring found ineffective

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sanitizing methods occurring at a rate that could have negatively impacted the quality of approximately 1,800 production batches each year.

What to Expect of Automated CIP Monitoring

Automated CIP monitoring systems should answer three simple questions: 1) Did you clean everything you were supposed to clean? 2) Did you clean everything the way it was supposed to be cleaned? 3) Did you clean optimally?

If the technology can't respond with clear answers, it's probably not for lack of data. Rather it's likely due to the system's inability to distill the data to a level that is useful. Too much information with too little interpretation is more frustrating than no information at all.

To assure that "yes" is the answer to the three questions day after day, a three-phase approach is recommended once an automated monitoring system is installed.

1. Standardize. During this phase, the aim is to make needed adjustments to CIP protocols to achieve at least 90 percent of washes done correctly (as mentioned before, the best Ecolab has seen is 60 to 70 percent). Creating consistency around CIP operations has an immediate, tangible impact on quality while also improving efficiency. Once washes are standardized to perform correctly and consistently, it's time for Phase 2.

> Automated CIP monitoring is taking much of the guesswork, and worry, out of quality and food safety by providing constant assurance that every wash is confirmed and validated.

2. Optimize. In this phase, the goal is to identify savings opportunities to further optimize washes. Ultimately, the focus should be to drive wash conformance rate upward to 100 percent.

3. Sustain. With CIP, many things can, and do, change as wash recipes are added and adjusted. Automated CIP monitoring should be an ongoing and well integrated component of operations to ensure sustained wash conformance—as well as consistent product quality and safety for the long term. Continuous monitoring also enables organizational learning as it yields insights and best practices that can be shared.

Of course, easy access to the results of 24/7 CIP monitoring is essential. Advanced systems feature online dashboards with scheduled and exception-based reporting, as well as access to comparative analysis (historical, relative, and best-case). They use phone, email, and text to alert you—and your service and support teams—to the need for action when immediate problems arise.

Having CIP performance data at your fingertips provides another important benefit: It helps you prepare for compliance with the Food Safety and Modernization Act (FSMA). FSMA requires extensive documentation and recordkeeping related to QA and control processes. Companies that cannot readily produce the required documentation could face inspections, fines, and even recalls. CIP monitoring reports will help avoid these and other regulatory pitfalls.

Constant Assurance

CIP has long been a tight-lipped introvert. But with automated CIP monitoring systems, it's becoming a babbling extrovert, pointing to problems that need quick action and suggesting opportunities to improve metrics or avoid catastrophe.

The transformation is astonishing, and it is not yet complete. As monitoring technologies continue to advance, look for CIP to become smarter, perhaps even intelligent.

Today, CIP is prescriptive. It takes direction on when and how to wash—and then it does the job. In the coming years, CIP will take direction on when and how to wash based on production. Further in the future as digital technologies provide an even more comprehensive view of production and cleaning performance, expect CIP to become "predictive," cleaning only when, and as much as, needed. These leaps forward will make CIP an even better partner in product quality and food safety.

Before you think about tomorrow, though, it's important to appreciate where CIP is today. Automated CIP monitoring is taking much of the guesswork, and worry, out of quality and food safety by providing constant assurance that every wash is confirmed and validated. The advantages are unmistakable:

- Anomalies are found immediately, and action can be taken to mitigate food safety impact;
- Risks are more apparent and better understood;
- Processes and applications can be optimized;
- Operational choices, and how they affect one another, can be evaluated; and
- Outcomes can be improved.

More than ever, food and beverage producers can be proactive in preventing risks. And more than ever, they can be assured that CIP is supporting, not undermining, their quality, safety, profitability, efficiency, and sustainability objectives. ■

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A Strong Food Safety Culture Via Collaboration

Collaborating throughout the supply chain results in more proactive and preventive suppliers | BY **KELLY THOMPSON**

Food safety is only possible through good collaboration based on preparation, communication, knowledge of who you are dealing with, and sharing common goals. Companies often wait until it's too late in the process to get these critical pieces sorted, resulting in a delayed response time to food safety issues. When a contaminant such as *Listeria* or *E. coli* is detected, the amount of time it takes to identify the cause and notify those affected could mean the difference between a mild scare and the potential loss of millions of dollars, and most severely, lost lives.

Today's marketplace is a high stakes environment where food recalls are inevitable. When a recall happens, it must be handled quickly, seamlessly, and professionally. Collaborating with your partners makes it easier to handle a recall effectively. Collaboration also strengthens the relationship between supplier and retailer, resulting in happy suppliers who are likely to be proactive and preventive, two key characteristics in food safety.

Crisis Prevention Via Collaboration

Effective collaboration throughout the supply chain is critical to preventing and managing food contaminant outbreaks. Last year's recall of Starbucks breakfast sandwiches is a good example of how effective collaboration prevented what could have turned into a national crisis. When traces of *Listeria* were found in a Starbucks production facility, the company was able to pinpoint the affected products and issue a recall quickly. As a result, no illnesses have been reported to date.

Spiraling Out of Control

Unfortunately, there are also instances where identifying the source of contamination becomes a lengthy process, and as a result, the outbreak becomes more severe. In September 2015, a Dole *Listeria* outbreak occurred, but the source of *Listeria* wasn't linked to Dole until late January 2016. The outbreak resulted in 15 hospitalizations and one death. In other cases, such as the Chipotle *E. coli* outbreak in 2015 when 55 people became ill, the source of the outbreak was never discovered and consumer trust remains damaged.

A lack of collaboration slows down the process of handling a food safety crisis. Inefficiency often breeds frustration, which leads to bad relationships between retailers and suppliers. If a supplier or retailer can't share (or chooses not to share) valuable information with their partner, then the relationship erodes further. When necessary information isn't shared, then poor decisions are made. Eventually, the partners don't want to work with each other and they part ways in hopes to find a better partner. However, until they understand the value of good collaboration, they won't find a "better" partner.

Ideas for Consistent Collaboration

Good collaboration is developed over time and must be maintained regularly to ensure its effectiveness. The following best practices will help you develop good collaboration with your suppliers.

Start conversations early. Engaging the food safety team early can help reduce food safety risk. Opening up lines of discussion before a product is approved allows time for the completion of appropriate testing to ensure product safety. Involving the food safety team early in the process can also help prevent the selection of a vendor with a history of poor facility audit results.

Align internal policies. Failure to communicate standard policies to external partners frequently causes collaboration breakdown. Suppliers often complain they are not given a clear understanding of requirements from retailers. This not only happens between retailers and suppliers, but also between suppliers and labs, suppliers and suppliers, or suppliers and internal departments. Taking the time to gain alignment internally will save time in the long run on internal operations. Including everything in a policy and communicating it will help improve collaboration.

Distribute a newsletter semiannually or quarterly. It's important to main-

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tain a consistent communication stream with your supplier community. Distributing a newsletter with policy change updates and other essential information holds a company accountable by ensuring it is keeping partners updated. By committing to a regular newsletter, you can ensure that changes are communicated regularly.

Conduct a "fire drill." An annual "fire drill" can be used to ensure accurate supplier contact information. Although employee turnover is common, retailers and suppliers often forget to tell their business partners. By updating contact info annually (or semi-annually), you can ensure your messages are getting through. During a "fire drill," you should solicit an action from the supplier, such as something as simple as "respond" or "click here" to confirm the email address.

Take Advantage of Technology

In a world where consumers demand greater food health and safety, technology is imperative. In order to strengthen a food safety culture within a business, incorporating collaborative technology is essential. With more needs comes more data. To list every ingredient, identify the origin of products, and stay ahead of trends, it can be difficult to piece together industry data requirements. Advancements in technology have simplified this process.

Data helps maintain consistency across global food supply chains, assess risks, and address challenges quicker than ever before, but it must be filtered to understand and benefit from it properly. Suppliers and retailers can leverage data and technology to drive down costs, minimize risks, and care for their consumer brands.

The Future of Food Safety

Each year, Trace One conducts research in the private label industry to gauge how supply chain partners are communicating and the efficiency of their processes. Participants are asked about how collaboration and transparency impacts respondents' businesses and what they consider to be major collaboration challenges in today's private label industry.

In the 2016 survey, retailers and suppliers clearly identified collaboration as a crucial ingredient to their private label success. In fact, 68 percent of respondents attributed an increase in private label sales to their ability to communicate and share information with partners throughout the supply chain.

Progress is achieved when collaborative solutions and ambitious leaders join together to propel an industry forward. With numerous viewpoints to learn from, the world of food safety—from packaging and sanitation to supply chain management and sustainability—grows stronger every day. By leveraging technology and relationships, collaboration can help retailers build trust with their suppliers, and ultimately their consumers. ■

Thompson is senior program manager of supplier collaboration for Trace One. Reach her at Kelly.Thompson@traceone.com.

During a facility evaluation, a certified coatings professional covers the entire site looking for any potential deficiencies such as corrosion, peeling paint, cracked flooring, and porous surfaces that can harbor bacteria.

The Facility Evaluation Before the Audit

Preparing a proactive coatings repair specification to expedite compliance fixes | BY REBECCA DOLTON

A compliance auditor arriving with a clipboard in hand could be a food and beverage facility manager's worst nightmare. No matter how well the facility operates, the inspector is likely to find something that will need to be addressed. Then the facility will need to quickly correct any flagged deficiencies so it can maintain compliance and continue operations. If it's not prepared to fast-track the required repairs, the facility may risk a potential shutdown.

As part of the FDA Food Safety Modernization Act (FSMA), food and beverage facilities are required to implement preventive control plans that describe how they will correct any problems that arise. These plans are designed to expedite repairs so facilities can quickly return to compliance. For example, having repair specifications already in place for rehabilitating and recoating concrete structures will allow a facility to take immediate corrective actions—such as issuing a detailed bid for repairs—following a compliance issue. Being able to initiate repairs this quickly improves the likelihood that the facility will be able to restore compliance within the three- to four-week window auditors typically mandate.

To prepare a comprehensive preventive control plan, facility managers may be best served by taking a page out of the compliance auditor's playbook and conducting a detailed facility evaluation of their own. Conducting a proactive facility evaluation, which is recommended to be performed with a reliable third-party coatings expert in tow, will allow the facility to write repair specifications for the wide array of environments found throughout its operations—and potentially correct issues prior to an official audit to avoid compliance citations.

This article focuses on compliance issues related to assets and areas of food and beverage facilities that feature industrial coatings.

Performing an Expert-Guided Facility Evaluation

Part of the FSMA directive requires facilities to perform periodic audits of their own to document and proactively address non-conformances throughout the year, not just at audit time. However, internal staff may not have the expertise to properly assess all areas of concern. That's where an expert—like a NACE-Certified Coatings Professional—can deliver significant value by participating in a detailed facility evaluation.

A certified coatings professional will be able to identify the optimal coating systems to use for specific facility environments and applications to ensure longer service lives and reduced maintenance needs. For example, internal staff may think an epoxy-based system is the most appropriate material for patching floors in a wet processing area. But the coatings professional will know that epoxies are prone to cracking and flaking in wet environments exposed to frequent washdowns and thermal cycling. The coatings professional would therefore recommend repairing the area with a urethane concrete-based system, which will expand and contract with the concrete substrate below, offering less opportunity for cracking, less potential for bacteria to grow under loose coatings, and a longer service life.

Like a FSMA audit, a comprehensive facility evaluation with a coatings professional will cover the entire site. However, the coatings professional will only focus on those assets and areas that require industrial coatings, such as wet and dry processing areas, mechanical equipment rooms, chemical storage areas, cold storage areas, warehouses, storage silos, employee welfare zones, water and wastewater treatment structures, and other areas that require coatings solutions that are suitable for use in USDA- and FDA-inspected facilities.

The certified coatings professional will often walk the facility with representatives from the sanitation, engineering, and

A certified coatings professional may recommend converting trench drains into box drains (shown) to reduce the wet surface area available to trap bacteria.

(Continued from p. 37)
maintenance departments, looking for any areas of concern. These stakeholders are vital participants, as they are intimately involved in audit and repair processes. Sanitation managers often deal directly with FDA or other third-party auditors and will know what needs to be fixed and by when. Facility engineers and plant managers oversee coatings recommendations, specifications, timing, and budgets. In addition, maintenance managers are responsible for scheduling and completing the repairs.

During an evaluation, this multi-disciplined group may address deficiencies like rusty equipment, peeling or flaking paint, porous surfaces that can harbor bacteria, and improperly sloped drains. For example, a facility won't pass inspection when peeling paint and rust are evident, so the coatings professional will be watching carefully for even early signs of corrosion. In addition, the professional will examine floors to determine if they are sloped properly to drains to eliminate standing water and reduce slip/fall hazards. It may also be noted where it would be helpful to incorporate a cove base to ensure a seamless transition from floors to walls and thereby eliminate a common harborage point for bacteria.

Preparing Facility-Wide Coatings Repair Specifications

Following an evaluation with a certified coatings professional, a facility will receive a detailed report that includes coatings repair specification recommendations for every area of the facility reviewed, based on that environment's specific needs. As noted, the recommended repair specification for patching a floor in a wet processing area will list urethane concrete systems as the materials of choice rather than epoxy systems, which are prone to premature failure in wet environments. Specifications for chemical storage room repairs may include impact- and chemical-resistant coatings, as these environments are prone to damage from forklifts and barrels. Specifications to repair insulated metal panel wall systems found in coolers may list different impact- and chemical-resistant coating systems rated for low temperatures.

Professionally prepared specifications may also include quotes for various levels of repairs based on service life, functionality, cost, and timing expectations, as well as a list of qualified contractors for bidding purposes. Ultimately, repair specification recommendations are intended to promote long-term solutions, not just quick fixes to pass an upcoming inspection. However, it's helpful for a facility to have a range of good/better/best repair scenarios, along with general pricing so managers can determine the best option based on all the variables in play. For instance, they may choose to make a faster, less robust repair initially to ensure a quick return to compliance during busy times and then opt to make a longer-term repair during scheduled downtimes for maintenance.

From a relationship standpoint, a formal evaluation and specification provided by a coatings supplier can further help with expediting repairs. When a facility is already set up in the supplier's system, it can reference the repair specification, place an order, and likely address repairs sooner than if the facility needed the supplier to first visit a site and make recommendations before ordering repair materials.

Regardless of which actions a facility takes to make repairs and return to compliance, the repair specifications provided following a professional evaluation will help the facility comply with FSMA requirements to implement preventive control plans. The specifications establish an in-house plan of action to address deficiencies and audit citations. They also enable the facility to take a proactive approach to addressing repairs as opposed to only making reactive repairs based on audit reports. In addition, a company can extend its repair specifications to other facilities to create standardized preventive control plans across multiple facilities and environments. Doing so can potentially lead to greater efficiencies, including streamlined bid preparations, consolidation of suppliers, pricing reductions, and faster repairs.

Repair specifications may include recommendations for incorporating cove bases (shown), which can provide seamless transitions from floors to walls, to eliminate a common bacteria harborage point.

Planning for the Official Compliance Audit

Following a comprehensive facility evaluation with a certified coatings professional and the receipt of comprehensive repair specifications, a food and beverage facility will be able to take the guesswork out of which coatings are the most suitable for each environment throughout its operations. The facility will be poised to implement a preventive control plan designed to reduce repair timelines before and after audits. It will also have the benefit of standardized specifications that can be shared company-wide, enabling the

(Continued on p. 49)

What to Look for During a Facility Evaluation

The following includes some of the common areas of concern a certified coatings professional will watch for during a comprehensive facility evaluation:

- Peeling paint;
- Flaking rust;
- Porous surfaces that can harbor bacteria;
- Proper slope-to-drains to reduce ponding water and areas for bacteria growth;
- Areas where cove bases can provide seamless transitions from floors to walls;
- Cracks or areas in flooring where water may be ponding;
- Areas of floors that must be patched prior to inspection;
- Line striping needs for employee/visitor safety;
- Rodent runs;
- Damage to insulated metal panel wall systems; and
- Trench drains that could be converted to box drains to reduce surface area for bacteria to grow and/or to reduce contamination potential. *—R.D.*

Hygienic Design: No Compromises in Inspection Technology

Dispelling the myth that concessions must be made where hygiene is concerned on meat and poultry equipment

BY **KYLE THOMAS**

More stringent measures in the production process have led to a greater emphasis on the hygienic design of production line equipment. Today's trend in the general food sector is geared toward purchasing equipment that has been smartly designed to address both hygienic construction and the challenges machines face in terms of product handling.

Many of the applications are in the meat and poultry industry—predominantly because in many cases other types of foods go through secondary processes prior to the product reaching the consumer. These processes, that may include cooking, reprocessing, or significant alteration of the raw material, often help to sterilize the product.

For meat and poultry, a large percentage of products are provided to the consumer in the raw state. They will go through a series of processes that will alter form, such as grinding for hamburgers, or deboning and trimming chickens, but those items that are reaching consumers are still raw and haven't usually been secondary processed.

What is Hygienic Design?

The latest guide from the Foundation for Meat and Poultry Research and Education, which was produced from their Equipment Design Task Force in 2014, can be found on the North American Meat Institute (NAMI) website. In terms of sanitary design principles, it is an ideal workmanship style document that outlines what sanitary design should mean both to a customer and a manufacturer. It is a good roadmap for suppliers to be able to look at the design and to quantify whether a system is going to be compliant with these design best practices.

Machines built using sanitary principles such as those provided by NAMI and the Sanitary Equipment Design Taskforce are designed so they meet a set of industry driven criteria that quantifiably defines sanitary construction. This includes such topics as the types and finishes of materials to be used and elimination of harborage areas where product can accumulate and create a microbiological risk. But the specifications are also very operations-centric providing guidance on best practices for inspection, maintenance, and cleaning protocols. The continuing challenge to manufacturers is to define what is the right amount of hygiene and sanitation for their specific operation and environment while still being profitable, protecting the consumer and the brand while complying with governmental standards and regulations.

In theory, every supplier of product inspection equipment should be able to design a device to perform a certain way at a specific point of time in a given environment. What's difficult is to keep that performance consistent and within specification for long periods of continuous operation. Hygienically designed systems must be built to last—especially given the rigors and conditions of the meat and poultry industry and they also must perform their inspection tasks as specified throughout their useful life. Therefore, the overall robustness of the entire system is extremely important.

Where inspection is concerned, precision X-ray technology performs best when applied in a well-defined and controlled manner. When the necessary robustness required for the environment and operational longevity is added in, these two things may appear to be in conflict. Robustness and precision do not necessarily go hand-in-hand but are not mutually exclusive either, they must be balanced

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carefully with each specifically addressed. In an X-ray system, for example, there is a generator, which produces a beam that is shot through a window, through the product, through the conveyor and then through to the detector, all contained within a housing to prevent X-ray emissions. When addressing sanitary design both inside and out with the need to clean machines rigorously every day, it should be done while maintaining the integrity, the technology, and its safe operation. Good design practices take these varying requirements into account with the manufacturer integrating them into a solution that effectively satisfies the needs for hygiene, longevity, and precise inspection.

In most cases, product is being inspected anywhere from 100-200 feet per minute in an environment that is wet from the product and periodic washdowns, creating a challenge to keep the conveyors moving and transporting product day in and day out. Like the design of the X-ray generator and detector assembly, the same rigor must be applied to the material handling and reject sortation system.

Other external influence factors around the machine such as floor and adjacent machine vibration and cold air handlers that can cause significant changes in temperature as they cycle on and off can impact machine performance, so it's important to consider the surrounding area to mitigate those external influences before finalizing the machine placement to ensure a successful installation.

Benefits of Hygienic Design

It may be obvious to say, but the more hygienic the design the less the risk manufacturers have of an event occurring where the machines themselves contribute to it. When considering equipment purchase, customers should be encouraged to sit down and review the designs and to carry out their own scoring. If there is no set method of scoring within their business, the guide previously referred to from the Foundation for Meat and Poultry Research and Education and found on the NAMI website is easily accessible and can be invaluable in the decision-making process. An educated customer—particularly when it comes to the principle of hygienic design—will see the benefits of procuring a system that has been designed specifically for its environment. Of course, many customers are aware of what's required already, but sometimes there is a preconception that inspection technologies need a "hall pass" when it comes to hygienic design and that there must be a compromise to achieve the desired inspection results to the detriment of the hygienic element. This is not always the case, as a system designed from the ground up to the specification can meet most of, if not all of the check boxes required. Just because it's an inspection technology doesn't mean there should be a compromise on standards.

> Where inspection is concerned, precision X-ray technology performs best when applied in a well-defined and controlled manner.

Machines built to strict industry standards are designed to minimize and eliminate harborage areas where product can accumulate and create a microbiological risk, but the design must also be very operationally-centric, providing methods for user operation, maintenance, and cleaning. The continuing challenge to manufacturers is to define what is the right amount of hygiene and sanitation for their specific operation and environment while still being profitable, protecting the consumer and the brand while complying with governmental standards and regulations. Needless to say, when most consumers are shopping for dinner they don't understand what it takes to produce a pound of ground beef—not least to produce it and still only charge $3.99 a pound, make a profit, and stay in business to continue to produce enough to meet future demand.

IP69 Doesn't Guarantee Hygienic Design

Although hygienic design is paramount in the meat and poultry sector, due to the raw element of the product and the frequent washdown requirements in the harsh environments, the food sector in general is making it much more of a priority.

Things such as ease of cleaning are very important, as is ensuring there are no areas that could trap contaminants or microorganisms, and these challenges should be addressed at the initial design stage. Part of the process for sanitary and hygienic design is making sure the machines are easy to inspect once cleaned to ensure the process has been carried out completely. The latest systems enable line of sight inspections that do not take long at all—leading to further time and therefore production savings.

Many associate hygienic design with IP69 ratings, but these are often confused. IP69 and hygienic design are not the same thing. Having a system with an IP69 rating does not mean you have a hygienic machine. It is purely an ingress protection rating. It has nothing to do with the sanitation of the machine and how well it has been designed in terms of hygiene. It simply ensures that cabinets and enclosures will not leak when washed down to that specification. For instance, Eagle has machines that are IP69 compliant that are not hygienically designed—whereas nearly all of the hygienically designed machines are IP69 compliant. It is important to understand the difference.

Correct Approach to Design

It is far better to have a machine that is designed specifically for purpose using specific guidelines, such as NAMI, NSF, and European EHEDG. This way, customers can be supplied with a robust product that is designed to most closely match their purpose. If you compare a product designed in this way to one that has been adapted, the differences are very noticeable. Of course, an adapted machine will be cheaper, but in the bigger picture a machine designed for the application will have a far more attractive total cost of ownership, and will deliver a far bigger incremental value to a customer.

How long do you want a machine to last? That is the question. If you have to decommission a machine four years into a seven-year depreciation cycle, then that's a fairly large hit to take financially. But there are other things such as cleaning cycles that are important to consider. These machines are cleaned on a daily basis—

(Continued on p. 49)

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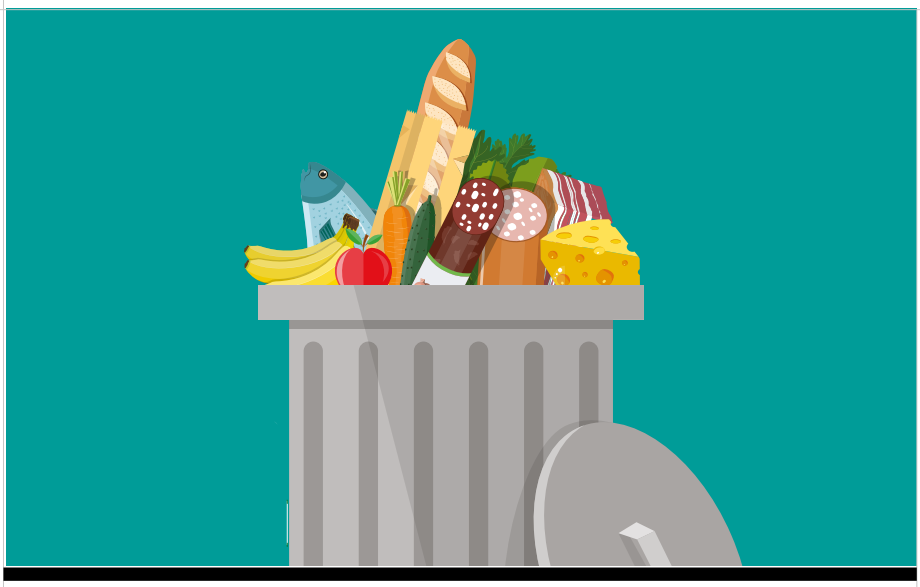
STOCK MANAGEMENT



Containing Food Waste Through Food Storage

With proper inventory management, food service managers can avoid unnecessary costs associated with food waste

BY **DALE GRINSTEAD, PHD, AND CHRIS JORDAN**

Food waste is a global problem that needs to be addressed by both consumers and businesses, such as retailers and food service establishments. According to a United Nations Environment Programme and World Resources Institute report, about one-third of all food produced worldwide, worth about $1 trillion, gets lost or wasted in food production and consumption systems. In the U.S., the amount of food wasted equates to more than 20 pounds of food per person per month.

There are numerous reasons as to why food is wasted. Sometimes consumers purchase an excess of food and can't consume it all before it spoils. Some food does not meet certain aesthetic standards and never makes it to retail shelves or restaurant plates. And in other cases, food rots at an accelerated rate because it isn't stored properly. Food service managers can commit to better inventory management and cooking with so-called "ugly" products, like misshapen fruits or vegetables. Proper food storage practices will also reduce food waste, as well as maintain food safety standards.

Reducing Food Waste

According to the EPA, limiting the amount of food that is produced and thrown away can help to address climate change as food waste contributes to higher levels of methane and greenhouse gases. Additionally, the land, water, labor, energy, and other inputs used in producing, processing, transporting, and preparing food that is wasted could have gone into other uses to benefit society.

> ... the opportunity for freezer burn increases if storage containers are not constructed with polymers that restrict the transmission of moisture.

Food waste not only means less money for restaurants, their stakeholders, and their employees, it can also drive up the price of food. No restaurant wants to throw away potential profit, yet so many do. National Restaurant Association says that between 4-10 percent of food purchased by a restaurant or food service operation is discarded before reaching the customer.

Another disturbing fact is some people in the world are in a position to purchase and waste food without a second thought, while others can't afford enough food or don't have access to the food they need to survive. According to Feeding America, more than 42 million Americans live in food-insecure households, including 13 million children. Food that is wasted could be redistributed to people in need, but it often ends up in landfills.

Food Storage Options

Improper food storage causes food to spoil at a faster rate. For example, freezer burn occurs when moisture in the product escapes to the freezer environment where the dew point is very low. The choice of packaging materials can impact food protection in such cases. In the case of freezer burn, the opportunity for freezer burn increases if storage containers are not constructed with polymers that restrict the transmission of moisture.

Thankfully there are numerous solutions for storing food, including the following examples.

Resealable storage bags. These are plastic bags that prolong the shelf life of food and reduce the risk of cross-contamination in food storage areas such as refrigerators, freezers, and pantries. Food service managers should look for bags with strong side seals, double zippers, and

welded zipper corners to reduce leaks and tears. The bags should close securely, but not be difficult to reopen.

Vacuum seal storage bags. These are airtight bags that preserve, protect, and store foods, such as fresh red meat, poultry, fish, and cheese. The bags may feature a multilayer film with an oxygen barrier, moisture barrier, or other purpose-designed properties.

Food storage containers. These plastic or glass containers of various sizes are used to store, and in some cases, reheat food.

5 Storage Tips to Address Food Risks

There are many food storage mistakes that can increase food waste and food safety risks. Consider the below five tips to reduce leaks, cross-contamination, freezer burn, accelerated spoilage, and more.

1. Handle food safely. Food cannot be above 41 degrees Fahrenheit for more than 4 hours total, so thawing and prepping should be completed within this window of time. To properly thaw freezer food, it can be transferred to the refrigerator or put under running water that is below 70 degrees. Food that is cooked should be cooled to 70 degrees within 2 hours and cooled to 38 degrees (refrigeration temperature) within 6 hours. It's best to label food items with the type of food, the date it was prepared, and a use by date if it is to be stored and consumed after 24 hours.

2. Arrange food properly. Prepared foods, such as deli salads, pre-sliced ready-to-eat items, and cakes, should be stored at the top of the refrigerator, followed from top to bottom by raw produce, raw seafood, raw red meat, raw ground meat, and then raw poultry. Separating foods in this manner reduces the risk of raw meat leaking onto and contaminating other food products.

3. Pay attention to food storage temperatures. If food is not stored at the proper temperature, it can spoil faster and be unsafe to consume. Perishable food should be kept at or below 41 degrees Fahrenheit in the refrigerator and at or below -4 degrees Fahrenheit in the freezer. If food was purchased from a refrigerated section, it should not be stored outside of the refrigerator. It's also best to pay attention to labels of food purchased outside of refrigerated areas, as they may need to be stored in the refrigerator after being opened.

4. Use food before it spoils. Food that is beyond its expiration date may suffer from quality issues, such as staleness or color change, as well as food safety issues. Processed food should be consumed within seven days after it has been opened. Food can be stored indefinitely in the freezer, although issues like freezer burn may affect the quality if food storage containers fail to keep moisture out.

5. Clean food storage areas. Although refrigerators, freezers, and pantries are considered non-food contact surfaces, they should still be cleaned regularly. Daily light cleaning and a weekly deep clean is recommended for refrigerators, while frozen and dry storage can get by with monthly cleaning. Temperature control of the food has to be maintained during cleaning, so refrigerated food should be moved to another cold storage area during cleaning. Use a degreaser for shelves and floors in refrigerators and pantries. Sanitizing is not necessary unless a food has leaked while being stored. In these cases, a sanitizer with a low-temperature claim is best.

Avoid frequent thawing of a freezer for cleaning as condensation can lead to microbial growth that can survive the freezing process. As long as the freezer is not turned off for cleaning, the food can remain in the freezer during cleaning. It is best to clean a freezer with a brush, broom, or other non-chemical method and only spot clean the floor with a chemical where needed. Avoid water-based cleaners when cleaning freezers, as the water will freeze.

The Future of Food

Food waste is a global problem that negatively affects climate change, food insecure households, resource allocation, and the economy. However, food waste can be curbed, and food service establishments can play a major role. Today, a number of chefs are tackling food waste with various tactics, such as donating unsold food to pantries and homeless shelters, composting, and learning to cook what might be considered waste, scraps, and rejected but perfectly safe food.

Proper food storage plays an essential component of every food waste initiative. Storage containers can reduce the occurrence of spoiled food and can generate more revenue simply because they allow restaurants to deliver fresh food to guests rather than to landfills.Food service managers need to understand their storage options and use them as needed. Doing so will allow food service operators to serve fresh and safe food and reduce the unnecessary costs associated with food waste. ■

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Be Our Guest: Food Safety Tips for Hospitality

With a myriad of services offered by hotels today, keeping both guests and brands safe often goes beyond the obvious risks | BY **DOUG SUTTON**

"Illnesses at Connecticut hotel, convention center under investigation"
"Bride suing hotel after norovirus outbreak at wedding reception"
"Report: Hotel chef 'most likely' source of norovirus outbreak"

Unfortunately, each of the above is an actual news headline from recent years.

Today's travelers expect the hotels they choose to offer food, whether it's a full-service hotel with restaurants and banquet services, or a limited service hotel that offers snacks and microwaveable meals. To customers, the responsibility of ensuring that these food items are safe falls to you; and failing to ensure that standard operating procedures (SOPs), staff, and vendors are all adhering to food safety standards could leave your hotel at the center of headlines like these.

But with a myriad of services offered by hotels today, food safety often goes beyond the obvious risks. Every operation is unique, and risks can vary depending upon the food services provided. Even the smallest slip in one area could result in a serious food safety crisis for a property, or create ramifications for the entire brand if it's a franchised or corporate-owned location of a larger chain.

While the risks are serious, there are a number of actionable steps that can be taken to reduce the likelihood of an incident at your hotels.

Safety Tips

Conduct a thorough gap analysis to identify areas of potential risk. When considering a food safety program, you need to assess risks throughout the facility. Kitchens may initially seem like the only area of real risk, but the truth is there may be dozens of other opportunities for potential foodborne risks. Does your hotel offer room service? Serve food poolside? Have an in-room gift service that may leave food sitting out? Do you regularly check food pantry, snack areas, or mini-bars for potential issues with refrigeration or pest infestation? Are all of your food handlers and servers fully versed on food safety practices? Do you have an allergen awareness program? Are your cleaning SOPs for food service equipment followed and enforced? Do you have a receiving policy in place for food items? Do your vendors know your food safety standards? Are you partnering with any food delivery services that provide guests with meals? These are the types of questions you or a food safety partner should ask during a gap analysis.

Ensure that all staff members have enough training to know the risks. Kitchen workers, bartenders, and food handlers should all receive in-depth food safety training in order to be prepared to handle a variety of circumstances—the food safety risks for a buffet will differ from those for table service. Hotels that host meetings and special events also serve guests in high volume, which requires knowledge of food safety risks that occur in these situations, including temperature controls for high volume foods.

Food handlers and servers should know key food allergens, understand where potential allergy risks exist in menu items, and be able to answer customer questions about them. Food allergies don't just cause discomfort—for some guests, they can be life-threatening. In addition to initial on-boarding, conduct regular training to not only keep staff up to speed on changes in operation, your menu, and food regulation, but also to continually remind them of proper food safety practices.

Signage can also help serve your team as a continual reminder about important food safety practices. That said, be aware that any sign in place long enough can become "part of the environment" for food workers and be overlooked. If using signage, keep it fresh so that employees don't become "sign blind."

Beyond staff that directly work with food, be sure that all of your staff members—from front desk to housekeeping—have a basic understanding of food safety and know where to go for help or assistance in an emergency. For example, housekeepers may play a role in delivering food gifts to rooms—but do they understand why it is dangerous for food to remain unrefrigerated for longer than four hours? Is there a policy in place to ensure checks on these deliveries? Or, if a guest were to complain about becoming

sick from food, would the front desk staff know the proper procedures to follow? If someone becomes sick in the buffet area, does the janitorial staff know the procedures to take for cleanup to prevent others from becoming ill? These are all food safety-related practices that could protect your brand from a serious illness incident.

Enforce a workplace illness policy, especially for food handlers. In recent years, many foodborne illness outbreaks linked to hotels have been identified as starting with a food handler who worked while ill. Norovirus, which is highly contagious, can be spread easily when food workers who are sick handle food and beverages. A food handler with Hepatitis A can also put people at risk; and anyone exposed to Hepatitis A may require a course of vaccination. These foodborne illness incidents put guests at risk, open properties up to liability, and could expose your brand to negative publicity.

> Kitchens may initially seem like the only area of real risk, but the truth is, there may be dozens of other opportunities for potential foodborne risks.

Be sure that the staff understands the risk that an ill food handler poses to the operation. It can be very impactful to talk to them about the human costs of the decision to work while ill. Beyond sickening customers, they could also sicken co-workers, causing them to be out of work, and leaving your team short-staffed. A foodborne illness incident could put the hotel's food operations or entire property in danger of being closed by the health department or regulatory agency, which could result in many people being out of work for a period of time—lasting days or even weeks. In that same vein, a foodborne illness incident could create the opportunity for lawsuits, which, if severe enough, could put the hotel out of business.

This is an especially important discussion to have with workers who do not have the opportunity to earn paid sick leave. Often, these workers come to work ill because they can't afford to take the time off, not realizing that their sickness could be putting so much more in jeopardy.

Utilize third-party auditors as an ally for your business. Partnering with a third-party auditing company can help ensure that brand and regulatory food safety practices are being adhered to in every location. Third-party assessments provide an objective viewpoint to spot any potential risks early on and recommend a corrective action plan. The best third-party companies also have their fingers on the pulse of the overall hospitality industry and can provide constructive insights into how your business is performing in food safety when compared with other hospitality industry benchmarks.

It's no secret that many health departments are stretched thin. You might say, "I get inspected by the health department periodically, isn't that sufficient?" These inspections may not actually be frequent enough to really identify problems and make organizational change. Three or four third-party assessments a year can help track progress and drive long-term behavior change for your entire team.

Third-party assessments can also complement the training demand that many hospitality operations find themselves under. According to the Bureau of Labor Statistics, in 2016, turnover in the hospitality sector is nearly 73 percent—highlighting how most operations are hiring new staff members regularly. Thorough third-party auditors can help coach team members new and old on company's standards and critical food safety practices, serving to reinforce training already conducted.

Some third-party assessment companies can even extend their assessments to evaluate operational elements of the property as well—the pool, spa, lobby, parking lot, meeting rooms, etc.—to judge items such as cleanliness, safety, staff interactions, and more.

With the hotel guest experience continually evolving, the number of areas in which hotels are exposed to food safety risks will only increase. Training and attention to food safety risks can no longer be isolated to the kitchen. Anywhere, any person, and any equipment that is along the path food travels in your operation allows for potential incursion of foodborne pathogens or an opportunity for food to become compromised. To safeguard your business, consider implementing a robust food safety program that includes a gap analysis, staff training, a well-developed and enforced illness policy, and third-party assessments. By taking these proactive steps, your hotel is setup for success to ensure guests have a stay that is memorable for all the right reasons. ■

Sutton is the president of Steritech, a provider of food safety and service assessments. Reach him at doug.sutton@steritech.com.

Events

OCTOBER

20

Making Sense of the Numbers: Statistics for Food Scientists
New Brunswick, N.J.
Visit http://www.cpe.rutgers.edu/courses/current/lf0607ca.html or call 848-932-9271.

24-26

Pasteurizer Operators Workshop
University Park, Pa.
Visit http://agsci.psu.edu/pow.

NOVEMBER

6-8

Better Process Control School
New Brunswick, N.J.
Visit http://www.cpe.rutgers.edu/courses/current/lf0703ca.html or call 848-932-9271.

28-30

113th Annual Convention & 90th Processing Crops Conference
Rochester, Minn.
Visit http://www.mwfpa.org/upcoming_events or call 608-255-9946 or email brian.elliott@mwfpa.org.

DECEMBER

4-5

Practical Food Microbiology
New Brunswick, N.J.
Visit http://www.cpe.rutgers.edu/courses/current/lf0401ca.html or call 848-932-9271.

JANUARY

30-1

IPPE
Atlanta, Ga.
Visit http://ippexpo.com/ or email info@ippexpo.org.

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The X37 Series of X-ray inspection systems are used for tall, rigid containers, including cartons, doypacks, metal cans, and plastic and glass containers. They can be configured with different detector sensitivity options supported by a range of power generators to detect and reject contaminants, such as metal, glass, calcified bone, mineral stone, and high-density plastics. To suit a variety of packaging applications, manufacturers can choose between a 0.4 mm and a 0.8 mm detector diode. The X37 Series includes the X3710, X3720, and X3730 systems, as well as the X3750 for glass-in-glass inspection. Featuring an adjustable, angled X-ray beam, the X3750 is capable of performing multiple food quality checks to help ensure not just product safety and integrity, but complete brand protection. **Mettler-Toledo, 800-447-4439, www.mt.com.**

FT-NIR System

Spectrum Two N FT-NIR system helps both technical and non-technical lab professionals analyze samples for quality assurance and quality control and to determine compliance with stringent industry regulations. Researchers at food processing and food testing labs can leverage the system for a broad range of safety authenticity purposes. These include determining nutritional quality or adulteration, especially in edible oils and solid foods such as spices. The system also has on-the-spot screening for nutritional parameters, along with potential contaminants or adulterants. **PerkinElmer, Inc., 800-762-4000, www.perkinelmer.com.**

X-Ray Inspection for Bulk Goods

Dymond Bulk is developed specifically with bulk goods in mind, and is particularly suitable for processes between incoming goods and packaging lines in the food industry. The intuitive system inspects bulk goods like nuts, smaller fruits, frozen vegetables, spices, coffee, and seeds, and rejects any foreign bodies it identifies. The X-ray system not only identifies foreign bodies made from metal, plastic, and stone, but also bits of dirt and glass, which has benefits for all goods that are introduced into the production process straight from the field. A conscious effort has been made to simplify the complex technology of the system for the user, from real-time detection via color-based contamination analysis through to straightforward belt replacement and an easy-to-clean inspection system. **Minebea Intec, 866-963-8587, www.minebea-intec.com.**

IoT Quality Management System

The Pod Quality system is designed to improve freshness and reduce shrink of fresh produce in transit. It empowers growers, shippers, and retailers to enforce process standards according to a new standard quality metric: The remaining shelf life of each shipment. This new IoT platform brings accountability, visibility, and actionable insights to the perishable supply chain. Pod Quality combines wireless "Pod" devices, mobile apps, and cloud-based recordkeeping to output actionable quality metrics. It translates the recorded temperature data into an actionable continuous quality score, called "Product Life." Product Life displays the relationship between a variety of variables—commodity type, initial freshness condition, and overall temperature exposure—and translates them to a single actionable metric via Product Life Models. **Vertigo, 352-363-5070, www.verigo.io.**

Quat-Free Surface Cleaner and Sanitizer

Alpet D2 Quat-Free Surface Sanitizer is used for hard, non-porous surfaces throughout the entire processing plant. Ready-to-use and requiring no rinse, it is highly evaporative and ideal for water sensitive equipment and dry processing environments. According to the company, on pre-cleaned food contact surfaces, including non-porous waterproof gloves, the sanitizer kills 99.999% of the following bacteria in 60 seconds: *Staphylococcus aureus, Escherichia coli, Escherichia coli* O157:H7, *Pseudomonas aeruginosa, Salmonella typhimurium, Listeria monocytogenes, Enterobacter sakazakii,* and *Vibrio cholerae*. It kills 99.9% of tested bacteria in 10 seconds on pre-cleaned, non-food contact surfaces, including non-porous waterproof footwear. Sanitizer is NSF listed, and Kosher, Pareve, and Halal certified. **Best Sanitizers, Inc., 888-225-3267, www.bestsanitizers.com.**

Tamper-Evident Irreversible Inks

Tamper Alert is an irreversible, heat-activated ink technology to identify tamper evidence in labels and packaging for products targeted for theft and counterfeiting. The technology provides customers with a tight activation window where the alert transitions from colorless to full color within a range of 10° C. Tamper Alert is available in target activation temperatures of 50° C., 60° C., 70° C., and 80° C. It also incorporates Turbo color technology to create strong color alert in blue, green, black, and red. Tamper Alert currently is only available in water-based applications. **Chromatic Technologies Inc., 719-592-1557, http://www.ctiinks.com.**

Agar Plates

ReadyPlate 55 ready-to-use agar plates offer sample testing for quality control of water and filterable beverages. With a diameter of 55 mm, the plates are available in a variety of certified kits that combine the agar plates with matching membranes needed for testing. The plates' lockable, stackable format increases safety and reduces the risk of cross-contamination during handling, transport, and incubation. The high fill volume makes positioning and removal of membranes to and from the agar plate easy, reducing the risk of handling mistakes and false positives. **MilliporeSigma, 800-645-5476, www.emdmillipore.com.**

Time-of-Flight Technology

Pegasus GC-HRT+ and GC-HRT+ 4D high resolution GC- and GCxGC-TOFMS instrumentation is ideal for analysis of complex samples. Encoded Frequent Pushing (EFP) boosts both sensitivity and dynamic range by factors of 10. EFP is a patented method of pulsing the Orthogonal Accelerator multiple times per spectrum to increase Duty Cycle. It works in conjunction with the Folded Flight Path mass analyzer, increasing performance and ease-of-use for customers who want to easily discover and quantify what is in their samples. **LECO, 800-292-6141, www.leco.com.**

Metal Detection Controls

Bunting Magnetics is improving its line of closed loop tunnel-style metal detectors for the food packaging industry with optional Triple Frequency controls. The controls enhance the company's imagePHASE platform by allowing the processor to learn a packaged food product in three different conditions, and select the one with that yields the greatest sensitivity. With the upgrade to these controls, the detector also displays the expected sensitivities to the operator with all three metal types—ferrous, non-ferrous, and stainless steel. **Bunting Magnetics Co., 800-835-2526, https://buntingmagnetics.com.**

Cloud-Based Recipe Analysis

DayMark and Nutritics are helping food processors analyze more than 60 individual nutrients in their grab-and-go food products, including calories, sugar, salt, vitamins, and glycemic index. System provides a breakdown of recipe costs and costs-per-portion, and reports contribution of individual ingredients. **DayMark Safety Systems, 800-847-0101, www.daymarksafety.com.**

Multi-Scan Metal Detection Platform

The Sentinel multi-scan metal detector scans up to five frequencies to help food manufacturers find ferrous, non-ferrous, and stainless steel metal contaminants in products. It's designed for a range of applications, including dairy, meat, poultry, fruit, vegetables, and bread. Inspecting these products for foreign objects is especially challenging because of what is known as product effect, where the signal from a particular type of metal can be hidden inside the electromagnetic response of the product. With prior technology, switching the operating frequency could make the hidden metal detectable, but could then make a different type of metal undetectable. The Sentinel alleviates this problem by scanning multiple frequencies, increasing the probability of finding all random sizes, shapes and types of embedded metal foreign objects. **Thermo Fisher Scientific, 763 783-2500, www.thermofisher.com.**

In Other News

In an effort to reduce *Campylobacter* infections, **Akeso Biomedical** receives Patent No. U.S. 9,655,912 B2 titled "Reduction of Gastrointestinal Tract Colonization by *Campylobacter*."

Romer Labs' AgraStrip Total Fumonisin WATEX receives approval by USDA's Grain Inspection, Packers, & Stockyards Administration for official testing of total fumonisin in the U.S. national grain inspection system.

PURE Bioscience's PURE Control antimicrobial is included in the newly updated list of Safe and Suitable Ingredients Used in Production of Meat, Poultry, and Egg Products in the FSIS 7120.1 Directive.

Recall InfoLink receives U.S. Patent #9,697,523 titled "Recalled product inventory notification, removal, and verification system."

Performance Packaging receives authorization from FDA for its AIRSHIELD technology for direct food and beverage contact applications to remove oxygen from packages.

CAT Squared releases an update to its SPC software that empowers plant floor operators with real-time SPC trending data and charts.

Advanced Ultra-Violet Systems' medical-quality infection prevention technology is now available online through the company's dedicated food processing and food service industries website www.uvfoodsafety.com.

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Blockchain to the Rescue ...

(Continued from p. 13)

vulnerable population with respect to foodborne illnesses and sensitivity to potentially dangerous chemicals," Rep. DeLauro said.

"Consumers should not have to worry about whether the chicken they buy comes from China, but at least this legislation will let them know that their local public school is not feeding their children Chinese chicken in the cafeteria," added Thomas Gremillion, director of the Food Policy Institute at the Consumer Federation of America. ■

Agres is an award-winning freelance writer based in Laurel, Md. Reach him at tedagres@yahoo.com.

Top 10 Points ...

(Continued from p. 17)

The Preventive Controls rule, the first of the seven FSMA provisions introduced to the food industry, should have already changed the way retailers, manufacturers, processors, and others in the food supply chain do business. If it hasn't impacted your company yet, don't wait until the FDA forces you to make changes that at best will be very costly and at worse could prove existential. ■

Fields is chairman and CEO of Park City Group. Reach him at randy@parkcitygroup.com.

The Facility ...

(Continued from p. 38)

parent company to streamline processes for ordering products and maintaining just-in-time deliveries, as well as for proactively identifying approved contractors to expedite repairs. Finally, the facility will have the potential to reduce long-term maintenance costs and reduce downtime by selecting the best repair options and products suited to each environment to promote longevity. With coatings repair specifications from a qualified professional in hand, food and beverage facilities will be ready to address nearly any required repair that may arise during an audit. Better yet, they'll be prepared to address areas of concern prior to audits to avoid citations. In fact, the coatings professional's recommendations will include suggestions to make any necessary repairs part of the facility's ongoing maintenance program so the repairs can be completed prior to actual FDA or other third-party audits. As a result, the audit process will be even less stressful, and the facility will have fewer compliance items to address after the auditor has completed his checklist. ■

Dolton is regional market segment director—Food and Beverage/Pharma for Sherwin-Williams Protective & Marine Coatings. Reach her at Rebecca.L.Dolton@sherwin.com.

Hygienic Design ...

(Continued from p. 40)

often multiple times—so to have a machine that has been designed to be disassembled, cleaned, and ready to be sanitized by one person in a matter of a few minutes is highly desirable. Most machines require two people to tear down and it takes longer. Subsequently it takes longer to put it back together. The time saved in man hours over the course of the machine's life alone is significant, coupled with the uptime advantages associated with those hours makes for a very attractive proposition.

Working with an expert supplier to talk through requirements and to cover all available options is the first step to take when considering the purchase of a hygienic product inspection system. It's not all about the initial investment. There is a far bigger picture to take into consideration, and in doing so manufacturers can ensure the protection of both brand and consumer, at the same time making considerable savings. ■

Thomas is strategic business unit manager at Eagle Product Inspection. Reach him at kyle.thomas@eaglepi.com.

SCIENTIFIC FINDINGS

For access to complete journal articles mentioned below, go to "Food Science Research" located in October/November 2017 issue at www.FoodQualityandSafety.com or type the headline of requested article in search box.

ARTICLE: Current Immunoassay Methods for the Rapid Detection of Aflatoxin in Milk and Dairy Products

The presence of high levels of Aflatoxin M_1 (AFM_1) in dairy signifies an alarming threat, as milk and dairy products contain essential nutrients for human health. For this reason, there is a pressing need for developing a fast and reliable screening method for detecting trace aflatoxins in food. Several analytical methods based on high-performance liquid chromatography and mass spectroscopy have been used for aflatoxin detection; however, they are expensive, time-consuming, and require many skills. Recently, immunoassay methods, including ELISA, immunosensors, and lateral flow immunoassay, have been preferred for food analysis because of their improved qualities, such as high sensitivity, simplicity, and capability of onsite monitoring. This paper reviews the new developments and applications of immunoassays for the rapid detection of AFM_1 in milk. Comprehensive Reviews in Food Science and Food Safety, **Volume 16, Issue 5, September 2017, Pages 808–820.**

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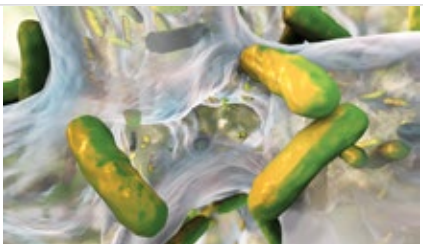

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ARTICLE: Exploring Flavor Life Cycle of Beers with Varying Alcohol Content

Consumers' willingness to drink alcohol-reduced beers is mainly limited by unfavorable flavor during consumption. To investigate the temporal flavor dominance, this study analyzed the five most dominant beer flavors from nine different beers among three types of beer with varying alcohol content to assess the Flavor Life Cycle. Results show that beers with different alcohol content displayed similar flavor dominance (e.g., bitterness) and displayed differences in worty-off flavor, malty flavor, and astringency. In alcohol-free beers, malty flavor increased after swallowing. For bitterness and astringency, higher alcohol content resulted in higher flavor dominance, especially prior to swallowing. The study provides advice to minimize unfavorable flavor in alcohol-free beer. Food Science & Nutrition, **Volume 5, Issue 4, July 2017, Pages 889–895.**

ARTICLE: Residential Bacteria on Surfaces in Food Industry and Their Implications for Food Safety and Quality

Nonpathogenic Gram-negative bacteria, especially *Pseudomonas* spp., followed by *Enterobacteriaceae* and *Acinetobacter* spp., dominate on food processing surfaces. Residential bacteria may end up in the final products through cross-contamination and may affect food quality. While such effects can be negative and lead to spoilage, the bacteria may also contribute positively through spontaneous fermentation. Pathogenic bacteria present in food processing environments may interact with residential bacteria, resulting in both inhibitory and stimulatory effects on pathogens in multispecies biofilms. This article discusses the issues surrounding bacteria in food premises. Comprehensive Reviews in Food Science and Food Safety, **Volume 16, Issue 5, September 2017, Pages 1022–1041.**

ARTICLE: Assessment of Irrigation Water Quality and Microbiological Safety of Leafy Greens in Different Production Systems

In this study, the impact of irrigation water on product safety from different food production systems (commercial to small-scale faming and homestead gardens) was assessed. Hygiene indicators and selected foodborne pathogens of water and leafy green vegetables were analyzed. Microbiological parameters of all irrigation water exceeded maximum limits set by the Department of Water Affairs for safe irrigation water. *Salmonella* and *E. coli* O157:H7 were not detected in all samples, but *L. monocytogenes* was present in irrigation water. This study highlights the potential riskiness of using polluted water for crop production in different agricultural settings. Journal of Food Safety, **Volume 37, Issue 3, August 2017, e12324.**

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