

# NEW Food



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How blockchain technology is the key to combatting supply chain fraud

Food waste: The importance of saving 'imperfect' produce from farms

Optimising allergen control by colour coding utensils and production areas

ISSUE  
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# Responding to modern-day consumer demands



**CRAIG WATERS**  
INTERIM-EDITOR  
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IT IS VERY hard to find someone who doesn't enjoy eating ice cream, but modern-day consumers are demanding healthier, lower-calorie products that taste just as good as their calorific equivalents.

The dairy foods industry is investing heavily in research that explores alternative techniques and formulations to reduce the sugar content of dairy products.

According to many research centres, consumers are demanding a much wider choice of reduced-sugar ice cream, yoghurt and flavoured milk products on the market. As overconsumption of sugar can contribute to a variety of cardiovascular, weight and dental problems, health organisations must be pleased at the efforts being made in this area to find healthier alternatives that still offer the authentic flavours that consumers desire.

In our Dairy In-Depth Focus on page 10, MaryAnne Drake, Professor in the Department of Food, Bioprocessing and Nutrition Sciences of the Southeast Dairy Foods Research Center at North Carolina State University, takes a closer look at sugar reduction techniques, and highlights why it's important for dairy manufacturers to understand research and consumer responses when designing and producing acceptable products.

Also in the In-Depth Focus on page 15, Cornell University colleagues Sarah Johnson and Syed Rizvi explain why an energy-efficient, novel machine for flash-freezing liquid foods is an important modern technique that promotes fresh and clean-label foods; particularly suited for ice cream production.

As the popularity of ice cream and other dairy products increases, the food industry must respond to consumer demands and utilise modern-day techniques to develop ever-better products.

Elsewhere in the issue we cover several other important topics currently impacting the sector, including how the right working culture in an organisation can ensure integrity and systemise trust to combat food fraud (page 48); a look at a state-of-the-art production plant in the Netherlands, which looks set to push the boundaries in infant formula production (page 37); and the challenges of improving food safety through blockchain technology (page 22).

Furthermore, please look out for our latest Application Note supplement that accompanies this issue of *New Food*, where you'll find contributors sharing their latest developments and innovations.

If you have feedback or would like to contribute to our publication or website, please don't hesitate to contact me via the email address above. Please also join our groups on social media platforms – just search for *New Food*.

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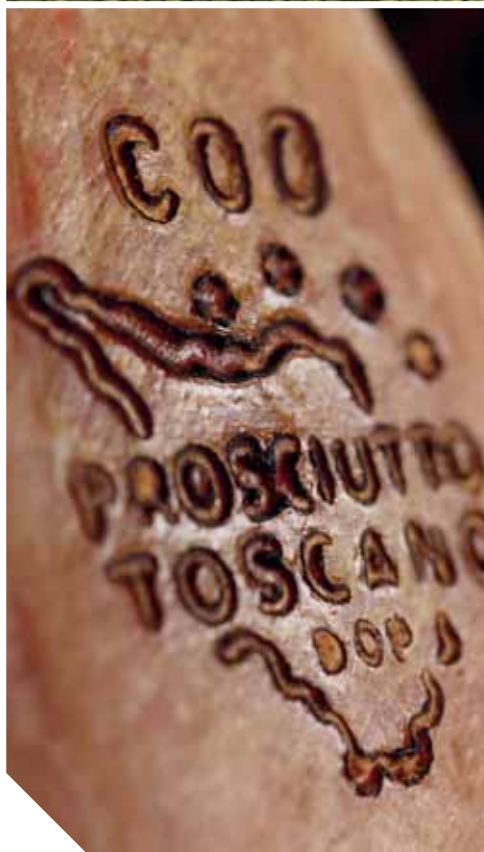


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## Want to be published in **New Food**?

New Food is looking for authors for 2019. If you are from a food manufacturer, university association or research institute and are interested in submitting an article

on processing, food safety, ingredients, NPD, analysis or sustainability, please send a synopsis to: [cwaters@russellpublishing.com](mailto:cwaters@russellpublishing.com)





## Food loss and waste has consequences from farm to fork

**Lisa Moon**, President and CEO of The Global FoodBanking Network, discusses the importance of saving 'imperfect' produce from farms before it hits landfills and directing it where it's needed.

**A**CROSS THE globe, we produce enough to feed the entire world's population; still, 821 million people are undernourished,<sup>1</sup> or chronically hungry.

A 2018 report suggests that 1.6 billion tonnes of food, approximately one-third of all food produced for human consumption, is lost or wasted along the supply chain.<sup>2</sup> Food loss and waste has become such a problem that the United Nations Sustainable Development Goals saw fit to create target 12.3, dedicated to halving food loss and waste by 2030.<sup>3</sup>

There is a global grassroots movement aiming to eliminate food waste at the consumer and retail level, but what about prior to this?

On-farm and post-harvest activities along the supply chain include everything from harvest to product landing in the hands of the consumer. And while waste happens at every stage of the supply chain, more than 30 percent occurs at production level.<sup>2</sup>

Post-harvest food loss is a leading cause of food insecurity<sup>4</sup> for millions across the globe, so minimising it helps provide nutritious food to hungry families and prevents adverse environmental effects. Wasted food also means wasted resources from the growing process, contributing to nearly eight percent of global greenhouse gas emissions.<sup>4</sup>

While enhanced safety measures and proper handling of products could decrease the amount of post-harvest loss, significant loss occurs due to the 'physical condition' or perceived food 'quality' – popularly termed 'imperfect', where a perfectly edible crop of 'misshapen' apples is sent to landfill for failing to meet aesthetic standards.

How can we save this product, otherwise destined for landfill?

Food banking organisations connected with The Global FoodBanking Network are recovering



**LISA MOON** has been President and CEO of The Global FoodBanking Network (GFN) since 2015. GFN is an international non-profit organisation based in Chicago that nourishes the world's hungry through connecting and strengthening food banks in 30 countries. Last year, GFN member food banks recovered and redirected food to more than 9 million people facing hunger.


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'imperfect' produce from farms and directing it to those most in need. If just a quarter of lost or wasted food could be diverted to food banks, it could feed 870 million hungry people.<sup>5</sup> Current efforts by food banks operating in nearly 60 countries mitigate an estimated 10.54 billion kg of CO<sub>2</sub>-eq annually,<sup>5</sup> equivalent to nearly 2.2 million passenger vehicles.

In Colombia, the Asociación de Bancos de Alimentos de Colombia (ABACO)<sup>6</sup> has developed Escuela Reagro to enhance the agriculture food recovery programme across the country. Since 2018, Reagro has served as a training programme for food banks to increase fruit and vegetable recovery and improve the nutrition of the most vulnerable in Colombia. Today, 17 ABACO food banks participate in the programme and have rescued more than 24,000 tonnes of produce, benefitting more than 30,000 individuals facing hunger every month.

In South Africa, 50 percent of food is lost at the agricultural level. To combat this problem, FoodForward SA<sup>7</sup> (FFSA) is encouraging farmers, growers and food processors to join the food recovery revolution through the launch of its Second Harvest programme, aimed at sourcing and collecting surplus fruit and vegetables directly from commercial farmers. While most of the produce is distributed fresh to the beneficiary organisations, FFSA also processes fruits and vegetables to extend their shelf life. The kiwi and tomato jams have been a huge hit with the beneficiaries<sup>8</sup>

Achieving zero hunger by 2030 will require no food to be lost or wasted. The demand for the community-based hunger relief that food banks provide is on the rise and its model – which has been tried and adopted in more than 60 countries globally – promises to help tackle the global challenges of hunger, malnutrition, food loss and waste. 



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# ROUND UP

The editor's pick of the most interesting developments within the food and beverage industry

## FSA firmly backs mandatory full ingredient labelling

THE FOOD STANDARDS AGENCY (FSA) has opted for the most stringent of the four options offered in a recent consultation on amending allergen information labelling. Under the proposed changes, food that is classed as pre-packed for direct sale (PPDS) will require labelling that clearly states the name of the food along with the list of ingredients. Any of the 14 specified allergens still present in the food must be emphasised to stand out in the ingredients list.

Ben Gardner, CEO of Navitas Group, has welcomed the FSA's backing: "Of course foodservice businesses may be concerned about the cost of complying with full ingredient labelling; however, food safety systems in general and allergen labelling solutions, in particular, are not prohibitively expensive even for smaller foodservice operators. For a stand-alone allergen labelling solution, we're talking about far less than the cost of a cup of coffee a day. That has to be worth it to give reassurance and peace of mind to customers with food allergies that their food purchases are correctly and accurately labelled."

Nathalie Newman, Allergy Consultant, said: "For anyone affected by, and living with, allergies; food labelling becomes crucial to



eating safely. Open and honest communication and sharing of all ingredients used enables the consumer to make an informed decision as to whether something is safe for them or not. Nowadays it's not just about the top 14 allergens; many are affected by allergies outside the top 14, which aren't currently declared. It makes it very difficult for them to eat out safely, or to buy prepared food that is suitable for them. This ruling by the FSA is a step in the right direction for consumers, and we must hope the government continues the momentum."

## Wagamama commits to drastically improving chicken welfare

WAGAMAMA has announced that it will meet the higher chicken welfare standards laid out in the European Chicken Commitment (ECC) by 2026.

There are one billion chickens raised and killed for food per year in the UK and 95 percent of broiler chickens are reared on standard, intensive factory farms. The breed is a key issue, with most chickens being bred to grow so fast their bodies can't keep up, often becoming crippled under their own weight.

The ECC contains six key measures addressing the major issues encountered in standard EU chicken production. The measures include prohibiting the use of fast-growing breeds, reducing overcrowding, and adding environmental enrichment to provide better conditions for chickens.

Wagamama has also released new plant-based options on its menu, including an innovative vegan egg. According to Wagamama, the company has seen a greater than 60 percent increase in the number of customers choosing a vegan option as their main dish over the last year.

"We applaud Wagamama for this positive and meaningful step for chicken welfare across Europe," said Vicky Bond, Managing Director for The Humane League UK. "It really is so encouraging to witness this growing number of companies not only turning their backs on intensively farmed animal products, but making it easier for their customers to leave animals off their plate every day."

## Mondelēz International completes sale of its MEA cheese business

MONDELÉZ INTERNATIONAL has completed the sale of its Kraft-branded cheese business in Middle East and Africa (MEA) to Arla Foods.

All Kraft-branded cheese products in the African and Middle-East markets, as well as a cheese manufacturing site in Bahrain, are part of this agreement with Arla Foods of Denmark.

Mondelēz International Inc products are available in 150 countries around the world and the company has stated that it reached net revenues of approximately \$26 billion in 2018.

According to Mondelēz International, this sale is to enable better focus on the faster-growing snacks categories.

Maurizio Brusadelli, EVP and President, Asia Pacific, Middle East, and Africa (AMEA) for Mondelēz International, said: "I am confident that this successful business will further develop under Arla Foods' ownership and we wish them every success. We will continue to be a leading player in the MEA snacking business. Our recently

inaugurated state-of-the-art biscuits factory in Bahrain will continue to serve local and export markets and will also now start producing Tang powdered beverages."

The cream cheese brand Philadelphia and Jocca Cottage Cheese are not included in the deal and remain under the ownership of Mondelēz International. Further to this, there are no changes to the cheese and grocery business of Mondelēz International in other markets around the world as a result of the sale.



## Morrisons introduces plastic-free fruit and veg areas

MORRISONS is to become the first British supermarket to roll-out plastic-free fruit and veg areas in many of its stores, helping customers buy bagless. Customers will be able to choose from up to 127 varieties of fruit and veg and buy them loose or put them in recyclable paper bags.

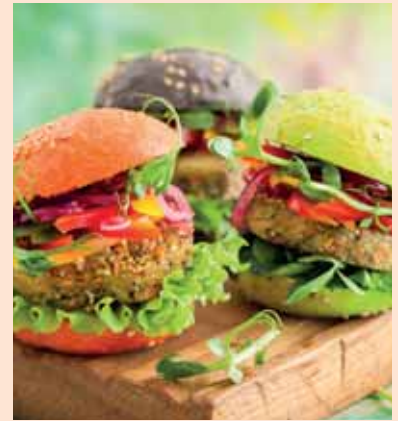
The move follows a 10-month trial in three Morrisons stores where the amount of loose fruit and veg bought by customers has increased by an average of 40 percent. The new 'buy bagless' fruit and veg shelves are expected to result in a similar switch from bagged to loose – saving an estimated three tonnes of plastic a week, equating to 156 tonnes a year.

This is the latest announcement from Morrisons, which has made changes that will remove 9,000 tonnes of unnecessary or problematic plastic each year.

This figure includes 174 million plastic produce bags removed from fruit and veg aisles, and 600 tonnes of unrecyclable polystyrene removed from branded food and drink products.

The loose fruit and veg areas will be rolled out in 60 Morrisons stores during 2019. They will then continue to be introduced as part of the supermarket's ongoing store refurbishment programme nationwide.

"Many of our customers would like the option of buying their fruit and veg loose," explained Drew Kirk, Fruit and Veg Director at Morrisons, "so we're creating an area of our greengrocery with no plastic where they can pick as much or as little as they like. We're going back to using traditional greengrocery methods and we hope customers appreciate the choice."



## European Parliament veggie 'burger' ban challenged

THE EUROPEAN PARLIAMENT'S proposal to ban the use of names such as 'burger' and 'sausage' from being used to describe vegetarian and vegan products is being challenged across Europe, with food awareness organisation ProVeg International driving the campaign.

The agricultural committee of the European Parliament voted in favour of the proposal on grounds that the names are misleading for consumers. If the proposal is passed into law, vegan and veggie burgers could instead be named 'discs' and sausages 'tubes'.

ProVeg International has launched a campaign targeting the proposed ban with a petition calling to reject the proposal, which it describes as "unnecessary" and "irrational".

"There is no evidence to suggest that consumers are confused or misled by the current labelling of vegetarian and vegan products," said spokesperson for ProVeg UK, Philip Mansbridge. "To suggest that consumers do not understand the meaning of the term 'veggie burger' and other similar terms is an insult to their intelligence. The use of 'burger', 'sausage' and 'milk' wording on plant-based products serves an important function in communicating characteristics that consumers are looking for when buying plant-based products, especially in terms of taste and texture. They've been used successfully for decades. Why confuse matters?"

Philip continued: "The proposed restriction would also unnecessarily restrict manufacturers, producers and the positive social and environmental changes created by the plant-based market, one of the fastest-growing and most innovative sectors in the food industry today."



## Refill campaign aims to prevent plastic pollution at source

RUN BY City To Sea, the campaign works via a location-based app, connecting people who are looking for water with thousands of local businesses, transport hubs and public spaces where they can refill their bottles for free.

Anyone can download the free app and find Refill stations where they can refill on the go.

Natalie Fee, founder of City to Sea, said: "In the UK alone, we consume 13 billion plastic bottles a year – and despite having some of the best quality drinking water in the world, 7.7 billion of them are plastic water bottles. Nearly half of those bottles are not recycled, with more than 15 million littered, landfilled or incinerated every day.

The Refill campaign now has more than 19,000 Refill stations in the UK alone – including railway stations, airports and high street chains such as Costa, Starbucks and Wetherspoons all offering free drinking water and we're looking to expand the campaign later this year."

The campaign has grown rapidly since launching in Bristol four years ago – there are now over 160 local Refill schemes across the UK and in 2019 the campaign will be launching internationally. The scheme has estimated that if all Refill stations are used just once a day, it's stopping around five million plastic bottles at source a year.

# Don't miss PROCESS EXPO 2019

PROCESS EXPO is North America's largest trade show dedicated to bringing the latest technology and integrated solutions to all segments of the food and beverage processing and packaging industry. Held on 8-11 October 2019, it's an ideal time to make new partnerships, discover emerging trends and technologies, and begin to plan for the years ahead.

## Exhibitors span all segments of the food and beverage industry

Over 500 suppliers from nine key industry segments, such as bakery, beverage, dairy, meat, pet food, and prepared foods, will showcase innovative technology and equipment to help increase efficiency and profits in your plant operations. Meet face-to-face with suppliers and discover customisable solutions, products, equipment, ingredients, and more. The horizontal nature of the exhibit hall allows you to get valuable crossover solutions and insights from professionals in other industry sectors that can be applied to your business.

## Five production line demonstrations

See five full working production lines firsthand. No other show offers this unique show floor experience!

- Sliced pepperoni – from raw ingredients through the smokehouse and then sliced and packaged for the consumer
- Ground beef patties – this automated line starts with cuts of beef and ends with the convenient packaged product you see in the supermarket

- Frozen pizza – from creation of the crust through depositing of sauces and toppings and packaging of the finished product
- Sliced cheddar cheese – from the separator and HTST, all the way through to post-packaging inspection, the line will produce a variety pack of cheese (sponsored by Dairy Farmers of America)
- Pet food kibble – see how dry kibble is produced and packaged in one of today's fastest-growing segments of the food industry.

## Premier education and training

PROCESS EXPO features one of the food and beverage processing and packaging industry's most innovative education programmes, with sessions throughout the four-day event focusing on a wide range of critical topics. The PROCESS EXPO University programme covers important topics, such as food safety and the Food Safety Modernization Act (FSMA), alternative methods of production and automation, as well as food processing and packaging topics specific to each of the major industry segments.

PROCESS EXPO also offers the following programmes:

- The Food Safety Program – led by the experts from the Food Safety Summit, this special Food Safety Program will help you keep your plants and your brand's reputation safe
- HACCP and FSMA Preventive Controls and Qualified Individual Certification Training
- Preventive Controls for Animal Food (New for 2019) – completing this course meets the FSMA requirements for a 'preventive controls qualified individual'
- Dairy Processing 101 (New for 2019) – during this comprehensive two-day course, attendees will receive an overview of the US dairy industry, understand the impact of dairy farm practices on the quality and composition of raw milk, take home a working knowledge of how raw milk and dairy product prices are established, and more.

## Make new connections

PROCESS EXPO 2019 offers a variety of networking opportunities. Whether it's your first time attending or you're a returning guest, networking activities will help you connect with your peers in a social and meaningful way.

## Don't miss it!

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# DAIRY

Dr MaryAnne Drake, Professor in the Department of Food, Bioprocessing and Nutrition Sciences of the Southeast Dairy Foods Research Center at North Carolina State University, explores reducing sugar techniques in products such as ice cream, yoghurt, and flavoured milk.

Sarah Johnson and Syed Rizvi from Cornell University provide insight into a method for flash-freezing liquid foods to promote fresh and clean-label food products, especially ice cream.

**SPONSORS:**



## ABOUT THE AUTHOR



**MARYANNE DRAKE** is a William Neal Reynolds Distinguished Professor in the Department of Food, Bioprocessing and Nutrition Sciences, Southeast Dairy Foods Research Center, North Carolina State University where she conducts research on the flavour and flavour chemistry of dairy products and other foods. Her research is focused on understanding how processing steps influence flavour and consumer perception of foods. MaryAnne has published more than 260 peer-reviewed manuscripts and given more than 330 invited industry presentations. MaryAnne is the Past President of the American Dairy Science Association, the Director of the Sensory Service Center and the Director of the Southeast Dairy Foods Research Center.

## Exploring alternative techniques for **reducing sugar content** in dairy products

According to research, progress is being made in producing reduced-sugar ice cream, yoghurt and flavoured milk that are more acceptable to consumers. Here, *Dr MaryAnne Drake*, Professor in the Department of Food, Bioprocessing and Nutrition Sciences of the Southeast Dairy Foods Research Center at North Carolina State University, explains more.

**D**AIRY FOODS are popular among consumers and sales gross more than \$125 billion per year.<sup>1</sup> With dairy product popularity comes new demands from consumers for healthier, low-calorie products that taste the same as their higher calorie counterparts.

In a 2018 report<sup>2</sup> of which I was a researcher, my colleagues and I reviewed the options available to the dairy industry to reduce sugar in products such as ice cream, yoghurt, and flavoured milk without sacrificing flavour.

The public health and consumer focus on health has increased in the past 20 years, leading



to a significant push for healthier food choices including dairy products. Overconsumption of sugar, for example, can contribute to a host of issues such as hypertension, type 2 diabetes, cardiovascular disease and dental cavities.

Dairy foods represent an extremely large market. The dilemma of how to reduce sugar content without sacrificing flavour and negatively affecting product sales is challenging, as sugar plays an important role in dairy foods, not only in flavour, but also in texture, colour and viscosity. Replacing sugar can have negative effects, making substitution inherently difficult.

Dairy products like ice cream, yoghurt and flavoured milk are potentially high in unwanted added sugar. Some of the standard processes for developing healthier food products, such as fat, sugar, and salt reduction, result in an unacceptable flavour. Sweet taste perception can also be affected by texture of the food matrix and the presence of fat. Other sugar reduction techniques include hydrolysis of lactose, ultrafiltration and direct reduction. In the 2018 review, we researched recent studies to assess the role of sugar, alternative sweeteners and sugar reduction in ice cream, yoghurt and flavoured milk, and explored the options available to the dairy industry.

### Ice cream

Ice cream is one of the most heavily consumed dairy products in the world. To achieve the sweet taste

desired by consumers, between 10 to 14 per cent of sugar needs to be added. Studies have shown that reduced sugar and reduced fat products, such as ice cream, show a higher propensity for a bitter aftertaste and a lower intensity of creaminess. Promising alternative options we found, including:

#### Calorie-reduced ice cream

Calorie-reduced ice creams sweetened with sorbitol and sucralose were most accepted compared with other 'light' vanilla ice creams or ice cream with a minimum reduction of 25 per cent of the total energy, sugar or lipid.

#### Sugar alcohols

Erythritol and lactitol are sugar alcohols that have been used to create low-calorie ice cream. Erythritol is more commonly used for sugar reduction in ice cream because it provides volume and texture and is only a fraction of sucrose calories.

#### Sugar-reduced chocolate-flavoured ice cream

Chocolate-flavoured ice creams are typically formulated with higher sugar content to decrease the bitterness associated with cocoa. When the sugar is reduced, not only does the ice cream taste more bitter, but it also tastes less chocolatey. In one study, researchers proposed a solution by marketing sugar-reduced chocolate ice cream to dark chocolate lovers, who already desire and tolerate substantially higher levels of bitterness. ▶

“ Dairy products like ice cream, yoghurt and flavoured milk are potentially high in unwanted added sugar ”

## Staying true to fruit

### Food processors seek brighter, stable, clean-label colours for dairy foods and beverages.

FOOD'S INNOVATORS and legacy brand peers face multiple challenges when securing the perfect colour attributes for their dairy products. Whether seeking the perfect strawberry hue for a milkshake, controlling the bleed characteristics of the fruit layer in a berry yoghurt, or wiping out clean label concerns across a range, reliable ingredients that meet tough colouring and processing challenges are in high demand.

Food and beverage engineers are looking for ways to provide robust colour stability and resilience in ultra-high temperature (UHT) processes, such as plate and tubular heat exchangers, steam injection and steam infusion.

#### Matching consumer expectations

Among consumer choices, fruit-based products are gaining ground, but

food processors need colours that match consumers' taste perceptions to ensure appeal. Many dairy drinks possess hues and tones in the red spectrum as well as yellow; think strawberry, pink grapefruit, pomegranate, rhubarb, raspberry, mango or banana milkshake.

The main challenge in dairy fruit beverage colouring is ensuring an all-natural, fruit-based product has the colour to match its flavour while also withstanding UHT processing. Finding colourants that fulfil this expectation is key.

#### Super-stable colours

Lycored's researchers have studied the UHT stability characteristics of our natural lycopene-based colours in detail, comparing two of our popular colours – ConstantCrimson A and ResoluteRuby A – against synthetic

Red 3. Analysis proved that our natural-based colours outperformed Red 3 in all four UHT process types as well as accelerated stability tests, highlighting no colour fade and excellent resilience to light and heat.

Consumer research also found Lycored's colours were perceived as more natural and appropriate for strawberry-flavoured milk beverages. Thanks to our rigorous testing, lycopene-based colours are proven by our application testing to be more true to fruit than popular alternatives. Our range from nature is also pH independent, taste neutral, non-GMO (Non-GMO Project Verified), allergen free, vegan, Kosher and Halal.

Find out how we can enhance your product today. Contact us via [www.Lycored.com/colorants](http://www.Lycored.com/colorants) ■

### EXPERTVIEW



**Christiane Lippert**  
Head of Marketing  
(Food), Lycored

“Thanks to our rigorous testing, lycopene-based colours are proven by our application testing to be true to fruit more than popular alternatives”



**ABOVE:** Chocolate milk typically has high sugar content and is therefore a frequent target for sugar reduction techniques



### Frozen yoghurt

Frozen yoghurt is often viewed as a much healthier alternative to ice cream because of its lower fat content and the presence of lactic acid bacteria, even when frozen, but the sugar content is typically the same as regular ice cream. A study of frozen yoghurt determined that substituting inulin and isomalt for sugar and fat led to a similar sweetness and a reduction in fat with no added sugar.

### Yoghurt

Yoghurt is generally recognised as a healthy food because of its nutritional content, but it is usually sweetened with sugar to increase palatability. Several studies have reported that liking yoghurt is influenced by texture, aroma and taste and that sweetness is an important component.

Several studies found that sweetener blends of non-nutritive sweeteners have been very successful in reducing sugar content of yoghurt.

One study reported that it was possible to produce a probiotic yoghurt successfully using sweeteners without affecting the viability of the probiotic microorganisms. The addition of non-nutritive sweeteners did not negatively affect the yoghurt-making process because the sweeteners did not break down over time.

### Flavoured milk

Flavoured milk is popular among children and adults because of its special taste and ability to meet the dietary requirements for dairy foods in the United States. Studies have shown that flavoured milk increases milk consumption. Chocolate milk, the most popular flavour, typically has higher sugar content and is therefore a frequent target for sugar reduction

techniques. However, reducing sugar in chocolate milk is quite costly and many school directors choose the higher sugar alternative to reduce cost or choose to eliminate chocolate milk entirely. There have been several studies into alternative ways of reducing sugar calories in chocolate milk with some contradictory results.

One study showed that withdrawing a chocolate milk option meant that three or four additional foods needed to be added into the diet to replace the nutrients from milk, adding additional calories and cost. Therefore, sugar-reduced chocolate milk should be considered the cheaper alternative.<sup>3</sup>

In another study parents preferred natural non-nutritive sweeteners over nutritive sweeteners as the sweetener source in chocolate milk.

Some studies found that added sugar could be directly reduced in chocolate milk and still be accepted by children and adults if it did not exceed 30 per cent.

### Conclusion

Overall, the most successful techniques for sugar reduction in dairy foods involve replacing sugar with non-nutritive sweeteners, whether natural or artificial, because these provide the sweet taste desired by consumers without added calories. Direct reduction of sugar and lactose hydrolysis methods also show promise.

Understanding current sugar-reduction techniques, research and consumer response to sugar reduction in dairy products is important for dairy manufacturers in order to design and produce sugar-reduced products. Sugar reduction is an inherently difficult task due to the many functions of sugar in food products, but progress is being made in developing products acceptable to consumers. 📌



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# On-demand, flash-freezing of ice cream

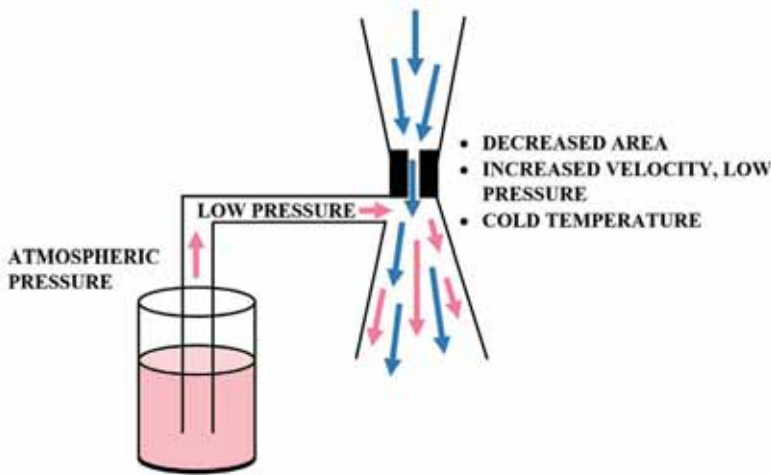
Modern technologies are needed to become more energy efficient in order to reduce their environmental footprint and lower energy costs. A food engineering lab at Cornell University has developed an energy efficient, novel machine for flash-freezing liquid foods that promotes fresh and clean-label food products, especially ice cream.

*Sarah Johnson* and *Syed Rizvi* from the university explain more.

ICE CREAM mix is traditionally frozen within a continuous freezer process, utilising a 'scrape-and-churn' method. Both liquid mix and air are pumped into one end of the continuous freezer and subsequently agitated. Agitation occurs through motor-driven rotating blades and dashers that extend close to the

interior wall of the barrel. Upon completion of agitation, the partially frozen mix is then drawn out, dispensed into packages and promptly placed into a blast freezer to undergo a time- and energy-consuming hardening process. Being one of the most popular desserts around the world, the production of ice cream is an energy-intensive ▶

FIGURE 1



ABOVE: Venturi mechanism utilising the Bernoulli Principle and Joule-Thomson cooling

process, inviting significant energy-saving opportunities. Furthermore, this process relies on economy of scale to be profitable and therefore large, single product batches are common while customised products can be difficult or even impossible to produce economically.

Traditional methods of ice cream production necessitate the product be able to withstand temperature fluctuations in order to be of high quality once received by the consumer. The ice crystals and air bubbles in the emulsion matrix of ice cream are very sensitive to these temperature fluctuations so they must be stabilised by the addition of emulsifiers and thickeners. By developing an on-demand system, these undesirable additives are no longer needed.

The novel flash-freezing machine freezes ice cream mix with instantaneous, direct carbon dioxide contact. The on-demand freezing/cooling system (patent pending) designed by the Rizvi Lab has been developed to rapidly produce ice cream (and other frozen and partly-frozen products) at the point of consumption with a unique taste profile that results from the incorporation of carbon dioxide. Not only does this novel technology

streamline various stages of the aforementioned freezing process, it also provides the following numerous advantages:

- On-demand production
- Elimination of refrigerated storage and shipping
- Reduced energy input
- Smaller equipment footprint, portable system with minimum moving parts
- Decreased contamination risk
- Suitable for clean label products
- Endless product variety
- Individual customisation of product.

**Theory**

Our flash-freezing machine intelligently combines favourable characteristics of both mechanical and cryogenic freezing systems by integrating Joule-Thomson cooling with the Bernoulli Effect. We utilise the distinct advantage of cryogenic cooling through the mechanisms of the Joule-Thomson cooling effect. The collaboration of these systems paves the way for an efficient, on-demand freezing system without the limitations of hazardous refrigerants, excessive moving parts, and high energy consumption.

The Joule-Thomson effect is a thermodynamic process that occurs when a fluid expands from a high pressure to a low pressure at constant enthalpy. This process can occur across a small orifice, where the pressure of the fluid is significantly lower at the outlet of the orifice than at the inlet. If the pressure and temperature of the media is calculated correctly, a gas can cool considerably in a very efficient manner.

Carbon dioxide is an optimal media to use in flash freezing of food products because it has an effective Joule-Thomson coefficient that allows it to cool under a reasonable pressure change. This characteristic enables the use of safe pressures, while achieving a cooled temperature that is suitable for the freezing of food products.

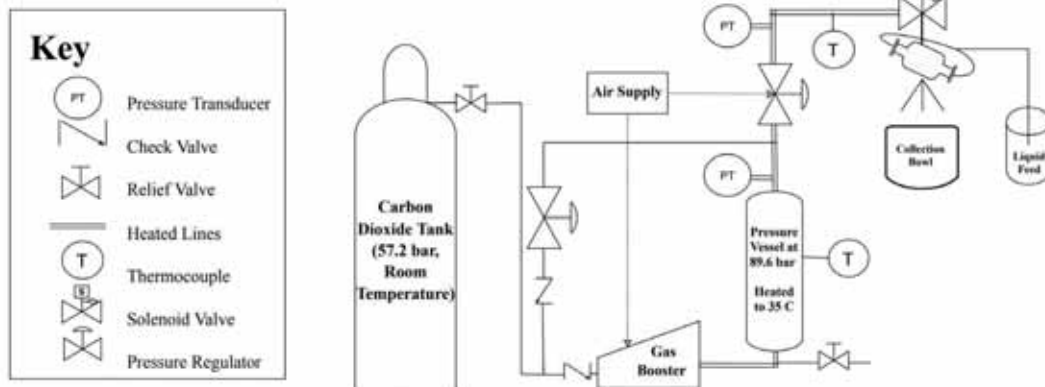
*The novel flash-freezing machine freezes ice cream mix with instantaneous, direct carbon dioxide contact*

TABLE 1 Ice cream nutritional information

Source	Ice Cream	Fat	Carbohydrate	Protein	Ingredients
Lab Made	Lab Formulation 1 (Lab Made Traditional Mix)	13.7%	22.7%	4.1%	Milk, Cream, Sugar, Corn Syrup Solids, Skim Milk, Stabiliser (Microcrystalline cellulose, Mono and Diglycerides, Cellulose Gum, Carrageenan, maltodextrin), Pure Vanilla
	Lab Formulation 2 (Lab Made Clean Label Mix)	18.0%	24.5%	1.4%	Pasteurised Grade A Cream, Pasteurised Grade A Milk Granulated sugar, Madagascar Bourbon Vanilla, Salt
Commercial	Commercial Ice Cream 1	17.0%	21.0%	4.0%	Cream, Skim Milk, Cane Sugar, Egg Yolks, Vanilla Extract
	Commercial Ice Cream 2	12.3%	24.6%	4.6%	Cream, Milk, Liquid Sugar, Skim Milk, Buttermilk, Milkfat, Corn Syrup, Water, Vanilla Extract, Mono and Diglycerides, Cellulose Gum, Guar Gum, Carrageenan, Dextrose, Annatto Color



FIGURE 2



Note: Components are NOT to scale

LEFT: System process diagram of the Rizvi Lab flash-freezing machine

**“The Joule-Thomson effect is a thermodynamic process that occurs when a fluid expands from a high pressure to a low pressure at constant enthalpy”**

The requirement of a small orifice for Joule-Thomson cooling provided prime opportunity to develop a low pressure (vacuum) in this section of the system. This vacuum is needed to draw up liquid into the cooling stream created by the Joule-Thomson effect. This is achieved by directing high-pressure carbon dioxide through the small orifice, creating a high velocity jet of carbon dioxide. This phenomenon, known as the Venturi Effect, is a specific application

of Bernoulli's Principle. Bernoulli's Principle implies that the volume immediately following the small orifice will have a lower pressure than the pressure before the orifice. If an inlet source is introduced directly after the orifice outlet, any fluid at a pressure higher than that after the orifice will be suctioned into the flow path. This setup (shown in **Figure 1**) is considered a Venturi tube, a basic mechanism commonly used in industry to mix multiple fluids. ▶

## Quality control of milk and dairy products at the speed of light

Along the value chain from farmer to table, milk passes numerous, complex production stages. Close and regular quality control guarantees a high standard for milk, dairy and whey products, which are marketed directly to consumers or as ingredients in the food processing industry.

Modern infrared and near-infrared spectroscopy offer many possibilities for quick and easy monitoring of raw milk, intermediates and end products. As a result, in addition to the continuous monitoring of quality, significant savings can also be achieved, for example by facilitating greater productivity or higher product safety due to faster reaction times.

### Which technology for which application?

In order to identify the best analysis method for a given application, a detailed survey should be the first step. Which types of samples should be analysed and where should the analysis

take place? These fundamental questions must be clarified with regard to future applications in order to avoid additional investments at a later stage.

If only liquid samples – e.g., raw milk, standardised milk or whey – are controlled, a stand-alone system, which is designed specifically for this purpose, would be the first choice, such as the *MIRA* infrared spectrometer. With its high-pressure pump and homogenising valve, it can reproducibly determine the main components like fat, protein, dry matter and lactose.

When additional solid or semisolid sample types are analysed along the production chain – such as whey powder, cheese, yoghurt or butter

– a modular FT-NIR spectrometer is the better choice. Such systems, like the *MPA II* FT-NIR spectrometer, provide the right measurement geometry for each sample type.

For larger companies, online FT-NIR systems like the *MATRIX-Fare* are the perfect tool for process control. Frequent measurements of key parameters at multiple measurement points are automatically sent to the process control system, providing a great deal of relevant information. Rather than relying on single lab samples, plant operators with access to frequent results can dramatically reduce in-process variation and adjust the process in time to avoid the production of costly out-of-spec products. ■

## EXPERTVIEW



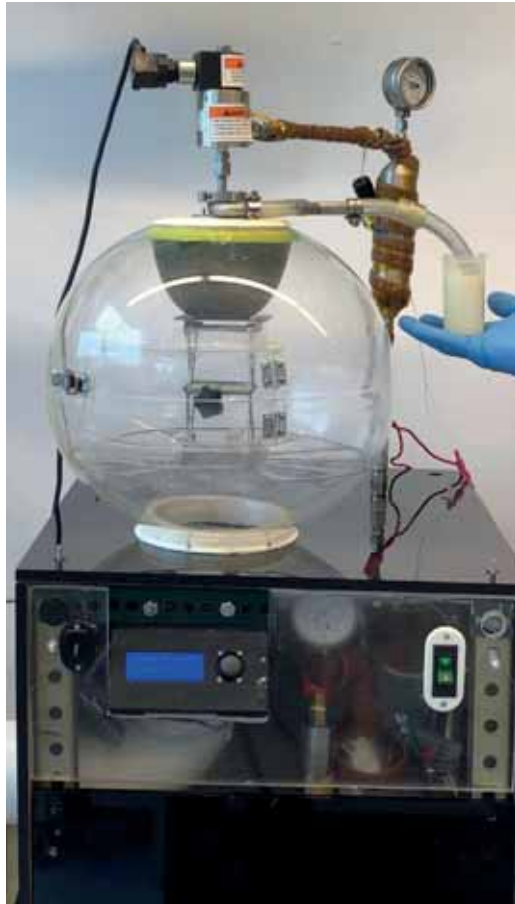
**Dr. Andreas Niemöller**

Business Unit Manager,  
Food Analysis Solutions,  
Bruker Optics

**“Modern spectroscopy is a fast and simple tool for the ever-increasing QC demands of the dairy industry – from raw milk to finished product”**

RIGHT: Rizvi Lab flash-freezing machine prototype

FIGURE 3



ABOUT THE AUTHOR



**SYED SH RIZVI** is international professor of Food Process Engineering in the Department of Food Science at Cornell University in Ithaca, NY. His laboratory is engaged in research on experimental and theoretical aspects of supercritical fluids, cryogenic freezing, high-pressure extrusion, physical and engineering properties of biomaterials and novel food processing technologies for value addition.

**Proof-of-principle unit**

A single-serve unit (shown in *Figure 3*) has been designed and built to prove the described principles. As illustrated in the process diagram in *Figure 2*, the system begins with carbon dioxide at roughly 830 psi (57.2 bar) and room temperature

conditions. The carbon dioxide is compressed in a gas booster and subsequently heated to the desired temperature before being further controlled by a pressure regulator. The pressure and temperature are set so that when the gas exits the carefully designed Joule-Thomson nozzle, the expanding gas will cool to -78°C, performing a cryogenic process. This is an ideal temperature to efficiently and directly flash-freeze food products.

The exit nozzle serves a dual purpose as a component of the Venturi eductor assembly. Two inlets are placed perpendicular to the gas flowing through the outlet orifice. These two inlets are introduced tangentially to one another so that when the fluid is suctioned, they will mix effectively. A fluid supply container is placed at the inlet of the fluid suction tube before the user activates a high-pressure solenoid valve. Once actuation is detected, the room temperature fluid is suctioned by the jet of carbon dioxide and simultaneously frozen due to the low temperatures of the carbon dioxide created by the Joule-Thomson effect. The resulting product is deposited into an enclosed collection bowl (shown in *Figure 4*) while excess carbon dioxide is exhausted from the collection area. The key benefit of this portion of the unit is that the liquid feed input requires no moving parts.

This novel system provides the opportunity to cool any liquid or food in liquid form to a frozen or partially frozen state on-demand. The current model of the machine produces a mass of frozen ice cream product around 100 grams (one scoop) within a three-second timeframe, returning an efficiency of around 67 percent. The resulting products are very smooth due to the smaller ice crystals that are formed from the almost instantaneous freezing compared to traditional freezing methods. The unique configuration of the system allows the user to manipulate parameters

TABLE 2 Testing results for ice cream products in Table 1

Ice Cream Sample	Viscosity (Pa·s) (20°C)	Overrun	1st Dripping Time (min.)	Maximum Melting Rate (g/min.)
Lab Formulation 1, Flash-Frozen	0.1473 ± 0.005	27.0%	20.55 ± 0.52	2.35 ± 0.09
Lab Formulation 2, Flash-Frozen	0.0248 ± 0.0002	35.4%	22.21 ± 3.87	0.64 ± 0.07
Commercial Ice Cream 1	0.0242 ± 0.005	36.6%	22.89 ± 1.79	0.58 ± 0.02
Commercial Ice Cream 2	0.0941 ± 0.005	76.4%	21.25 ± 2.50	0.88 ± 0.06







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RIGHT: Flash-frozen ice cream product

FIGURE 4



ABOUT THE AUTHOR



**SARAH JOHNSON** is a student at Cornell University pursuing a Master of Science degree in Food Science with a concentration in Food Engineering. Her research is focused on novel cryogenic freezing of food. She holds a B.S. in Mechanical Engineering from Carnegie Mellon University.

such as pressures, temperatures, and inlet geometries to achieve desired product qualities. It is possible to introduce various gases or air into the suctioning portion of the system by altering geometry in this section.

**Testing**

While the frozen products from this machine contain small amounts of carbonation, they compare well with commercial ice cream products when tested quantitatively. Four ice cream products listed in **Table 1** underwent testing consisting of mix viscosity measurements at 20°C, overrun, and meltdown testing. Testing results can be found in **Table 2**.

There appears to be a tendency for ice cream made with lower viscosity mix to experience higher overrun values when produced in the flash freezing machine. This phenomenon is especially prominent in the Lab Made Formulation 1 mix, which is 2.6-5.9 times more viscous than other mixes. This apparent correlation indicates that the flash-freezing machine may be viscosity dependent, lending itself to lower viscosity mixes, which are often synonymous with clean label mixes that lack viscosity-inducing gums.


The overrun values for flash-frozen ice cream products are similar to the commercial Ice Cream 1 overrun. Overrun in this range would categorise as super premium ice creams, which is highly appealing to consumers. Results demonstrate that first dripping time is proportional to ice cream overrun, while the maximum melting rate is inversely proportional to overrun. This aligns with previous research that finds there is a decrease in drip-through rate as overrun increases.<sup>3</sup> The inverse relationship between overrun and maximum melting rate can be explained by higher overrun values having lower diffusivity and air having an insulating effect, causing a lower meltdown

rate.<sup>3</sup> Deviations from these correlations may be attributed to the extent of fat destabilisation, especially in flash-frozen samples.

Although percentage of fat destabilisation was not measured in this study, it is possible that higher shear stress occurred when flash freezing the ice cream starter mix, which could lead to a higher percentage fat destabilisation and therefore a slower melting rate when the overrun was not particularly high.<sup>4,2</sup> In addition, numerous factors including varying formulations, processing conditions, and unknown storage conditions may contribute to deviations from expected correlations.<sup>1</sup>

It is theorised that flash-frozen ice cream has smaller ice crystal sizes compared to commercial ice cream. Many small ice crystal sizes may create a more tortuous path for serum to melt through, decreasing the melt-down rate.<sup>2</sup> Additional research, including detailed Cryo-SEM imaging, must be conducted to determine if there is a correlation between melting rate and ice crystal size.

**Conclusions**

The proof-of-principle flash-freezing machine has been successfully developed and tested. Various products including water, ice cream, frozen yoghurts, and sorbets have been frozen using the proof-of-principle unit. To validate the ice cream produced in the flash-freezing machine, the products were quantitatively analysed alongside similar commercially-accepted products. The results thus far demonstrate that the ice cream frozen in the flash-freezing machine is comparable to those made in industrial continuous freezing operations, with the added advantages of carbonated taste and smooth mouthfeel. Further research needs to be conducted to better support these claims. Forthcoming improvements will help to optimise this technology to provide a novel and effective method of flash-freezing other liquid foods. 

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# MOTHER NATURE'S PREBIOTICS FOR POWERFUL LIFE



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<sup>1</sup> Bode L.; *Glycobiology*. 2012 Sep;22(9):1147-62. <sup>2</sup> Göhring KC et al.; *J Nutr*. 2016 Dec;146(12):2559-2566

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# The key to combatting supply chain fraud

Continuing his reflections<sup>1</sup> on the challenges to improving food safety through technology and specifically blockchain, **Rob Chester**, UK Managing Director of Food at NSF International, examines some possible hurdles and why technology alone will not provide all the answers.

**T**HE MESSAGE is loud and clear to the big players in the food industry: you cannot afford to stand still. You need to be involved with disruptive food tech, whether through adapting and innovating in house, partnering or acquiring clever start-ups. Since 2014, according to estimates by DigitalFoodLab,

€4.7 billion have been poured into food tech investments in Europe alone and this amount has been increasing exponentially every year.

In March 2019, NSF International threw its hat into the ring and launched the new NSF Verify blockchain service. Initially, it will focus on bringing the consumer the story behind the beef they see on



There are two problems in this thinking. Firstly, an immutable record can capture erroneous information forever, just as it captures truthful data; which means extensive considered thought must go into the input systems. The source of the data and its capture mechanism must be verified and accurate. As we have discovered, a simple record providing the identity number of an animal is not enough to ensure veracity. To be sure of a convincing record with integrity, we had to add a locked-in DNA sample and geo-fence the farm and farmer.

**“ Preventing fraud in the supply chain is very much top of everyone’s agenda when considering the primary uses of blockchain ”**

#### Fraud will always find a way

Secondly, even when these issues are ironed out, fraud will always find a way. Regrettably, there can be no such thing as a system that is entirely fraud proof for ever. As Dominic Watkins of DWF says: *“Blockchain will not replace other checks, but will help simplify record keeping. Similarly, it will not eliminate fraud. After all, the intention of fraud is to defeat any system. But what it will do is make fraud more challenging, as it is far easier to validate if products are truly legitimate.”*

Fraud is like a water leak: at first it's not noticed and everyone carries on complacently until one day the ceiling falls in. Only after the first crisis happens does anyone try to locate the source. So constant vigilance is needed, necessitating ongoing oversight and management of participants, data input sources and computing innovations. This is not control or management, as by its nature blockchain democratises the data; in the language of GDPR, everyone in the blockchain ecosystem is their own data controller and data processor. This is governance, which I believe is one of the most important factors that will determine the success of blockchain – and it's one that we absolutely must get right.

#### GDPR issues

The first major hurdle for blockchain to navigate is GDPR. If the records are immutable, how can we comply with such issues as the individual's right to privacy and the requirement to delete personal records when they must live forever in a blockchain? This is often the first question that people ask, but perhaps surprisingly is not proving to be an insurmountable problem. Dominic Watkins is sanguine about this from a legal point of view: *“GDPR has spawned a sequence of new industries, ▶*

the supermarket shelf. It will enable many farmers to be part of the marketing of their own produce to consumer decision-makers via a scannable QR code on the pack. NSF is now kicking off the pilot with two major retailers and has already learnt a lot, with undoubtedly a huge amount more to be gleaned as the pilot progresses.

Preventing fraud in the supply chain is very much top of everyone's agenda when considering the primary uses of blockchain. Its fundamental design is to provide an immutable and traceable record of transactions and activities in as much detail as is configured into a particular system by its designers. The most optimistic thinking is that blockchain can eradicate fraud forever.



**ABOVE:** The first major hurdle that blockchain has to navigate is GDPR 

*but it need not stop blockchain. Provided that proper permissions are in place then it is perfectly achievable to make these systems work. There is always a solution."*

Some solutions are already emerging, including holding sensitive personal records 'offline' in a database that is linked to, but not part of, the immutable blockchain. Another possibility is to mark such records with a key that can lock the data so that it is impossible to access without the key. Fortunately, private community blockchains such as ours, where the participants are clearly defined and a gatekeeping system is in place, are much easier to have oversight and clear governance over than public blockchains where anyone can freely access data.

There are other regulatory implications that are more difficult to tackle, however, and will require lawyers to work out in detail. Our food supply networks are huge, often embracing many different parties within different types of businesses, and with different imperatives – in many cases collaborating across borders with different jurisdictions. The regulatory picture is going to be different for every blockchain ecosystem and the solutions will have to be worked out on a case-by-case basis.

### **This is a human story**

My final point is that to talk solely of technology solutions in food safety is to miss the point; technology is the tool that helps facilitate the solutions that we as people and an industry have decided we want to implement in order to live our lives and run our businesses. Fraud is by and large a human problem caused by a combination of motive, opportunity and reward. Is it not better to remove the incentives to fraud at source than to combat it after the event? This is an issue of corporate culture, fairness, transparency and openness that motivates individuals to 'do the

right thing' – something that psychologists tell us is a natural human instinct in all but psychopaths. It is an important idea that runs through all human behaviour and links to many strands of activity in the food industry.


Coming back, therefore, to the design of the NSF Verify blockchain service: it is obvious that consumers want to trust the products they buy, and trust is created by providing them, verifiably and transparently, with the relevant information about its source and the values and standards against which it was produced.

At NSF International's recent London Conference, Dr Anabel Gutierrez Mendoza from Kent University used the example of data-driven personalisation to create consumer engagement in purchasing choices. This creates issues of privacy and data ownership, which have to be handled with sensitivity for the engagement strategy to be successful. Just as with Facebook, if the consumer feels the contract is not fair and that they are in some way being taken advantage of, or that their identity has in some way been 'stolen', all the technology in the world will not make it work. There has to be a tangible or intangible benefit for everyone in the unwritten contract. Consumers want to trust a brand and its products, its values and the way it treats its employees and suppliers before that brand earns the right to engage with them.

Consequently consumers benefit and the supply chain benefits because consumers add value by the choices they make. Once the system starts to work in earnest, retailers will start to see a clearer picture of what is performing and what consumers want, driving a new value chain that helps farmers and everyone throughout the supply chain realise the full value of their products.

This is also true in regulation and compliance. Chris Hodges, Professor of Justice Systems at Oxford, has shown how compliance systems that work with the grain of human behaviour and use a variety of tools to encourage compliance, are so much more effective than the traditional regulator wielding the 'big stick', even with advanced surveillance systems. This is because the top-down punitive approach tends to alienate the community and drive bad behaviours underground, while cooperative compliance uses the natural human impulse to want to 'do the right thing'. These are the kinds of regulatory activities we will need to examine in more detail for blockchain ecosystems.

Perhaps that is and will be our most important learning. Once again, we circle back to human behaviour and corporate culture when determining how best to use technology to improve food safety in our business.

So the blockchain journey has begun; but make no mistake, we have a long way to go. 

## ABOUT THE AUTHOR



Before joining NSF, **ROB CHESTER** worked for Walmart in the UK, the US and China. While in China he was the Chief Compliance Officer and in the US he ran Operations Compliance across Walmart's 5,000 US stores. Prior to Walmart he held several compliance roles globally for Tesco. He holds an LLB and Postgraduate Diploma in legal practice from UCLAN in the UK.

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# Exploring the best ways of supplying food safety services to customers around the globe



New Food recently hosted a webinar in association with Waters, which explored five main areas that contribute to supplying food safety services to customers around the globe. Speaker of the webinar **Claude Charreteur**, Director of Business Development at Upscience, takes a moment to look at some key takeaways from the webinar.

## In terms of contaminants determinations, what are the latest innovations that you could now propose to your customers?

First of all, I would like to say that we must be conscious of the possibilities of techniques, as customers sometimes ask us to analyse contaminants by rapid methods or by NIRS spectroscopy. In terms of contaminants, I must clarify for the moment it doesn't work; we cannot achieve the same performances or even positive results with alternative methods. For contaminants, UPLC, GC, and ICP are currently the only suitable reference methods. Upscience Italia continues to work on some automation of the extraction process in order to optimise the extraction step and catch some more molecules. We want to include in our process the capacity to extract pesticides and mycotoxins in the same run. We are also working hard on polar pesticides, which

are not easy to separate and detect with classical methods. One of the biggest revolutions today concerns more microbiology tests and the appearance of routine PCR, which enables laboratories to deliver results in under 24 hours, sometimes less for *Salmonella* and some other pathogens. With the NGS technique, again our laboratories could propose to customers a complete screening of pathogen microbes in food matrices. In case of doubt, this new technology, which is mastered in our laboratories in France, provides a complete solution for our customers.


## In terms of more classical tests, what are the latest innovations that you could now propose to your customers? And on which types of solutions are you working?

When we talk about bromatology tests, we are talking about old chemistry

and the innovation in this field is again more focused on automation; direct connection with LIMS in order to accelerate the flow of results. The introduction of NIRS in routine laboratory work also allows our laboratories in, for example, Vietnam to propose a first quick and rapid prediction of feed raw materials to our feed millers customers. With this method we can deliver to our customers classical parameters (moisture, protein, crude fibres, starch, ashes) in less than 24 hours.

## You talk about BIPEA, can you explain what it is? Why did you choose it, and do other companies provide the same services?

BIPEA is a European non-profit organisation located in France. Utilising nearly 2,500 laboratories in the world (throughout 120 countries), it offers more than 150 regular proficiency-testing (PT)

programmes. In other words, it provides laboratories with blind tests and delivers complete reports to laboratories for checking, validating and comparing their accuracies with others. When it was created, BIPEA counted 60 laboratories and provided eight PT programmes in the fields of grains and milling. In the early 1990s, BIPEA decided to launch proficiency-testing programmes in the fields of agri-food and contaminant(s). PT programmes in the Environment field were created at the end of the 1990s. In 2009, BIPEA innovated through the creation of PT programmes in the field of cosmetics; especially sunscreen products. BIPEA has also been expanding internationally, increasing the number of participants in its PT programmes. But, of course, BIPEA is not the only one: LGC is also a great provider of PT and Fapas is probably the more well known. 

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 8-11 SEPTEMBER 2019

 LAS VEGAS, USA

# IBIE set to bring the world of baking to Las Vegas in record numbers

The International Baking Industry Exposition (IBIE), the Western Hemisphere's largest baking industry event, is extending a special welcome to its growing global community of wholesale, retail and artisan bakers with a high-value international delegation programme and other special onsite amenities.

MORE THAN 30 percent of IBIE's attendance is international, representing more than 100 countries. With each passing show, the International Baking Industry Exposition (IBIE) continues to demonstrate its influence on the global grain-based foods industry. Its rapid growth in international participation has transformed IBIE into the global platform it is today, fostering the cross pollination of ideas, collaboration, and the formation of new business relationships.

"We know our international guests travel a long way and make a big investment in their participation, so we want to ensure their planning and participation in IBIE is as easy as possible. Whether our international visitors have questions about international delegation discounts, the exhibition, the educational program, accommodations, registration or visa questions, we have dedicated international support ready to assist and accessible through the international page on the IBIE website," said Anjia Nicolaidis, IBIE's International Specialist.

IBIE continues to increase services and benefits for international guests and in 2019 is offering dedicated international support both before and during the show. Onsite, IBIE will offer registration counters reserved solely for serving international guests to facilitate easy check in. Additional onsite support will be available in the International Lounge making business meetings and networking easy with amenities such as



complimentary Wi-Fi, refreshments and translators on hand to help overcome any language barriers.

International visitors are encouraged to visit the international and foreign language pages of the event's website for additional information about how to join or organise a delegation and to register.

### More about IBIE

IBIE, sponsored by the American Bakers Association (ABA), the Baking Equipment Manufacturers and Allied (BEMA) and the Retail Bakers of America (RBA), is recognised worldwide as the grain-based

food industry's largest, most comprehensive trade event. A 'working show', where millions of dollars of business is conducted daily, IBIE brings the entire professional baking community together, offering the complete range of equipment, supply and ingredient solutions and showcasing the newest baking technology in 700,000 net square feet. The triennial event will next be held in Las Vegas, Nevada on 8-11 September 2019, with a full day of education on 7 September.

Attendees include employees of: artisan and specialty bakeries, donut, pie and cookie retailers; cake and cupcake shops; multi-store and single-unit retail bakeries; wholesale bakeries, suppliers and distributors; supermarket chains, central bakeries and commissaries; supermarket in-store bakeries; intermediate wholesale bakeries; foodservice operators; tortilla producers; snack food producers; and biscuit and cracker producers.

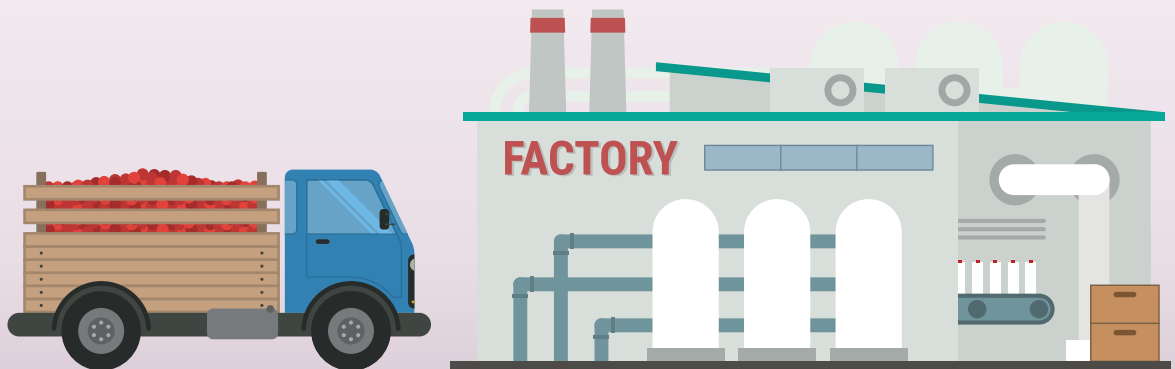
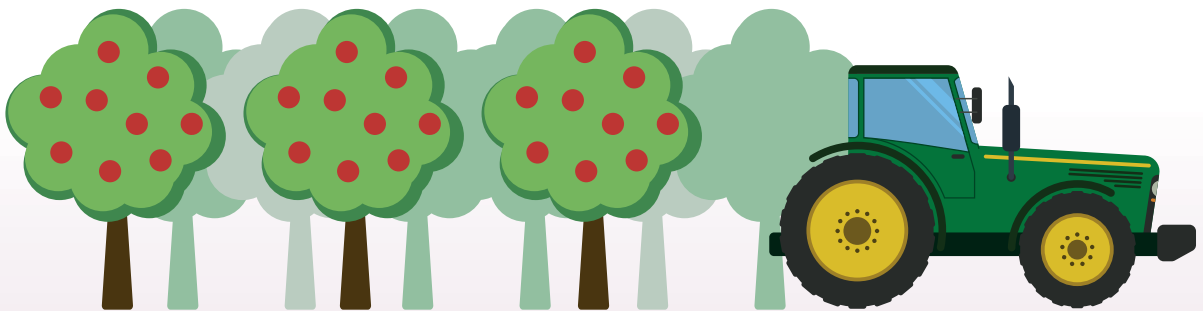
Exhibitors include manufacturers and suppliers of: baking/food equipment and systems; ingredients, flavourings, spices and fillings; ingredient handling systems; packaging materials and systems; technology; sanitation equipment; transportation and distribution equipment; refrigeration equipment; and business services. ■

 [www.ibie2019.com](http://www.ibie2019.com)

# PROCESSING

Dan Stackmann, Founder & President of Upton's Naturals, explains their passion and the process for bringing pre-seasoned, ready-to-eat jackfruit to the marketplace.

Anna Lambert, food industry writer, reports on Salumificio Viani's Tuscan prosciutto production process.





# Pioneering the jackfruit food craze

*Dan Staackmann* is the Founder and President of Upton's Naturals – an independently-owned natural foods company with a focus on meat alternatives and vegan values. Here he explains their passion and the process for bringing pre-seasoned, ready-to-eat jackfruit to the marketplace.

## ABOUT THE AUTHOR



**DAN STAACKMANN** is the Founder and President of Upton's Naturals, an independently-owned, ethical vegan food company based in Chicago, IL. A 25-year vegan and long-time advocate for animal rights and environmental sustainability, Dan founded Upton's Naturals in 2006 with a DIY attitude and slow-growth business model. Beginning in a shared kitchen, Dan created and introduced the first integrally-flavoured packaged seitan. In 2013, Dan worked with award-winning architects, UrbanLab, to design and build a mixed-use building in Chicago's West Town neighbourhood that includes private living space, offices, production space, and a café called Upton's Breakroom.

**A**S VEGANS for more than 20 years, we're always in search of simple and convenient foods that fit our lifestyle. Over time, we've learned that if we want something we can't find in the marketplace, we should make it ourselves and that philosophy led us to get started in the seitan business. We knew it was a versatile meat alternative made with recognisable ingredients, but wished it was conveniently paired with familiar, delicious seasonings. That wish was the starting point that eventually saw us build a production plant from the ground up and start producing the first, flavoured seitan in our hometown of Chicago. The inspiration for our jackfruit followed a similar path. Before trying it ourselves in 2010, my partner Nicole Sopko, who is also Upton's Naturals' VP, began hearing about a handful of restaurants serving jackfruit tacos and barbecue sandwiches. We fell in love with it when we tasted a jackfruit dish at a Nepalese restaurant and wished the process to cook it at home was easier. Fresh, unripe jackfruit is incredibly hard to come by, not to mention very sticky and messy to work with. The closest thing to convenience in the category was canned jackfruit packed in water or brine, and this option is filled with preservatives and only sold at Asian specialty stores. Transporting water from Asia only to dump it down the drain in the United States didn't make sense to us, and those cans also required additional processing and longer cooking time for the consumer. Some recipes recommended cooking the jackfruit for up to three hours for an amount of product that only yields two to three

sandwiches. That's a lot of work for a little sandwich. We wanted to give consumers a responsible, clean-label, fast and delicious solution; so we made it our personal mission to bring pre-seasoned, ready-to-eat jackfruit to the marketplace.

### Finding the right partner

To determine our first steps, we started by contacting every company that sold the cans, but none of them took us seriously. Many told me, "Americans don't want that much jackfruit," or clearly let me know that it wasn't worth their time to have a conversation. I confidently approached a couple of the bigger brands at trade shows, but they couldn't be bothered with me. It took a few years of rejections to realise that I needed to get on a plane and visit factories all over Asia until I found the right partner. Jackfruit turns quickly, so shipping the raw fruit to the US to be processed wasn't an option. It also didn't make sense to ship the whole fruit only to send much of it to a landfill – or in the best case, a compost heap. It took extensive learning on our part to come up with the best processes for the task, and we had to become educated on every aspect of this project; from cultivation and processing, to packaging, importing and exporting.

First, we got to know the farms, which range in size from 20 trees to more than 2,000 trees. Most of the trees average about 15 feet tall, but we've also seen trees over 50 feet tall! Jackfruit is harvested by hand because the fruit grows on both the trunk and all branches of the tree. With the right climate conditions, the trees don't need much

to thrive and are known for quickly producing fruit without much input. They bear fruit within just a few years and have a high tolerance to pests. We then learned that ensuring success wasn't just about finding the right farm; but finding one that was also close to a world-class processing facility. The equipment and skillsets required for farming and processing are totally different, and the equipment required is a multi-million-dollar investment that needed to be in place along with proper accreditations and infrastructure.

After an exhaustive search, we ultimately found a partner in Thailand to do all the processing and packaging before shipping the finished product overseas. Jackfruit is widely cultivated in Thailand, but there were a couple of other countries in the running, including Sri Lanka. Despite being one of the top three producers of jackfruit, India was not an option for us after we heard from some major processors that, "We might need to bribe forest rangers to get the volume you're looking for." We did not feel comfortable with this type of approach. Instead, we wanted a partner with good references, accreditations, and one we had a good feeling about on a personal level. The network of family farms tied to the processing facility we found had been growing cultivated jackfruit for many years and was on board with my request to sell me the unripe jackfruit in addition to the ripe fruit they were used to selling. This created extra demand for the farmers, who prior to the arrangement often had unused crops, and resulted in a mutually beneficial relationship.

### Refining the process

In addition to finding the right partner, another challenge we faced when working to bring Upton's Naturals' Jackfruit to market was matching recipes that we had developed in the US. Spices don't always taste the same in all parts of the world, and it took quite a bit of trial, error, and time to refine the process from harvest to shelf. We worked through this issue and other challenges though, and our determination led us to be the first company to make pre-seasoned, heat-and-serve, natural jackfruit nationally available to the US market. Our product line-up included Bar-B-Que, Chili Lime Carnitas and



LEFT: Most Jackfruit trees average 15 feet tall, but some can be over 50 feet tall

Thai Curry flavours to start. Made with only simple, recognisable ingredients, each flavour offers a good source of fibre, is completely free of cholesterol, gluten, soy, oil, GMOs, and artificial flavours, and is 100 percent vegan. We went on to introduce new Sweet & Smoky and Sriracha Jackfruit varieties, plus an Original version for cooks wanting to add their own spices.

### Launch to market

Jackfruit's launch to market went well and was so very different to our experience of introducing our seitan retail products in 2006. At that time, the vegan landscape was much more niche. In fact, we used to have 'vegan/vegetarian' on the packaging because we were afraid people wouldn't know what the word vegan meant. By the time we launched Upton's Naturals' Jackfruit in March 2015, vegan diets were gaining awareness, as was jackfruit. There had already been a few larger articles published about the fruit as a meat alternative and they multiplied from there. While we weren't the first to introduce jackfruit to American consumers, we were the first to make it easy to enjoy, and our timing couldn't have been better. Mainstream press

“Jackfruit is widely cultivated in Thailand, but there were a couple of other countries in the running, including Sri Lanka”

BELOW: Upton's Naturals' jackfruit range is suitable for a mainstream palate





**RIGHT:** Jackfruit is a versatile tropical fruit with a sweet flavour 



began quoting us in educational articles about jackfruit, sharing news of our products and touting jackfruit as the top food trend of 2017, 2018 and still into 2019. A few other companies liked our idea of selling pre-seasoned, heat-and-serve jackfruit in a pouch and brought their own version to market. Simultaneously, veganism started to resonate with a mainstream audience and jackfruit became known as the diet's go-to, whole-food meat alternative for pulled chicken or pork. This exposure helped with education and awareness of our products and ultimately kickstarted the jackfruit food craze. We suspect that the market will continue to grow over the next few years.

**“ We haven't followed trends, we've followed our passions ”**

### Growth

Since our launch of Jackfruit in the US, Upton's Naturals doubled its staff and grew by 300 percent. Our team outgrew the live/work space we built in 2013 and expanded into a new production space that is six times the size, all the while staying independently owned and operated. We also leveraged our partner relationships in Thailand to bring shelf-stable, pre-cooked vegan meal kits and the first vegan, shelf-stable, pre-cooked mac & cheese to market. Our products are currently sold in over 5,000 stores<sup>2</sup> in the US, including leading retail chains like Whole Foods Markets, Walmart, Wegmans, Sprouts, Stop & Shop, Giant, King Soopers and Safeway/Albertsons. We have huge appreciation for our retail partners that have shown support for the meat alternative category and promoted it in the same manner as for big food businesses and subsidised commodities with significantly larger trade spend budgets.


### REFERENCES

1. [www.uptonsnaturals.com](http://www.uptonsnaturals.com)
2. <http://www.uptonsnaturals.com/where-to-buy>

### Exciting opportunities

In 2017, our company saw 100 percent growth over 2016 and started to launch products in 15 countries worldwide. Today, we're celebrating our jackfruit products being sold in over 1,000 retail locations across the United Kingdom, including 800 Holland & Barrett and more than 300 Sainsbury's stores, along with natural and conventional retailers throughout Canada, New Zealand, Australia, Finland, Denmark, Sweden, Norway, Germany, Iceland, Ireland, Chile and Mexico. The response from International markets has been very positive. The awareness of jackfruit and adoption of vegan diets at retail and in restaurants is just beginning on a global level. We're excited to be at the forefront of the movement and making an impact by bringing quality and convenient meat-free options to consumers. Just as we did with our US rollout, we're learning along the way and seeing sales grow. For example, people in other countries don't eat spicy barbecue the same way we do in the US, so we've made some changes to the Bar-B-Que Jackfruit flavour to appeal to local taste buds. We also discovered the importance of organic certification, which we will have available in Europe this summer.

### Following the passion

When we started down the path of bringing pre-seasoned, heat-and-eat jackfruit to market, we didn't suspect it would be the next big thing. We just knew that we liked it and thought other people would too. I think that mentality is a big part of why we've been successful. We haven't followed trends, we've followed our passions. We took meat alternatives like seitan and jackfruit that have been around for thousands of years, updated them for today's consumer and a mainstream palate, and made them convenient and easily accessible. While we did this because it was what we wanted for our own diet and lifestyle, the response has been amazing. We truly are proud of the impact our products have had on more people embracing veganism and are excited for the change we can continue to make as Upton's Naturals moves to its next stage of growth. 

## ABOUT UPTON'S NATURALS

After testing the market in a handful of local restaurants, Upton's Naturals' Seitan proved to warrant a product packed for retail and a dedicated production facility. The seitan launched in a limited number of natural food stores in the Midwest and reached national distribution by 2011. In 2013, Upton's Naturals' Founder and President, Dan Staackmann, worked with award-winning architects, UrbanLab, to

design and build a mixed-use building in Chicago's West Town neighbourhood that includes private living space, offices, production space, and a café called Upton's Breakroom. In 2015, after growing a loyal base of customers, Upton's Naturals was the first in the world to launch pre-cooked, pre-seasoned young jackfruit in a retort pouch, which is now available in 20+ countries worldwide. In April 2018, the company expanded

into a new production facility that's more than six times the size of the West Town facility, where Upton's Breakroom remains. Upton's Naturals' latest products are shelf-stable, heat-and-serve Ch'eesy Macs and Thai-inspired Real Meal Kits. In an industry where lab-grown meat makes headlines, Dan believes in sticking to the basics and clean labels, focusing more on cooking than on science.



## Rosy past, present and future

*Anna Lambert*, food industry writer, reports on Salumificio Viani's state-of-the-art production process, which combines centuries-old techniques with artisanal know-how to ensure the sweet taste and warm pink hue of the Tuscan prosciutto it produces.

**A**WAY FROM the rolling hills of Tuscany on a less-than-prepossessing industrial estate a short drive from Siena, an ongoing culinary alchemy is taking place. Here at Salumificio Viani, a family business that began in 1922 as a simple butcher's shop and now employs over 100 staff, Prosciutto Toscano DOP is produced to grace tables around the world. It's a painstaking process, as third-generation family director Marta Viani explains: "It's about time, it's about patience and it's about being absolutely sure of the quality of your product."

### It begins with the pig

The elemental genesis of prosciutto production is, of course, the pig. Twenty-one farmers in the region supply Viani with approximately 100,000 hams per year, from crossbreeds of Duroc Italiana, Large White Italiana and Italian Landrace pigs. They are bred to the specifications of the Consorzio del Prosciutto Toscano (The Tuscan Ham Consortium). This is a body comprised of local producers who came together in 1990 to promote, enhance and protect their products by ensuring close links with

the territory they come from, which resulted in it receiving coveted DOP status in 1996. According to Consorzio rules, pigs whose hams make it into the Viani factory for DOP-status products must have been born, bred and slaughtered in Tuscany or its nearest neighbours; will be a minimum of nine months old; and will have been fed on a diet of specially chosen grains to ensure optimal health. Only pigs weighing between 146 and 177kg while living are suitable.

Even if they meet those criteria, though, it's not a given that they'll wind up on the production line: the fresh hind legs are inspected to ensure they adhere to the selection requirements set out by the Consorzio, that they are imperfection-free and of the requisite size and shape.

### The factory process


Upon satisfying these strict criteria, selected legs then pass through to the factory floor, where they are hand trimmed to give each ham its typical round shape, with fat and rind being removed in a particular way: "It's the V-shape we create that's typical to Tuscany and key to the process," ▶

### ABOUT THE AUTHOR



**ANNA LAMBERT** writes on food from both the consumer and producers' perspectives, and her work has taken her around the world, from Germany and the Netherlands to Italy and the USA.



**ABOVE:** Black pepper adds flavour and has antibacterial properties 

**ABOVE RIGHT:** The curing process can take as long as 20 months 



**“ By the time they are given a final taste and check, almost a year will have passed since the batch of porcine hind legs first entered the factory ”**

explains Marta. “Taking away more of the fat improves salt absorption, giving our prosciutto its special flavour.”

Wastage at this stage is minimal: fat offcuts are used in Viani’s salami-production line, while meat offcuts are sold on to pet-food manufacturers.

Once the trimmed hams have been tattooed with their batch numbers and shot through with the Tuscan POD metal disc, excess blood is pressed out of them and they are salted by both machine and – most importantly – hand. “This stage is vital because the salt must be massaged carefully into every crease of the ham – otherwise that area won’t cure properly,” stresses Marta. “And the only chemical we use in the preservative process is salt, simple salt. We do add a special mix of bay leaves, juniper berries and garlic for flavour, however – though the quantities and combinations are a closely-guarded secret.”

What strikes the visitor in this section of the production floor is the contrasting marriage of state-of-the-art technology – some of the newest in the country, says Marta, and with vertical storage added in 2011 to maximise space – and traditional techniques, such as hand-salting. “This is never going to be a totally mechanised process,” Marta adds, “human expertise and judgement will always be essential in determining quality and flavour.”

**BELOW:**  Massaging the ham



As the process continues, we see how technology is used to mimic nature, with various cooling rooms set at temperatures matching those of the seasons. Thus, once salted, the hams are stored for approximately one month at low temperatures that mimic the months of December and January: cold and dry. Next, in the pre-ageing process, they are stored for roughly three months at a temperature and in conditions that echo those you’d find outside in Tuscany during February and March: humid, cold and windy.

Further stages mirror the climate between June and July, when the air is dry and warm. This is when the all-important smearing process takes place: pig fat is blended into a paste with salt, pepper (which acts as a natural anti-bacterial agent) and flour to create a natural seal around the meat. “Around 10 years ago, we switched from using wheat flour to rice flour within the paste, so that we could offer the customer a gluten-free product,” explains Marta, demonstrating that Viani was clearly ahead of the game regarding awareness of dietary requirements and potential allergens. Prosciutto also stands up to scrutiny when it comes to health scares surrounding cured meats – no nitrites are used in its production and Marta is keen to point out that the fat it contains is largely unsaturated.

During the final curing phase, the hams are left in a room where the temperature hovers between 12-14°C, before they are given a ‘spiking’. As the name suggests, a ‘spike’ or needle made from horse bone is inserted at different points within the meat. An experienced ‘nose’ within the team checks that the meat smells as it should, allowing for any potential possible defects to be spotted. Outside inspectors, too, carefully check the hams at intervals, to ensure safety and quality. Finally, once accepted as being up to the required standard, the meat is branded with the distinctive Prosciutto Toscano DOP mark.

By the time they are given a final taste and check, almost a year will have passed since the batch of porcine hind legs first entered the factory. “There is





no room for speed here," says Marta. "The curing process for some of our products – *dissossare* prosciutto, for instance, which is left on the bone – extends to as long as 16, sometimes even 20, months. The longer the cure, the better the taste."

### Promoting the culture and distinctive characteristics of the product

Away from the factory floor, we meet Marta's brother, Fabio, who was elected President of the prestigious Consorzio del Prosciutto Toscano in February 2019. He considers a primary part of his role as being to, "spread the culture and distinctive characteristics of our exceptional product; not just throughout Italy but around the world. That's why Prosciutto Toscano DOP is participating in this year's most important fairs: Summer Fancy Food in New York, the Anuga Food Fair in Cologne and Tutto Food in Milan – to get our message out and to allow buyers to find out more about us. Making it clear that we're part of the EAT project, which emphasises all that DOP stands for and what makes us special, is very important, too."

### What are the key challenges facing Prosciutto Toscano?

Food fraud is an issue facing producers of all sizes throughout the world and being part of the DOP scheme, Fabio believes, is essential not only to ensuring the integrity of the product but in making food fraud harder to commit. "Ensuring our customers know what to look for – our branding and the DOP labelling – acts as a defence against counterfeiting and protection for the consumer and for those within the Consortium."

Fabio continued: "We've achieved so much since we launched the Tuscan Ham Consortium back in the 1990s, but there's still great potential for growth. Our commitment will be to make consumers more aware of the significance of the link with the territory, the genuineness and traditions that PDOs guarantee, while never losing sight of our commitment to quality and food safety."

In European markets beyond Italy, the reality is that the Italian cured market is dominated by Parma ham. "Their brand awareness is so strong,"



says Fabio, "they have an internationally-recognised name and they're huge: they put out nine million products a year, while the Consorzio del Prosciutto Toscano puts out 400,000. With figures like that, we can't compete on price."

Nevertheless, some markets are receptive to the delights of Prosciutto Toscano, particularly Germany. Viani has also just started supplying to the US. Fabio said: "It's very exciting for us as that market has huge potential. It's demanding, too, though because of the specific US rules governing food production that we must adhere to. We need to use a totally different production line."

Sampling the Viani DOP prosciutto, with its sweet mellow taste, may well be enough to persuade the consumer to broaden its horizons when it comes to the cured meats of Italy. As Marta explains: "While we cannot compete on price, we can compete on flavour, simply because we are so different. We offer a unique experience, with a taste that's different from every other sort of ham. That's why we say to buyers: visit us, try our product – we think it's worth the extra." 📍



**↑ ABOVE:** Marta Viani says that human expertise and judgement will always be essential in determining quality and flavour of the prosciutto

**← ABOVE LEFT:** Fabio Viani smells the horse-bone spike to check the quality of the prosciutto

**↪ ABOVE CENTRE:** The finished product

## THE EUROPEAN ART OF TASTE PROJECT (EAT)

The EAT project is a three-year initiative, co-funded by the European Union, to promote four areas of Italian food produced in the Tuscan Protected Denominations of Origin (PDO).

These are Olio Chianti Classico DOP olive oil, Prosciutto Toscano DOP, Pecorino DOP cheese and Vino Chianti Classico DOCG (Designation of Origin Controlled and Guaranteed). The project aims to build awareness of these products and their characteristics at local, national and international level. Among the

international target countries, the project leaders say that Germany and the UK are countries where there is little knowledge of PDOs and what they mean, "This is why the main goal of the programme is to expand and deepen the knowledge, to counter the advance of the products from the 'new world' while maintaining and conquering new market shares. In Italy, where there is more knowledge about PDO, the main objective is to increase the specialisation of the level of cognition and a small increase in market share."





# FOOD FOR THOUGHT



With Europe being a key market for the Brazilian poultry-meat industry, *Ricardo Santin*, Executive Director at ABPA (Brazilian Animal Protein Association), shares the extensive efforts they undertake to ensure their products meet high quality and safety standards.

## How is the ABPA able to ensure industry standards are adhered to in the fast-growing Brazilian poultry industry?

We're busier than ever in the Brazilian poultry industry – officially the largest exporter in the world, distributing to over 150 countries; however, quality control and safety remain critical to our success. We are committed to ensuring our products guarantee buyers quality produce and have invested in several projects to achieve this. An in-depth study took place in 2018 with a particular focus on the European market, to ensure Brazilian poultry was meeting safety standards across the globe. The European market continues to be key for Brazilian poultry and it's important we continue to provide that confidence for our customers.

We have also recently undertaken an independent in-depth on-site analysis of the Brazilian poultry-meat industry, looking at all aspects of the chain from breeding to facilities and processing

methods. This garnered vital information that's enabling us to build on our ambitions to maintain high quality control, transparency, and safety throughout the poultry industry in Brazil.

## What have been the key findings from the ABPA's recent analysis of this industry?

The in-depth analysis looked at various aspects of the Brazilian poultry industry, providing a thorough report that will enable us to maintain and build on our high standards. The analysis identified strengths in several areas, particularly in food safety, sustainability and animal welfare. In terms of animal welfare, livestock was found to be kept in units with space to move around, at optimal temperatures and with plenty of natural light. Animal feed was found to be of good quality with a high level of nutrients. It found that the farms breeding them undertook robust biosecurity measures and invested in good veterinarian and technical support systems. Sustainability


was another key finding, with low energy consumption a priority across Brazilian poultry farms.

Many farms were found to use bioenergy from planted forests, electricity sourced from hydroelectricity, and animal feed that is often locally sourced, reducing transportation. It was also identified that poultry food-safety standards are high in Brazil, with facilities following HACCP guidelines and undertaking internal audits that are reviewed several times a year, thus ensuring that poultry products meet the highest standards. These findings reassure us that we are maintaining high quality standards and provide insight and inspiration on areas we can develop further.

## What will the ABPA do to ensure high-quality standards are met within the Brazilian poultry industry in the future?

Building on the work we have already undertaken to ensure high-quality standards

are being met, we will continue to prioritise these standards. We endeavour to not only maintain those high standards but to build on them, ensuring this level is met throughout the poultry industry and aiming to set an example globally as the leading supplier of poultry products.

Our aim is to continue to invest in initiatives such as independent analysis to ensure standards are maintained, and innovate within the industry with projects such as the scientific advisory committee. This will consist of a range of experts forming a panel from various sectors including food safety, sustainability, and animal health and welfare. Although this is an ABPA initiative, it is our objective that the committee represents an independent voice to enable us to maintain and improve standards across the poultry industry. We are proud of the hard work and commitment of the Brazilian poultry industry members who are positive and excited for the future. 

# BRAZIL

## COMMITTS TO GLOBAL APPROACH AT EVERY STEP OF THE VALUE-CHAIN



© Photography: Mamed, Petry / Eurico Sales

Over the years, Brazil's chicken meat industry has grown to become the world's leading exporter. It is also the world's second largest poultry producer. **Some 160 countries across 5 continents look to Brazil for their poultry supplies, chicken meat in particular.**

### AN AMBITIOUS PLAN TO ANTICIPATE DEMAND

As a major global poultry meat supplier, Brazil has developed an action plan that goes beyond food security requirements, and aims to address current and future global needs. The plan is to focus on differentiation through quality, notably sustainable development. The Brazilian poultry meat industry has elected to undertake these actions in the European Union as a priority and demonstrates its capacity to anticipate the needs of the EU, which has earned a reputation as one of the world's most demanding markets.

Following the mapping of European needs, the Brazilian poultry meat industry undertook an in-depth on-site analysis of the poultry meat industry's facilities and breeding and processing methods.

It identified strengths in food safety, sustainability (energy management and transportation), as well as animal health and welfare, all key focus points for the ABPA's continuing plan for progress.

### Animal Health & Welfare

Livestock are reared mostly in optimal temperatures with plenty of natural light, have room to move around, are fed nutritious food and are bred on farms with robust biosecurity measures and good veterinarian and technical support.

### Environmental Sustainability

Low-energy consumption at all the farms is a priority and good climatic conditions mean heating isn't necessary during most of the year. Also, the farms use bio-energy provided from planted forests and electricity comes mostly from clean hydroelectricity infrastructures. The poultry food is sourced locally, cutting the need for polluting food transportation.

### Food Safety

The food safety standards, meanwhile, are high with facilities following HACCP protocols. Internal controls, frequently reviewed according international private standards, mean the poultry distributed is of good quality and fully traceable, and meets European Union standards.

### Scientific Committee

The Brazilian poultry meat industry has now implemented a scientific advisory committee formed of three independent experts from the European Union and one from Brazil. The committee consists

of a range of experts recruited from a variety of sectors including food safety (with a focus on quality and traceability), environmental sustainability and animal health and welfare. Although initiated by ABPA, the aim is that the committee will be an independent voice talking about the chicken meat industry.

### The plan for progress implemented by The Brazilian Association of Animal Protein – ABPA, consists of 3 elements:

1. Mapping of European needs in term of food Safety, traceability, animal health and welfare led by independent experts from French consultancy firm specialised in animal production sector.
2. In-depth on-site analysis of the poultry meat industry's facilities and breeding and processing methods.
3. Creation of an independent Scientific Committee intended to support the chicken meat industry.



# Proteomics of shellfish allergens: using LC-MS to detect important food-borne allergens

New Food recently hosted a webinar in association with SCIEX, which explored the ongoing proteome analysis of shellfish as a first stage towards developing a routine LC-MS food test. Speakers of the webinar **Michelle Colgrave** and **James Broadbent** from CSIRO take a moment to look at some key takeaways from the webinar.

## KEYNOTE SPEAKERS:



**MICHELLE COLGRAVE**  
Professor of Food and Agricultural Proteomics, CSIRO

Michelle Colgrave holds a joint position in the School of Science at Edith Cowan University. Michelle is using proteomics, the study of proteins, using mass spectrometry (MS), to help identify key proteins that will benefit Australia's food and agriculture industries and improve human health.



**JAMES BROADBENT**  
Research Scientist – Proteomics, CSIRO

James Broadbent's work principally involves measuring proteins and proteomes in crops and food products, for the improvement of agriculture practices and food safety.

### Why was LC-MS chosen over other techniques?

We are an established proteomic laboratory with vast experience in protein and peptide detection, so this was an easy choice for us. LC-MS directly measures the presence and/or quantity of a protein. Antibody techniques are known for their sensitivity and ease of use, but they rely on the binding efficiency of the target protein to another protein. In food the protein targets are often cleaved or modified. The epitope to which the antibody binds may be masked or even destroyed. Polyclonal antibodies detect multiple epitopes, which hopefully tackles this issue in a similar way to what we described by using peptide marker panels. An additional advantage of LC-MS is that we can monitor several protein targets and distinguish species based on the selection of unique peptides – this cannot always be achieved when using polyclonal antibodies.

It really came down to the accuracy, precision and robustness of LC-MS.

### Are there any benefits of using Paragon over other database search algorithms?

There's a couple of really nice things about this search engine, one of them being its ability to search for a lot of modifications or amino acid substitutions without compromising the integrity of your search. The other is that it has a really simple interface where your inputs are translated into search parameters. This way, you can spend less time tinkering with settings and more on the work at hand.

### Can your approach be applied to other food products? What would be the key points of difference?

We started with discovery proteomics in fresh unprocessed foods and then

moved to a targeted assay in a variety of processed foods. You could apply this workflow to many food types. The key is always going to be sample preparation though, so that you can deal with complex and varied matrices (solution, dry, lipid-rich, sugar-rich). You need to consider testing how these different sample matrices will affect the instrument's response and consider matrix-matching and the use of internal standards to overcome such issues. The inclusion of internal standards will mitigate matrix effects, but sample preparation for specific matrices is likely to be the biggest point of difference. Again, I would reiterate that in food, you are dealing with many different species in a highly complex sample: food producers will use different starting materials, so discovery proteomics should incorporate as much of the genetic diversity of starting material as possible. 📌

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# A whole new way of approaching infant formula

A state-of-the-art production plant in the Netherlands looks set to push the boundaries in both specialised infant formula and sustainability.

*David Boulanger*, Senior Vice President Operations, Danone Specialized Nutrition, shares their journey to realising this spanking new facility.

**T**HE OPENING ceremony for our new Nutricia Cuijk production facility in the North Brabant area of the Netherlands in March 2019, was a particularly exciting day for Danone. Joining our entire team and a broad range of stakeholders – including the Deputy Prime Minister of the Netherlands and Minister of Agriculture, Nature and Food Quality, Carola Schouten – were representatives from wider industry and healthcare. Together, we marked the completion of a three-year ▶



**RIGHT:** Deputy Prime Minister of the Netherlands and Minister of Agriculture, Nature and Food Quality, Carola Schouten (L) pictured with Head of Danone's Specialized Nutrition business, Véronique Penchienati-Bosetta (R) and Factory Director, Sijmon Hage, at opening of Danone's new €240 million specialised infant formula factory in Cuijk, the Netherlands



journey to build a state-of-the-art, energy-efficient, zero-waste plant – no mean feat.

The facility will primarily produce specialised infant formula that meets the needs of infants diagnosed with specific medical conditions – such as, for example, an allergy to cow's milk protein – as well as standard infant formula. The €240 million investment is among Danone's largest in its European production network in the last ten years. As Danone Specialised Nutrition Executive Vice President Veronique Penchienati-Bosetta said on the day: "At Danone, we believe the health of people and the planet are interconnected, as expressed through our company vision 'One Planet. One Health'. Our new Nutricia Cuijk facility is a significant investment towards achieving that vision. At this facility, we'll be producing food for vulnerable babies; and we're also doing everything we can to preserve a healthy and clean environment for future generations."

**“ The facility will primarily produce specialised infant formula that meets the needs of infants diagnosed with specific medical conditions ”**

### The right time

The global prevalence of allergies is steadily rising, and approximately two to five percent of infants develop a cow's milk protein allergy (CMPA) within the first year of life. The Nutricia Cuijk plant employs a specific manufacturing process to produce foods for special medical purposes containing extensively hydrolysed protein to meet the specific nutritional needs of infants diagnosed with this type of allergy. The new Nutricia Cuijk plant has been built to spec to further support the expansion of Danone's range of specialised infant formula products tailored for babies with specific health needs.

Upholding our central value of sustainability was a key factor in the plant's design. The Nutricia Cuijk facility will eventually replace an older plant in Cuijk that is gradually being phased out. The newly-built facility uses advanced

environmental technologies coupled with efficiently-designed manufacturing processes to ensure water and energy consumption, as well as CO<sub>2</sub> emissions, are kept to a minimum. The facility will have double the production capacity of the legacy plant, yet will use 60 percent less water, 25 percent less energy and emit 50 percent less CO<sub>2</sub>. To further minimise its carbon footprint, the plant is powered by 100 percent renewable electricity.

We've also set our targets to reduce the new plant's full-scope carbon emissions. To this end, Nutricia Cuijk sources dairy ingredients exclusively from Western Europe – a region with the world's lowest dairy farming CO<sub>2</sub> emission rates. Of these ingredients, a significant majority are sourced locally, from the Netherlands and neighbouring Germany. Nutricia Cuijk also embraces the principles of the circular economy – 100 percent of the facility's waste is recovered, including all packaging waste.

"Producing such highly specialised infant formula, our new facility builds on the scientific heritage of Nutricia, coupled with the latest green technologies. Today's opening ceremony marks the next chapter for Nutricia Cuijk – here in the Netherlands, and as part of the Danone family," said Veronica Penchienati-Bosetta.

### The two-step production process at Cuijk

The factory at Cuijk is split into two separate sections – 1) Powder Production, and 2) Blending and Packaging – each tasked with carrying out specific processes.

### Powder production

In this part of the factory, the various ingredients are processed into liquid product and then spray-dried into powder. These processes include the following:

### Reception of raw materials and ingredients

- The various raw materials are delivered to our reception warehouse, consisting of a tank farm for liquid bulk ingredients and a dry warehouse for all other ingredients
- Liquid raw materials are unloaded at sheltered bays and cooled before being stored in our tank farm. The most important liquid ingredients are demineralised whey, whey protein concentrate, vegetable oils, glucose and galacto-oligosaccharides (GOS)
- Dry ingredients in Big Bags (flexible intermediate bulk containers, FIBCs) and other ingredients in 25kg bags, drums and intermediate bulk containers (IBCs) are stored in conditioned areas. The most important dry ingredients are lactose, whey protein concentrates, minerals, vitamins and enzymes.



### Wet phase production

- In the wet phase department, liquid products are prepared for the spray dryer. This happens in three phases: compounding, vegetable oil blending and vegetable oil injection and homogenisation.
- Extensively hydrolysed products – such as specialised formula for children

with CMPA – include an ultrafiltration step after compounding to remove any remaining large protein fractions that may provoke allergies.

- After the wet phase production, an automated clean-in-place process cleans the equipment to avoid contamination, microbiological growth and pollution. ▶



**ABOVE:** Danone's new production site for specialised infant formula manufactures high-quality products to nourish 3.5 million babies every day

## EXPERTVIEW



**Jean-Philippe Tourniaire**

International Product Manager, Bio-Rad

*"It is critical that food safety testing method providers optimise methods in order to reach the best detection performance with strong validations"*

## Taking infant formula testing seriously

**Food safety testing of infant formula is a highly sensitive topic. Due to the sensitive nature of its consumer, the product must be safe; i.e., free of any chemical or microbiological contaminant. With a risk of potentially significant impact on baby's health and an associated strong media impact, industrials and public authorities have an important responsibility to deliver safe products.**

In the past two years in Europe, two significant recalls of infant formula products were made following salmonellosis cases. As a consequence, and after a parliamentary investigation in France, new recommendations were made to reinforce the controls and improve the processes at different levels. This included the reinforcement of the sanitary management plan, with increased sampling plan and environmental testing.

Regarding microbiological safety, *Salmonella* and *Cronobacter* are the two main pathogens targeted, while Enterobacteriaceae is used as hygiene process criteria. It is critical that food safety testing

method providers optimise methods in order to reach the best detection performance with strong validations. In the infant formula world, this is challenging because there is a large diversity of composition, which can have a significant effect on the performance of the detection methods. In addition to the very low water activity in these matrices and an associated physiological stress, the presence of technological probiotic flora can potentially interfere with the growth of the targeted pathogens. Different probiotics will have different effects.

There is also a global trend to perform sample pooling, increasing the weight of the portion that will


be analysed from 25g to 375g (or more). This needs to be correctly assessed by extensive validation and verification at a user's site with their own matrices. The quality and the efficiency of the microbial enrichment will be crucial to guarantee the right performance of the global method.

As method providers, our role is to support infant formula manufacturers and to help them ensure absolute safety while meeting their industrial issues of time and cost. New detection methods in food microbiology, such as Polymerase Chain Reaction (PCR), allow for highly accurate screening in a short time. ■

For more information: [bio-rad.com/iqcheck](http://bio-rad.com/iqcheck)





**ABOVE:** Aerial view of the factory 

## ABOUT THE AUTHOR



Since September 2018, **DAVID BOULANGER** has been in charge of Operations at Danone Specialized Nutrition and was promoted to the position of Senior Vice President Operations, Specialized Nutrition in January 2019. In his role, David is responsible for the global end-to-end supply chain, through 27 factories, producing and delivering Early Life Nutrition & Advanced Medical Nutrition products in more than 90 countries around the world. David started his career in the Mars Group and joined Danone in 2001. He started in the Biscuits division, where he occupied various positions within the Supply Chain area. In 2010, he was appointed Vice President Operations for Danone's Advanced Medical Nutrition division and became Vice Present Operations for the Early Life Nutrition division in 2013.

### Dry phase production

- After the wet phase, spray dryers transform the liquid product into a dry powder. This process ensures a product with the right quality, colour, taste, dissolubility and moisture content.

### Big Bag filling

- After drying, the powder is stored in Big Bags. At this stage, the product is checked for the correct composition, taste, colour and microorganisms.

### Blending and packing

In this department, the spray-dried powder is blended to become the final product, packed (into boxes or cans) and prepared for distribution around the world.

### Blending

To arrive at the specific formula, the base powder produced in the production process is mixed with other ingredients, such as vitamins and minerals.

### Packing

We have three different packing lines, hermetically separated from each other to avoid product contamination. Currently, one canning line is in operation, the eazypack line, and a second canning line is being planned.

### Distribution

Once a batch has received final approval from the quality department, it is released for further distribution. Finished product is typically stored for a maximum of 24 hours in the factory.

### Quality and food safety

Every product we make needs to be of the highest quality and safety so the Nutricia Cuijk factory


has been designed with quality compliance as a starting point. We have implemented the latest technologies and most efficient processes to enable integration of the highest standards of both quality and safety into the design and operation of the factory.

### Product traceability

To achieve full traceability of our products upon leaving the factory, they carry a number of features; these ensure they are protected on the way to consumers. Currently, our products are traceable through production date, can sealer number, batch and sequence number, and registration numbers from certifying authorities. In addition to our standard high-quality production process, this year we are introducing innovative technologies to our package design, which can best be compared to a 'product passport'. We will add extra protective layers to packaging and implement laser marking – an extra quality seal that will show if a product's been tampered with – and unique QR codes on outer and inner packaging.

### A major investment

Danone's €240 million investment in Nutricia Cuijk, which was announced back in 2015, represents the largest international capital investment in a greenfield location in the Dutch province of North-Brabant in over a decade. With the new facility based in the Netherlands, Danone aims to build on the scientific capabilities of Nutricia and expects to benefit from the Netherlands' strong agricultural heritage, expertise in nutritional research and excellent local supply chains. At the Opening Ceremony, Carola Schouten, Deputy Prime Minister of the Netherlands and Minister of Agriculture, Nature and Food Quality, said, "Danone's Nutricia Cuijk facility is not only a monument to innovation and sustainable production, but also a recognition of the Netherlands as a dairy country. With the opening of this factory, Danone again contributes to the Dutch Topsector know-how and our expertise in specialised nutrition."

Once fully operational, the facility will employ close to 500 people and will – through indirect employment – support up to an additional 2,000 jobs. With the support of on-the-job training, the entire local workforce will transfer from the legacy plant in Cuijk to the newly-opened facility. At full capacity, Nutricia Cuijk will produce more than 600 different products – including the well-known Aptamil and Nutrilon brands – for customers in over 90 countries, feeding more than 3.5 million babies daily. 

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# Meat fraud, an old crime with some new twists

The meat trade globally does not have a good reputation and it seems there is a constant stream of fraud issues unmasked. *New Food's* webinar in association with Thermo Fisher Scientific will explore how meat fraud can manifest itself and the best ways to deter the fraudsters.



26 JUNE 2019



3:00PM (GMT)


THERE ARE VERY few other industries that seem to have the level of cheating that meat does. Could we imagine reading about fraud in the manufacture of plane parts or pharmaceuticals and still feel OK to use the products?

Yet despite multiple scandals, meat remains an essential component of many of our diets and

provides an important source of essential nutrients to keep us healthy.

In this webinar we will examine the many ways that meat fraud can manifest itself: from a dodgy butcher adding sawdust to his sausage, to a national scandal involving large parts of the meat industry and government involved

in corruption, bribery and cheating.

While there are many ways to cheat, there is an almost equal number of ways to try and catch the cheats. The webinar will explore these and show how they can be employed in different parts of meat supply chains to have maximum impact on deterring the fraudsters. 

## KEYNOTE SPEAKER:



**CHRIS ELLIOTT**

Professor of Food Safety and Founder of the Institute for Global Food Security, Queen's University



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# FOOD SAFETY

Scientists Martin Rose, Taichi Inui, Moira Dean and Jane Parker examine the true meaning of the term 'natural' within the food sector, emphasising its impact on risk assessment and risk management.

Arun Chauhan, Founder and Managing Director at Tenet Law, explains how leadership style within an organisation plays a part in preventing and mitigating the risk of food fraud.

Deb Smith, global hygiene specialist, explains why allergen management is vital in any food business.

Dr Lisa O'Connor, Chief Specialist in Biological Safety at the Food Safety Authority of Ireland (FSAI), explores the importance of HACCP procedures.



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## Naturals in food: facts, myths and perceptions

In the second of a two-part article,<sup>1</sup> *scientists Martin Rose, Taichi Inui, Moira Dean and Jane Parker* examine the true meaning of the term 'natural' within the food sector, emphasising its impact on risk assessment and risk management.

### ABOUT THE AUTHOR



**DR MARTIN ROSE** has a background in analytical chemistry and has worked as a Government research scientist in the field of food chemical safety for over 30 years. He is currently an independent consultant on food chemical risk assessment and food control. He is a member of the RSC Food and Toxicology Group Committees.

**T**HE RISK assessment process for food chemicals and ingredients is a scientific evaluation of the risk it poses to health as a function of both toxicity and exposure. Risk management uses the risk assessment and combines the evidence with social, political and economic factors to derive limits. A recent ILSI (International Life Sciences Institute) workshop discussed advantages and disadvantages of both hazard- and risk-based approaches to ensuring food safety and concluded that the value of risk-based approaches is becoming increasingly recognised.<sup>2</sup> Whether or not a compound is derived from natural or synthetic processes is irrelevant to risk assessment, but not to risk perception and therefore risk management.

Taking formaldehyde as an example: this is classified as a known human carcinogen both in the EU and the USA. The main concern is inhalation and respiratory cancers, but it is also associated with leukaemia; so there is no dispute that this is a dangerous compound. However, formaldehyde is known to occur naturally and is an essential intermediate in cellular metabolism in mammals and humans. Formaldehyde is found at highly variable concentrations in food, ranging from < 0.1mg/kg in

milk to > 200 mg/kg in fish, and calculations show that oral exposure to formaldehyde from food would not normally exceed 100 mg/kg food per person per day, i.e. 1.8 mg/kg bw (body weight) per day for a 70 kg person.<sup>3</sup> It is known that methanol is metabolised to produce formaldehyde, and that methanol is formed from aspartame by enzymes in the digestive system; thus consumption of the sweetener, aspartame, leads to an increased exposure to formaldehyde. However, despite this association with a known carcinogen, it does not make sense to restrict the use of aspartame on this basis since exposure from using aspartame, even with large amounts, results in far lower levels of methanol and formaldehyde than are found from other dietary sources. In fact, the maximum potential change in cellular levels from aspartame at its acceptable daily intake (ADI) is less than the normal variability in these cellular levels. Many of the most toxic compounds that humans are exposed to from their diet come from natural sources and can be considered as natural compounds (**Table 1**).

Although the risk assessment process is the same regardless of the production process, there are some challenges that tend to be associated with 'natural' ingredients. Synthetic, or 'artificial',



ingredients are often well-defined materials and are usually of high chemical purity. Specifications can be tight, and toxicology studies are conducted on defined materials. Natural ingredients, on the other hand, are generally poorly defined materials, with extracts of varying purity and specifications can be very loose. There can be seasonal or geographical variations that are inherent in the biological nature of the products from which they are derived. Often, it is not certain what was tested or the purity of the product. 'Regulatory creep' can be a problem with the range of quantities used and applications to which natural ingredients are used.

Most traditionally used foods have not been subject to systematic toxicology study but are considered safe to consume as they have a long history of use and lack any evidence of harm. This 'history of safe use' concept has originally been developed for assessment of novel foods and foods derived from genetically modified organisms<sup>4</sup> as a benchmark for comparative safety assessment. To move away from subjective decision making, a multi-criteria decision analysis model was subsequently developed as a comprehensive comparative approach to assess the safety of natural materials.<sup>5</sup> Using all available evidence (concerning history of use and evidence for concern of the natural material or its components), safety decisions can be made more objectively and transparently.

### Drivers and challenges when converting to natural

#### Flavours

Today's consumer demands both natural and sustainable food, so we must question whether they can both be achieved together. Let's consider the world's most popular flavour, vanilla.

Madagascar is responsible for 80 percent of the world's vanilla, but in 2017, it faced a devastating cyclone. This saw the price of high quality Madagascan cured vanilla beans overtaking the price of silver and it currently sits at around US\$550 per kg (up from US\$10 per kg five years ago). An increase in demand, with a decrease in supply and an expensive crop that supports over 80,000 farmers has led to exploitation, corruption and poor-quality produce.

One solution to supplementing the variable, inadequate and expensive supply of extracts of vanilla planifolia is to produce vanillin, the main component of vanilla extract, from other sources. Vanillin can be produced via chemical synthesis, but this is very clearly not natural. However, regulations allow vanillin that has been produced via physical, enzymatic or microbiological processes (which conform to traditional food preparation methods) to be labelled as natural. In the US, natural



vanillin can be generated from clove oil or pine tree using eugenol or coniferyl alcohol as starting materials respectively. The EU regulations, perhaps recognising that this may mislead the consumer, do not class this as natural, but vanillin derived from rice bran or corn sugar can be classified as natural in the EU. Thus, by using other natural flavouring ingredients, as defined by EC/1334/2008, it is possible to make a more cost-effective natural vanilla flavouring that still contains vanilla but also contains naturally sourced and isolated aroma molecules such as Vanillin ex Ferulic Acid Natural to 'make the vanilla go further.'

#### Colours

Colour influences purchasing decisions, signals the quality and safety of the food and influences flavour perception. The classification of natural colours is less regulated than for flavourings, but the Natural Food Colours Association (NATCOL) has

#### ABOUT THE AUTHOR



**DR TAICHI INUI** holds PhD in natural products chemistry. He has expertise in nutritional science, preventive medicine, and food oral processing through 10 years industrial experience. Currently he is APAC Regional Manager for Nutrition Science & Advocacy at DSM Nutritional Products.



ABOUT THE AUTHOR



**DR JANE K PARKER** is a chemist and a keen cook, who became fascinated with flavour – why and how do things smell? She is currently Associate Professor in Flavour Chemistry and Manager of the Flavour Centre at the University of Reading and a member of the RSC Food Group Committee.

**TABLE 1** Examples of 'natural' toxins

Toxin	Effects	Found in
Algal toxins	Can cause diarrhoea, vomiting, tingling, paralysis	Affects shellfish such as mussels, scallops and oysters
Ciguatoxins	Can cause both central and peripheral neurologic symptoms: vomiting, diarrhoea, numbness of extremities, mouth and lips, reversal of hot and cold sensation, muscle and joint aches	Barracuda, black grouper, dog, snapper, and king mackerel
Cyanogenic glycosides	May result in acute cyanide poisoning and has also been implicated in the etiology of several chronic disease	>2,000 plant species including cassava, sorghum, stone fruits, bamboo roots and almonds
Lectins	May cause severe nausea, diarrhoea and vomiting	Some beans
Furocoumarins	Phototoxic and are problematic mainly after dermal exposure	Effects are reported after consumption of large amounts of vegetables
Mycotoxins	Symptoms of severe illness and even death can appear quickly after eating highly contaminated food, chronic mycotoxin exposure can induce cancers and immune deficiency	Numerous foodstuffs such as cereals, dried fruits, nuts and spices
Various components found in fungi	Can induce vomiting, diarrhoea, confusion, visual disturbances, salivation and hallucinations. Onset 6-24 hours after eating; fatal poisoning associated with delayed onset of very severe symptoms affecting liver, kidney and nervous systems	Poisonous mushrooms
Solanines and chaconine (glycoalkaloids)	Effects on the nervous system included increased heart, pulse, and respiratory rates, sedation and coma	Sprouts and green parts of tomatoes, potatoes, and eggplants
Pyrrolizidine alkaloids	Some are acutely toxic but the main concern is the DNA-damaging potential of certain PAs	Tea, herbal infusions and food supplements

defined a classification of natural colours related to 'degree of naturality' (**Table 2**). Again, food regulations are not aligned with consumer demand, nor are they aligned globally. Spirulina extract that comes from a blue-green algae is classified as an 'additive' in the US, but a 'food' in the EU, while pigments like chlorophyll are allowed as a colour additive in the EU, but not in US. The major challenges, particularly when converting to natural colours, are that natural colours are more susceptible to interactions with other components of the food matrix, inorganic salts, light, oxygen, processing and especially pH. Anthocyanins change from red to blue over a pH range of 3-6, and heat treatment or the addition of vitamins can cause browning. Colours from natural sources are more expensive than their synthetic alternatives, but companies are focusing on minimising the agricultural footprint and optimising extraction procedures, formulation and applications.

**Pet care products**

As the use of the term 'natural' has expanded in human food, so it has been adopted and applied to the world of pet food too – with one significant difference. In the USA and EU, the term 'natural' is defined either by regulation or Code of Practice. In practice, at least in Europe, few, if any pet foods are likely to be able to describe themselves as natural but many can, and do, claim to be made with natural ingredients. Of course, this

doesn't necessarily mean that they are better than foods not making such a claim, since main meal pet foods must contain all the daily nutrients that a pet needs; so 'natural' isn't necessarily better in nutrition terms. Neither does it mean the products are safer – any European pet food containing animal products must be processed to minimum legal standards to ensure that they

ABOUT THE AUTHOR



**PROFESSOR MOIRA DEAN'S** research group focuses on studying the 'head, heart and hands' (perceptions, attitudes and behaviours) of actors along the food supply chain to explore food security challenges in three main areas: global food integrity, nutrition and health, and how we'll feed the world's growing population in a sustainable, cost-effective and environmentally-friendly way.


**TABLE 2** Classification of 'natural' colours

Colour category		
Artificial colours	Increasing 'naturality'	Synthesised from chemicals e.g. tartrazine, brilliant blue
Artificial but nature identical colours	↓	Synthesised from chemicals but are chemically identical to those found in nature
Nature-derived colours		Extracted from natural source, but chemically modified eg. Stabilized with Cu – or laked with aluminium
Natural colours		Extracted from natural source e.g. turmeric, anthocyanins, chlorophylls, carotenes, calcium carbonate
Colouring foods		Juices and concentrates e.g. black carrot, orange carrot, spirulina, sweet potato, hibiscus

are safe for owners to handle and pets to consume. Increasingly, 'natural' has become shorthand for a product sector within pet food, that encompasses other terms and claims, such as organic; exclusion diets (i.e. made without wheat); ancestral products and ancient grains. This approach, together with advances in innovation and technology, such as the introduction of chilled pet foods in Europe, offers both challenge and opportunity to manufacturers wishing to expand into this growing area.

### Conclusions

Terms such as 'natural' have an increasing importance to consumers and therefore to

the food industry. This is reflected not only in terms of product development and marketing but is also a key factor for innovative food technologies. Whilst 'natural' is important for the consumer, it is part of a balance of conflicting interests. The consumer wants products that are unprocessed and natural – but at the same time are convenient, affordable and quick to cook. This presents a challenge for industry to implement production processes, ingredients, packaging and marketing activities so that the product may be perceived as natural, with similarities to traditional food, yet with long shelf life and convenience. 

### ACKNOWLEDGEMENT

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To find out more about the Royal Society of Chemistry (RSC), and in particular the Food and Toxicology Interest Groups, see <https://www.rsc.org/Membership/Networking/InterestGroups/Food/index.asp> and <http://www.rsc.org/Membership/Networking/InterestGroups/Toxicology/index.asp>

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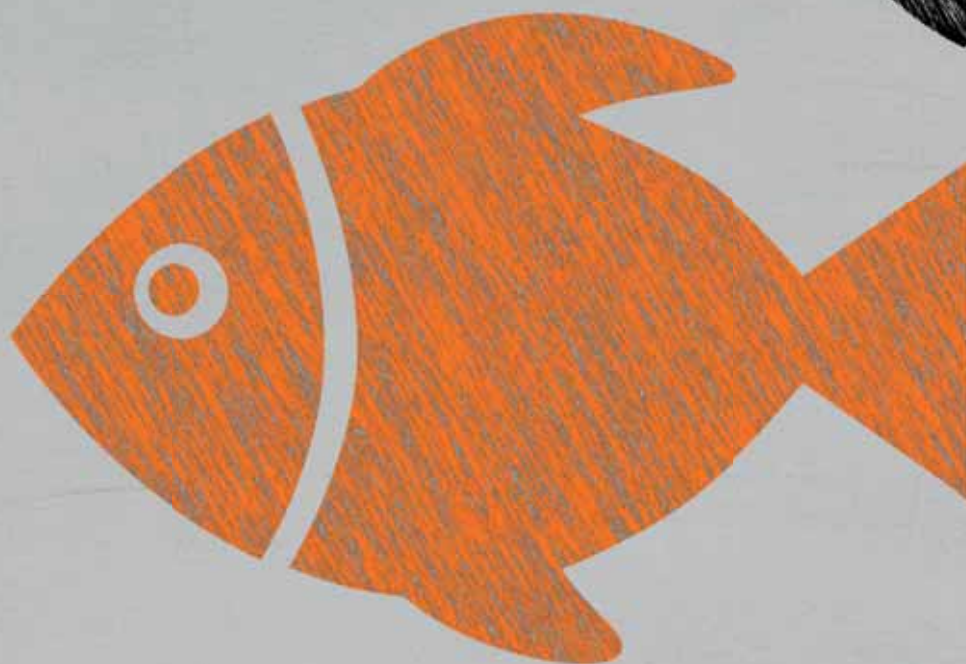
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## Food fraud: how the right culture can ensure integrity and systemise trust

*Arun Chauhan*, Founder and Managing Director at Tenet Law, explains how leadership style within an organisation plays a part in preventing and mitigating the risk of food fraud.

**Y**OUR BUSINESS'S culture is its 'DNA'. It represents the unique way it operates; 'How we do things around here'. It's what differentiates your business and defines its values. Leaders set the tone for this culture and, in this sense, leadership is the dynamic way that each organisation is led by either an individual or group (eg board or management).

Dishonesty within any business, be it internal or external, can result from many factors. One factor that is often overlooked is leadership – not in

the sense of governance but as a key dynamic impacting culture and therefore engagement. Engagement is key. Failing to instil the right culture can lead to heightened risk of employee disenchantment, which can present itself in many ways – from simple acts of ignorance through to dishonest activity.

It is often cited that pressure initiates symptoms that lead to dishonest behaviour. Pressure can encourage employees to act dishonestly as they use it to rationalise their conduct. That is the traditional fraud triangle.<sup>1</sup>



However, in all sectors, we overlook how pressure is associated with fraud and is directly attributable to leadership.

### The influence of leadership

Every leader wants to be the best and achieve their corporate objectives. Problems start when corporate objectives cascade down to the individual without an understanding of the challenges upon the individuals to meet those objectives. Self-protection can come into play and leaders often pass on the pressure to their teams, which may prompt them to act in a manner that invites risk to the business.

A leader increases the risk of bad behaviour in the following ways:

- Condoning an unethical approach
- Encouraging team members to cut corners
- Turning a blind eye to bending the rules to meet unrealistic targets
- Not recognising the pressure placed on employees due to absent leadership or too many demands.

Each of these can lead an employee to become disenchanted and act out of character. The cauldron of pressure created by leadership in the workplace is proven to influence good people to do bad things.

Poor leadership can create a toxic environment, rich with stress, poorly-aligned performance incentives and everyday tolerance of wrong-doings. If organisations don't strive for zero-tolerance of bad conduct, they allow for a maximum-tolerance for small wrongs.

There are three leadership types that actively make an otherwise conscientious culture prone to fraudulent behaviours: the autocratic leader, the metrics-driven leader (the clock-watcher) and the absent leader.<sup>2</sup>

Leadership style closely correlates with employee behaviour. When the culture created by a leader is disconnected from their team or the mission of an organisation, employees may well become

disengaged – meaning they'll only be coming to work for the money and certainly aren't candidate whistle-blowers.

This disengagement coupled with high-pressured, highly-conflicting working environments can lead to employees being unable to make morally sound decisions. All of us, when emotionally drained, are susceptible to poor decision making. Leaders can be guilty of creating an environment that influences good people to lose their way – unable to find 'true north' on their moral compass when drained, which results in bad conduct, or dishonesty.

Our moral compass is not fixed. It can change path if the environment created by our leadership influences it in such a way.

### Food fraud

From unintentional mislabelling of products<sup>3</sup> to the nationwide horsemeat scandal<sup>4</sup> and international honey laundering practice<sup>5</sup>, food fraud is rife across the globe with few signs that it's abating.

Since bartering and trade began, fraud has been present. The food sector now comprises complex supply chains linking myriad suppliers, spread over ▶



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Alternative Fraud Triangle



ABOVE: Tenet's Alternative Fraud Triangle 

several countries, each with different cultural norms that combine to create a more heightened risk profile than many other sectors.

This increased risk profile, coupled with the potentially devastating impact – both in terms of financial and reputational loss – can result in

highly-esteemed food brands falling prey to the smallest of mistakes.

The only safeguard against this is ensuring all of your fraud defences are working; starting with your team.

People in an organisation protect against risk of fraud when they buy into their organisation's standards and compliance processes.

As profit margins in the food industry are typically much smaller than in other sectors, high performance targets can be difficult to achieve and sustain. Any financial loss incurred can be crippling to overall business performance and shareholder confidence.

This means, when tackling financial crime – a key risk to the integrity of your supply chain – many food businesses can be primarily concerned with combatting fraud due to regulatory or financial sanctions, as opposed to being purely driven to combat financial crime itself. This is a question of being a grown-up company demonstrating corporate maturity.

In his Model of Maturity and Culture,<sup>6</sup> David Jackman depicts how values-led businesses follow the spirit of the law, not just the letter – demonstrating corporate maturity by partnering

EXPERTVIEW



**Nina Spencer**  
Commercial Manager,  
Premier Analytical Services  
(PAS)

## The importance of risk assessment in food safety

**Effective risk assessment is not only essential for achieving robust food safety management strategies but also underpins the legal requirement as laid out in food safety regulations, whereby food businesses must use a system based on HACCP principles to identify and control all relevant food safety concerns.**

Risk assessment requires a thorough knowledge of the product and what makes it what it is; including ingredients, process, process intermediates, processing environment, distribution, storage conditions and consumer use.

This information is then assessed against a solid knowledge base of hazards and how to mitigate the risk of their occurrence.

Whilst there are financial considerations to maintaining and developing this required level of knowledge, the financial impact of not doing so can mean the difference between a viable and non-viable business as failure to perform effective risk assessment, thereby preventing effective risk management, potentially jeopardises

the safety of the consumers exposed to those products.

It is also essential to maintain a suitable level of knowledge to assess the fitness for purpose of risk assessments performed by suppliers into a business or third-party manufacturer, as the end product relies on effective risk management throughout the supply chain. The risk management system is only as strong as its weakest link.

The risk assessment process must identify and inform from the initial risk assessors to all stakeholders involved in the manufacture – and, importantly, the evolution – of the product and process. It should lead to a clear and concise risk assessment profile for each process and product type, which is understood and serves

to underpin all controls used during manufacture as well as provide a point of reference for review when dealing with issues or considering managing change.

If correctly performed, it can avoid costly mistakes, ensure customer safety, enhance business reputation and enable cost effective control, avoiding unnecessary costs in inappropriate validation and verification exercises.

PAS recognise the importance of effective risk assessment and communication and can assist with this process by investing in the necessary knowledge and making it accessible where businesses require it. This enables cost effective solutions to help businesses deliver safe products to market. ■

*“The risk management system is only as strong as its weakest link”*

with regulatory compliance bodies to ensure product integrity. However, those primarily fearing regulatory enforcement, will work only to meet the minimum standards, thus leading to a weaker corporate culture that views compliance as a cost to the business.

Trust is the by-product of value-led businesses (and their leadership). High trust typically demonstrates higher compliance standards, which, in the food sector, ultimately protects the consumer and builds brand collateral.

If you're placing profit ahead of all other business factors – including your team – it can promote a culture at high risk of demotivation and disenchantment.

**How well do you know your supply chain?**

Only science can give you full confidence in the ingredients of each product in your supply chain. Technology is now key to food integrity – be it DNA or other tests.

For example, if you're buying fresh fish from a fishmonger, you can be confident you're purchasing genuine, fresh fish. Frozen blocks of fish bring uncertainty to the fish's authenticity; a factor that's even more in doubt when buying fish paste or powder.

If your supply chain places profit ahead of integrity (albeit without realising it) or is disenfranchised by the way they're treated, you may fall victim to 'tricks of the trade' practices.

Leaders affect the financial and other commercial pressures on suppliers, which can lead to product quality and brand reputation being compromised.

DNA testing is the only sure path to knowing with certainty that ingredients are genuine. However, this takes time and can be costly as well as indicate mistrust amongst your supply chain. In turn, this can project poor leadership, profile a negative corporate culture and prompt disenchantment – all factors that contribute to a high-risk environment for fraud (the act you were seeking to prevent in the first instance).

Instead, preventing fraud is about systemising trust and placing integrity first.

**Ensuring integrity in your supply chain**

"What's the worst that could happen if we fall victim to fraud?" is the best question to address when attempting to identify the risk of fraud and mitigate it through leadership, culture and tackling disenchantment.

These principles, when combined, are about creating a culture with high levels of trust ▶

ABOUT THE AUTHOR



**ARUN CHAUHAN** is the Founder of Tenet Compliance & Litigation – a specialist law firm helping clients prevent and reduce the impact of fraud through better education and the cost-effective pursuit of claims. Arun is the Deputy Chair of the charity, the Fraud Advisory Panel and regular contributor to BBC Watchdog.

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**ABOVE:** The international honey laundering scandal shows that food fraud is rife across the globe

and integrity and zero tolerance for dishonest behaviour. This, in turn, will reduce the risk of fraud within the food supply chain. A positive culture such as this will project throughout the business.

**A global issue**

Food fraud is a global issue, as highlighted by the honey laundering scandal.<sup>7</sup> Your food supply chain is global – across several different jurisdictions with different regulatory standards.

As a nation, the UK has relatively high food standards with the food supply chain being led by retailers. In Europe, the market is led by manufacturers.

The Italian agricultural market is worth an estimated €7 billion<sup>8</sup> with a significant portion controlled by organised crime groups.

Supply chains call for complete transparency to assure their global integrity across all jurisdictions – regardless of various regulatory standards. To achieve this, it's vital to evaluate the culture of your whole supply chain, determining how it acts at each stage. As a result, you'll be able to ascertain if your supply chain is:

1. Delivering a product of consistent world-class quality
2. Meeting minimum regulatory standards to ensure compliance while maximising profit margins in each jurisdiction
3. Placing profit ahead of all other factors – eg, cutting corners to improve margins with little regard for moral or legal consequences.

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**Protecting your business: a summary**

Food brands flourish or wither on the strength of their leadership and this maxim is particularly pertinent to their susceptibility to fraud.

Leaders set the moral compass and the tone, which guides what their teams believe and how they behave.

Responsibility, commitment, honesty, and loyalty are just words until a leader shows they're real in their deeds when faced with a judgment call.

The first stage of preventing fraud is to think about it differently – see your company culture from each employee's point-of-view – is it positive? Or does something need to change? Our people are our eyes and ears; engage with them and they will engage with you. This ethos is at the heart of businesses that combat fraud more effectively than others.

Preventing and mitigating the risk of food fraud is all about creating a culture of information sharing and whistle-blowing throughout the entire industry.

**SIX KEY PRINCIPLES**

Chris Elliott, School of Biological Sciences professor at Queen's University Belfast, cites six principles guiding high-integrity food supply chains<sup>9</sup>:

- 1 **Safe food:** Improved education and innovative food packaging can reduce levels of food-borne illnesses.
- 2 **Authentic food:** There are myriad opportunities for food and drink fraud within the global food supply chain. Ensuring authenticity will prevent loss of trust.
- 3 **Nutritious food:** Detailing micro-nutritional content of food.
- 4 **Sustainable systems:** The UK has a pivotal role to play in delivering sustainable agriculture by increasing crop yields without impacting nutritional content, reducing food waste through better storage.
- 5 **Highest ethical standards:** Continuing to lift standards.
- 6 **Respect:** For both the environment and people in the food industry.



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## ABOUT THE AUTHOR



**DEB SMITH** has over 30 years of food safety/research training and experience. Prior to joining Vikan she worked for 16 years in DEFRA's Food Safety Division, and nine years as Food Hygiene Research Manager at Campden BRI. Deb holds qualifications in Applied Microbiology (HNC), Nutrition & Food Science (BSc(Hons)), Advanced Food Hygiene and HACCP, and is also a qualified FSSC 22000 Lead Auditor. She has authored/co-authored numerous food safety/hygiene publications and regularly presents her research at National and International food safety events. Deb is an active Committee Member of EHEDG and IFST. She is also current Chair of the Micro MIG at Campden BRI, and sits on the Service Provision Technical Working Group of GFSI. At Vikan, Deb provides food safety and hygiene advice, training and support, both internally and to the food industry.

## Optimise your allergen control with colour coding

Allergen management is vital in any food business, but optimal functioning requires it to be seamlessly integrated into a site's overall food safety management system. Potential consequences of ignoring this, or getting it wrong, range from causing a consumer discomfort to causing their death. *Deb Smith*, global hygiene specialist, explains more.

### Allergen control: why is it important?

Allergies of all kinds are on the increase. It is estimated that one in 50 children in the UK has a nut allergy. Peanut allergy cases have tripled in the last decade and hospital admissions related to allergic reactions have increased by 33 percent in the last five years. Every year in

the UK there are around 10 deaths as a result of food allergies, with the under 25s being at greatest risk.

Consequently, it is essential that all those involved with the production of food know what the allergens are, why they need to be controlled, and how this is best achieved.



## Allergen control: legal and global food safety standard requirements

There are currently 14 allergens listed by the EU, listed as follows:

- Milk
- Eggs
- Cereals containing gluten (wheat, rye and barley)
- Fish
- Crustaceans
- Molluscs
- Tree nuts
- Soy (soya)
- Peanuts
- Sesame
- Lupin
- Mustard
- Celery
- Sulphur dioxide (sulphites).

If your site produces foods that contains any of these allergens (allergenic foods) and/ or foods that don't (non-allergenic foods), you have a legal responsibility to ensure that those that do are labelled properly, and that those that don't are allergen free (or are labelled appropriately).

In addition to the legal requirement for control of allergens, if you are working to the BRCv8 safety standard, this contains specific requirements regarding 'Management of Allergens'.

### Requirement 5.3:

'The site shall have a system for the management of allergenic materials, which minimises the risk of allergen contamination of products and meets legal requirements for labelling in the country of sale.'

### Section 5.3.8:

'Use of validated cleaning methods and *equipment* that are *identifiable* and *specified for use* with allergenic material, and that are of single use or can be *effectively cleaned* after use.'

## Allergen control: how can it be achieved?

Ideally, on a site that produces both foods that contain allergens and foods that don't, production of foods that are allergenic would be carried out in a physically separated area, using dedicated equipment, facilities and personnel. This approach would minimise the risk of allergen cross-contamination to the non-allergenic products.

However, this situation is very rare and, more often, allergenic food production is carried out on a separate line that is spatially segregated from non-allergenic food production; or on the same line with a deep clean of the equipment between allergenic and non-allergenic food production.

In all cases, the use of colour coding can help to further minimise the risk of allergen cross-contamination and aid compliance with global food safety standards.




## Use of equipment that is '*..identifiable and specified for use with allergenic material*'

Use of colour-coded cleaning equipment and utensils provides a visual check that only equipment colour coded for use with that allergen is used.

The more unusual and distinctive colours – such as orange, pink, purple and now lime – are often chosen for use with allergens.

Additionally, equipment can be colour coded at a secondary level using coloured silicone rubber bands. These rubber bands can also be used to identify vacuum attachments used for different purposes.

Segregation of allergen production areas by colour provides an easy visual check that only tools

 **ABOVE:** Equipment can be colour coded at a secondary level using coloured silicone rubber bands


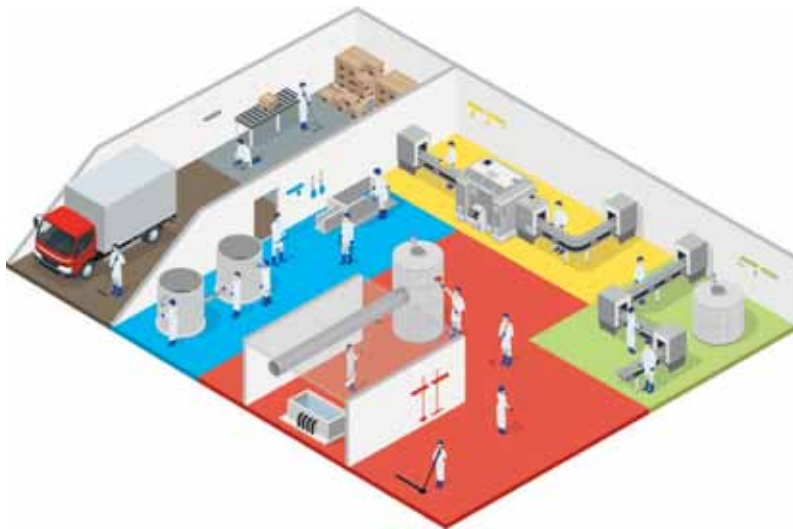
 **BELOW:** Equipment used for each different allergen should be stored on its own separate colour-coordinated rack or board



FIGURE 1



**RIGHT:** Segregation of allergen production areas by colour provides an easy visual check that only tools and utensils colour-coded for use in that area are to be used



and utensils colour coded for use in that area are to be used; for example, the use of lime equipment only in the lime 'allergen' production area shown in **Figure 1**.

To minimise the risk of cross-contamination further, cleaning tools and utensils used for allergens should be stored on colour-coded wall racks or shadow boards; for example, if lime-coloured equipment is used with the allergen sesame, they should be stored on a lime-coloured tool rack.

Equipment used for each different allergen should be stored on its own separate colour-coordinated rack or board, and no tool

## ARTICLE 14 OF REGULATION (EC) NO 178/2002

This article on the general principles of food law sets out European food safety requirements. It includes that food must not be placed on the market if it is unsafe, for example:

- Injurious to health
- Unfit for human consumption.

This can include food that is allergenic and not labelled properly and food that is non-allergenic but is unintentionally contaminated with an allergen.

used for allergenic food production/cleaning should be stored on the same board as those used for non-allergenic food production/cleaning.

### Use of equipment that 'can be effectively cleaned after use'

Equipment that can be effectively cleaned after use incorporates hygienic design. Both the BRC and FSSC 22000 specify the requirement to use cleaning equipment and tools of hygienic design.

#### BRCv8

4.11.6. 'cleaning equipment should be hygienically designed...'

#### FSSC 22000: ISO/TS 22002-1:2009

11.2 Cleaning and sanitising agents and tools: 'Tools and equipment shall be of hygienic design...'

Good hygienic design principles have been specified by the European Hygienic Engineering Design Group.<sup>1</sup> This document is available as a free download.<sup>2</sup>

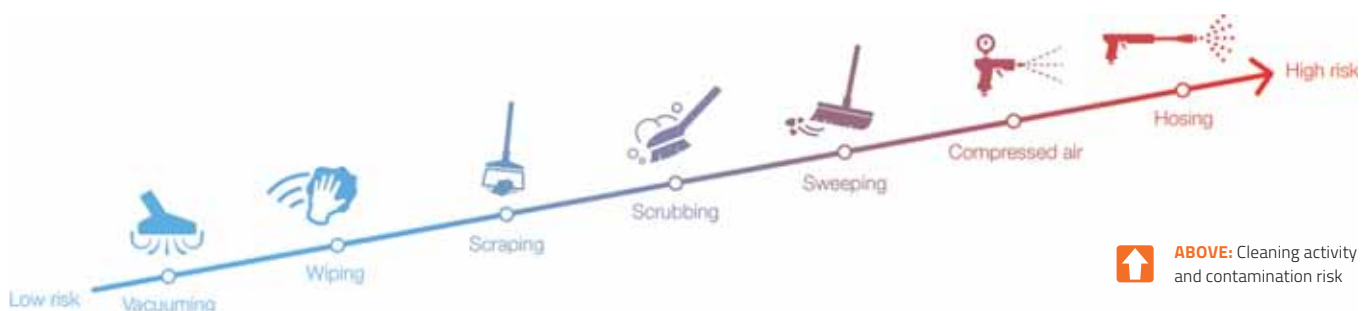
They specify that equipment should:

- Have no sharp internal angles
- Have all areas accessible for easy cleaning and disinfection; i.e., avoid deep recesses, nooks and crannies
- Be of one-piece construction, or quickly and easily dismantled/re-assembled

## REGULATION (EU) NO 1169/2011

This regulation on the provision of food information to consumers, provides the following:

- Clearer and harmonised presentation of allergens (for example, soy, nuts, gluten and lactose) for prepacked foods (emphasis by font, style or background colour) in the list of ingredients
- Mandatory allergen information for non-prepacked food, including in restaurants and cafes.



**ABOVE:** Cleaning activity and contamination risk

- Have a smooth surface finish
- Be made of appropriate materials; i.e., non-absorbent, food-contact compliant.

It is also important to clean equipment prior to first use. Un-wrapped, boxed or even bagged equipment may be contaminated with allergen residues from being handled during production, packing, transport and storage.

Furthermore, all cleaning activities spread contamination, so the cleaning equipment and methods chosen to control allergens can play a key role in minimising cross-contamination:

- Choose cleaning equipment and methods that maximise contamination removal and minimise its spread
- Don't clean, or at least minimise cleaning, during production
- Clean things as far away as possible from open product (spacial segregation)
- Clean in physically-segregated areas to protect product from splashes etc, (separate cleaning rooms/screens)
- Allow time for aerosols and particles generated by cleaning activities to settle before cleaning food contact surfaces

- Have dedicated allergen spill kits in the same colour as the allergen cleaning tools and utensils.

Further guidance on the use of colour coding for food safety, the selection of hygienically-designed brushware and the maintenance of cleaning equipment and utensils can be found on the Vikan website.<sup>3</sup>

## TOP 10 TIPS FOR ALLERGEN CONTROL

1. Understand why it is important
2. Choose equipment of good hygienic design
3. Clean equipment before first use
4. Use colour-coded equipment for allergen use
5. Use colour-coded segregation of areas used for allergenic food production
6. Use methods and equipment that maximise cleaning and minimise spread of contamination
7. Store tools used for allergen cleaning separately and appropriately
8. Regularly inspect, clean and replace your cleaning tools
9. Have dedicated allergen spill kits
10. Train your staff in allergen control.

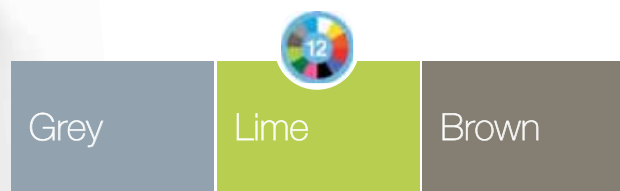
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## HACCP and your food business

*Dr Lisa O'Connor*, Chief Specialist in Biological Safety at the Food Safety Authority of Ireland (FSAI), explains the term HACCP (Hazard Analysis and Critical Control Point), which can confuse people but essentially refers to procedures that must be in place to ensure the food you produce is safe to eat.

**“ In Europe it is a legal requirement for all food businesses to have a food safety management system based on the principles of HACCP ”**

**A** FOOD SAFETY management system based on the principles of HACCP is a systematic approach to identifying and controlling hazards, whether microbiological, chemical or physical, that could pose a threat to the production of safe food. In simple terms, it involves identifying what could go wrong in a food business, planning how to prevent it and checking that the plan is being followed.

In Europe it is a legal requirement for all food businesses to have a food safety management system based on the principles of HACCP. Meeting this requirement can be achieved in several ways, depending on what best suits your food business. You may:

- Develop a HACCP system by applying the principles of HACCP
- Follow a relevant industry guide to good practice, recognised by the national Authority, in which the HACCP principles have been applied in its development.

In the case of a food business undertaking simple food operations (e.g. service of pre-packaged food) the correct implementation of the legal hygiene requirements (sometimes referred to as prerequisites) may be enough to control all hazards. Such prerequisites include:

- Cleaning and sanitation
- Maintenance
- Personnel hygiene and training
- Pest control
- Plant and equipment
- Premises and structure
- Services (compressed air, ice, steam, ventilation, water, etc.)
- Storage, distribution and transport
- Waste management
- Zoning (physical separation of activities to prevent potential food contamination).

The foundation of a food safety management system is having effective standards of good hygiene practice (prerequisites) in place. In general, most hazards are controlled by the prerequisites.

HACCP is used to identify and control key steps in the food business that are critical in ensuring the preparation of safe food.

When developing a HACCP system, businesses must carry out the following:

- Ensure staff involved have a basic understanding of HACCP. If it is necessary to hire a HACCP consultant, businesses should ensure staff understand how the system works and are suitably trained to ensure effective implementation.
- Depending on the size of the business, assemble staff into a team, with a team leader to lead the design and implementation of HACCP. In the case of a small business, one person may develop the HACCP system. The team should have a good knowledge of your business.
- Describe your product(s) and the intended use by consumers and then, depending on the size of the business, draw up a flow diagram to show each step of your operation. Walk through your operation to confirm that the flow diagram is correct and check that it covers all the foods your business produces.

There are seven principles of HACCP. A food safety management system based on these seven principles will enable hazards to be identified and controlled before they threaten the safety of your food and the health of your customers.

### 1. Identify the hazards

Consider each step (e.g. purchasing, delivery, storage, preparation, cooking, chilling, etc.) in your operation and identify what can go wrong; e.g. *Salmonella* in a cooked chicken product due to cross contamination with raw meat (biological hazard), contamination of uncovered food with detergent (chemical hazard), or a piece of broken glass falling into uncovered food (physical hazard). In recent years, due to the requirement to provide accurate information on food allergens for both pre-packaged food and food sold loose, allergens are being treated by businesses as a fourth hazard category, which they need to identify and control.

### 2. Determine the critical control points (CCPs)

Once hazards have been identified, you must ensure that they are adequately controlled. As aforementioned, most hazards are controlled by ensuring that you are operating an effective prerequisite programme, i.e. good hygiene practices. ▶

## Impartiality and independence of ISO 17025 accredited laboratories

The Upscience laboratory has belonged to the ADM group since July 2018. Sometimes customers or some raw material suppliers of our group ask us questions about our impartiality and independence. Some competitors argue the fact that we are not independent enough and that results of our analyses could be communicated to our managers or shareholders. Chapter 4 of the ISO 17025 standard requires lab managers to organise and manage the production with complete impartiality and independence.

First of all let's say that this requirement has always been present in our lab networks and since the beginning of its history in 1964 access to our lab, which at that time was inside our factories, has been subject to formal authorisation and all data has been stored in special and closed rooms. Plant production managers have always been considered as customers for our labs and there was no direct reporting line between the staff in charge of the lab analyses and the plant production managers.

The very essence of Upscience was, and is still, to provide a result that is technically the most representative and ethical. The commitment of Upscience's management is also key; we clearly give our technicians and engineers the possibility of alerting our managers if they consider that the quality of their results are being subject to external or internal pressures.

We belong to a large group and we (all the staff) have some daily

relationships with members of our group. That is what ISO 17025 calls, 'familiarity'; this means that, the risk resulting from Upscience or its staff being too familiar or overconfident rather than seeking confidentiality with some members of the group is high. That's why in the organisation, we promote a complete anonymisation of the samples and as soon as the samples arrive in our lab they just become completely anonymous. Samples become just numbers. ■

### EXPERTVIEW



**Claude Charreteur**  
Business Developer  
for Upscience, Neovia

*"The very essence of Upscience was, and is still, to provide a result that is technically the most representative and ethical"*

ABOUT THE AUTHOR



**DR LISA O'CONNOR** has been working with the Food Safety Authority of Ireland (FSAI) for over 20 years in various roles. She currently leads the team responsible for producing guidance on microbial food safety issues, conducting microbial risk assessments and providing scientific support to the FSAI's Biological Safety Sub-committee. She has been involved in producing national guidance on HACCP, negotiating European guidance and in coordinating a national strategy to improve HACCP compliance levels.

A critical control point (commonly referred to as 'CCP') is a step where a control procedure must be applied to prevent a food safety hazard occurring or reduce it to a safe level. It is the last chance to control a hazard before the food is sold. For example, thorough cooking of beef burgers will kill harmful bacteria that may be present in the centre or thickest part of the burger.

**3. Establish critical limit(s)**

Set limits to enable you to identify when a CCP is out of control; e.g. the temperature at the centre of a beef burger following cooking must reach a minimum of 70°C for two minutes, or equivalent (i.e., 75°C instantaneously).

**4. Establish a system to monitor control of the CCP**

When CCPs and critical limits have been identified it is important to establish a way to monitor and record what is happening at each CCP. Typically, monitoring will involve measuring parameters such as temperature and time. However, the method and frequency with which you monitor will depend on the size and nature of your food business.

**5. Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control**


When monitoring indicates that a CCP is not under control, corrective action must be taken (e.g. the temperature of refrigerated cooked meat rises to >10°C for over 24 hours due to a technical fault in the refrigerator). The cooked meat is disposed of and the refrigerator is repaired to maintain new cooked meat supplies at the correct temperature.

**6. Establish procedures for verification to confirm the HACCP system is working effectively**

Review the system periodically and whenever you make changes to your operation; for instance, when replacing an oven verify that the time/temperature settings in the new oven achieve the minimum safe cooking temperature for a particular dish by probing the food.

**7. Establish documentation concerning all procedures and records appropriate to these principles and their application**

To ensure successful implementation of a HACCP system, appropriate documentation and records must be kept and be readily available; e.g., cooking temperatures. It is unrealistic to operate a HACCP system or to demonstrate compliance with current legislation without providing evidence such as written records. The simplicity of the record keeping will very much depend on the nature and size of the business. The aim should be to maintain control without generating excessive paperwork.

A HACCP system provides food businesses with a cost-effective approach to control the safety of food from ingredients through production, storage and distribution, to sale and service to the final consumer. The preventive approach of HACCP not only improves food safety management, but also complements other quality management systems. While HACCP is a legal requirement, it should not be considered a legal burden, but rather an insurance policy. 

“ The foundation of a food safety management system is having effective standards of good hygiene practice in place ”





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# EVENTS DIARY

Keeping you up to date with upcoming events in the food and beverage industry



july

**International Association for Food Protection Annual Meeting**  
 Date: 21-24 July 2019  
 Location: Kentucky, USA

september

**PROCESS EXPO**  
 Date: 7-11 September  
 Location: Chicago, USA

**AOAC 133rd Meeting & Exposition**  
 Date: 8-11 September  
 Location: Colorado, USA

october

**International Baking Industry Exposition**  
 Date: 8-11 October  
 Location: Nevada, USA

**World Mycotoxin Forum**  
 Date: 14-16 October  
 Location: Belfast, Northern Ireland

november

**BrauBeviale 2019**  
 Date: 12-14 November  
 Location: Nuremberg, Germany

**9th International Symposium on Recent Advances in Food Analysis (RAFA 2019)**  
 Date: 19 November  
 Location: Prague, Czech Republic

december

**Fi Europe 2019**  
 Date: 3-5 December  
 Location: Paris, France

For more information about other industry events, go to: [newfoodmagazine.com/events](http://newfoodmagazine.com/events)

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When it comes to protocols, **Solus Scientific** keeps variety to a minimum. **Solus One Salmonella** immunoassay can be used to test herbs, spices and flavourings using 4 variations on 1 protocol.

Matrix	Solus presumptive positive	Solus confirm positive	Solus chapter 5 positive
Honey Mustard Onion Seasoning (375g)	9	9	9
Flavoured Ranch Seasoning (375g)	9	9	9
Cinnamon (25g)	9	9	9
Paprika (25g)	9	9	7
Black Peppercorns (25g)	8	8	8

**Variation 1:** Majority of spices and blends, including allspice  
25g  
1:10 dilution (BAM 1:100)

**Variation 2:** Herb spice and blends  
375g  
1:10 dilution

**Variation 3:** Oregano or cinnamon  
25g  
1:50 dilution (BAM 1:100)

**Variation 4:** Cloves  
25g  
1:100 dilution (BAM 1:100)

Solus One Salmonella uses proprietary mBPW+ Solus selective supplement and 20-24 hour enrichment at 41.5°C for all matrices.

The development of this set of methods for herbs, spices and flavourings forms part of our application to AOAC for extension to scope for these matrices. Encouragingly, our results to date show a statistically insignificant difference between Solus One Salmonella presumptive and confirmed results and between Solus One Salmonella method and the reference method at 5% level for all matrices evaluated.

Contact [Sales@solusscientific.com](mailto:Sales@solusscientific.com) for further information.  
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