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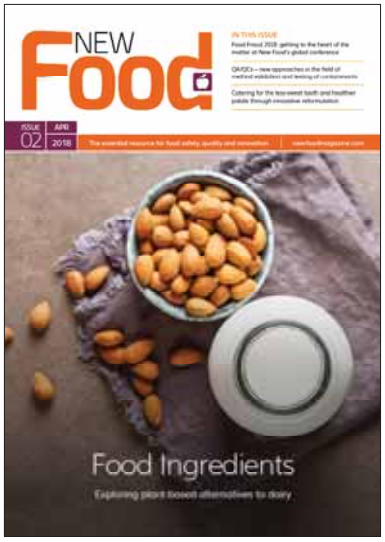

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Exploring the alternatives

In this issue we examine the ways in which the food industry is catering to new tastes.

ANNA LAMBERT
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PLANT-BASED proteins and ingredients have, of course, been around for as long as we've been eating. It's only recently, though, that we've seen their emergence in the sort of products that have traditionally been the domain of the dairy industry. Find out what's driving this change, and how it's manifesting itself, in Tage Affersholt's and Daniel Pedersen's feature on page 42, based on industry research that they carried out earlier this year. Away from the world of dairy substitutes, Andrew Dahl argues the case for greater adoption of algae on the world's menus. Find out if you agree with him on page 46. What of reforming existing, less healthy, foods, though? With the introduction of the sugar levy looming here in the UK as I type, the *New Food* team reports on the demand for healthier 'treats' across the confectionary and soft-drinks markets and highlights some recent reformulation success stories.

Meanwhile, how best to monitor contaminants when both those regulations and the food eaten by the creatures we consume may be subject to change? Tania Portolés of the Research Institute for Pesticides and Water (IUPA), Spain, has some interesting answers in her research on expanding the detection and quantification of contaminants, presented on page 10. This is followed up by David Stadler and Rudolf Krska's discussion of the impact of lot-to-lot variation on the accuracy of multi- mycotoxin assay on page 15. To potential contaminants of an entirely different kind: machinery lubricants. These can, and do, find their way into the food chain – which is why using the highest quality food-grade product is essential. Our In-Depth Focus on how to identify a product that conforms to all regulatory requirements and does a great job makes for essential reading – it begins on page 27.

Key to food safety – and an issue that's come to the fore since the now five-year-old horsemeat scandal – is food fraud. How exactly, though, is food fraud defined? This was just one of the issues experts grappled with at New *Food*'s Food Fraud 2018 conference – read George Smith's review of the event on page 36.

As *New Food*'s new editor – and a newcomer to the global food and beverage market – I would particularly welcome your views on, and experiences of, the global food industry. To share them with me, or with other readers of *New Food*, don't hesitate to get in touch. You can also join our groups on a range of social media platforms – simply search online for *New Food*.

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

New Food is looking for authors for 2018. 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: alambert@russellpublishing.com

This year's event follows up on the success of *New Food's* Food Brexit 2017

NEW Food HOSTS

FOOD BREXIT

LONDON | 1 NOVEMBER 2018

OPINION | INTERACTION | ADVICE

As the date of Britain's official departure from the EU draws ever closer, many in the food industry are still asking just what Brexit will mean for them.

MUCH has changed since the British Government and the European Union were engaged in a troubling deadlock at the end of 2017, when *New Food* hosted its first Food Brexit conference. Now, the wheels have begun to turn and, arguably, a clearer picture of what the future might look like has begun to materialise.

On November 1, Food Brexit returns to the Queen Elizabeth II Centre in London to offer a perspective from leading industry figures about what the coming months and years might offer and how best to get set for what's to come.

The event brings together academics, association chiefs, producers and politicians for sessions ranging from presentations and case studies to question-and-answer sessions and panel discussions, providing a broad and interactive insight into the subject.

Sessions include:

- State of the Nation – what are the next steps for Brexit and what are we likely to see following the draft withdrawal agreement getting a provisional green light?
- Action Planning: Farmers – part of a series of panel discussions to take place over the day examining the potential boons and blows of Brexit and what they might mean for individual sectors under the food umbrella
- Challenges of Food Security – Brexit may be a problem for exporters but what about imports? Will the British food system adapt to become more self-sufficient or will our future trade deals make us more reliant on imports from further afield?
- Brexit: The Legal Steps to the Land of Hope and Glory – four decades of legislative history seldom unwind cleanly. In this session, we will look at what legal challenges the nation faces as Brexiteers seek to make good on one of their key campaign promises: sovereignty
- What does a 21-month transition period mean for businesses? Does it offer food manufacturers more of a chance to ensure minimal disruption for January 21 or does it simply defer inevitable growing pains?
- Action Planning: manufacturers
- Action Planning: food service
- Watered Down Food Safety Standards: fact or fiction? The media has attempted to fuel and douse anxieties about the potential impact of Brexit on the nation's food safety since the referendum. Chlorinated chicken and hormone-fed beef stand tall as poster boys for the issue, with some describing the concern as unfounded propaganda while others argue it presents a very real and very troubling change to our standards. But what's the truth?
- Action Planning: retailers
- Voices of the Regions – it's true to say that some regions of the United Kingdom were more enthusiastic about Brexit than others, and it is equally true to say that it will impact each in different ways. In this session, we invite representatives from each into a panel discussion to have their say.

Following each session, there will be a period in which members of the audience can set their questions to the speaker or speakers.

The speakers joining us at Food Brexit include:

- Prof Tim Lang, Professor of Food Policy, University of London
- Gavin Milligan, Group Sustainability Manager, William Jackson Food Group
- Prof Tim Benton, Dean of Strategic Research Initiative, Leeds University
- Dominic Watkins, Partner & Head of Food Sector, DWF LLP
- Anastassia Beliakova, Head of Trade Policy, British Chambers of Commerce
- Katie Doherty, Policy Director, International Meat Trade Association
- Chair: Prof Chris Elliott, Queens University Belfast
- Kerry McCarthy MP and Chair, APPG Agroecology
- Phil Ponsonby, CEO, Co-op West Midlands

For further information, visit: newfoodmagazine.com/food-brexit

NEW FOOD LEADERS' SERIES 2018

The Scottish diet: high time for improvement

Geoff Ogle, Chief Executive, Food Standards Scotland

AS A NATION, we in Scotland still buy too many foods we simply don't need, like confectionery, cakes, biscuits, pastries, savoury snacks and sugary drinks. These contribute 20 per cent of the calories and 50 per cent of the sugar we purchase. The amount of calories, sugars and fats still being consumed from these discretionary foods and sugary drinks is just not sustainable. A healthy nation is important for a successful and sustainable economy and recent estimations put the cost of obesity as high as £4.6bn in Scotland.

In March, we published an updated situation report for Scotland: *The Scottish Diet: it needs to change 2018* and it made for stark reading. Our research has shown that two thirds of adults in Scotland remain overweight or obese and almost a third of children living in Scotland are still overweight or obese.

Our report revealed that, while people have been reducing the amount of sugar they get from sugary drinks, there has been no reduction in the overall amount of sugar we buy because of the increased purchase of sugar from other foods.

The time for change is now and we are working hard to combat the growing strain on the economy and health services. Progress is already starting to be made with the soft drinks levy, but we would like to see the same tougher measures on sugar across more products.

There is some good news though. Public attitudes are changing, with 64 per cent of people in Scotland now saying they are concerned about our country's unhealthy diet, and 77 per cent agree the types of food which are most available to buy outside the home are usually the least healthy.

As much as 25 per cent of the calories we consume come from food and drink we eat outside the home or from home delivery. We will be developing a new strategy this year which will consider measures to improve the nature of this type of food. The Out of Home Sector has a key role to play in improving Scotland's diet and needs to ensure it doesn't lag behind other sectors such as retail and manufacturing, which have made serious efforts to improve the content of their products and the information they provide. The Out of Home Sector now needs to show it is serious about its role in helping to improve our diet.

While change is needed, it could be argued that significant barriers remain in place that continue to prevent change from happening. For example, three quarters of confectionery is bought on price promotion. In our view, public support is an important step on the way to changing that.

While we're leading the way on diet and obesity at home, we also need to begin to cast our net wider.

In March 2018, we hosted a gathering of experts and representatives from around the globe to give us some Fresh Thinking on Food at our first conference in Edinburgh. Tackling diet and obesity at home is our starting point but to share our knowledge and experiences, and compare them with the challenges being faced around the world, is equally invaluable. Scotland needs an effective and outward looking regulator that is recognised, and has influence on, a worldwide scale, so that the good work we have already achieved does not go to waste.

The conference covered four areas that are of a major interest to Food Standards Scotland: diet and obesity, future food trends, crime and authenticity and food safety. These are all vitally important if we are to maintain Scotland's well-deserved reputation as the land of food and drink.

For change to happen in Scotland, we need individuals, industry and Government to work together.

GEOFF OGLE was appointed the first Chief Executive of Food Standards Scotland, on 1 April 2015. This followed his appointment as Acting Director for Food Standards Agency in Scotland in 2014. Before this, Geoff was Portfolio Director, improving FSA's approach to programme management. Geoff joined the FSA in December 2008 and worked in field operations until 2013 with responsibility for all compliance and enforcement of FSA approved premises. He moved from that role to become the senior investigating officer for the horsemeat incident. Geoff became the interim FSA Director for Wales in May 2013 until February 2014, where he gained valuable experience working in a devolved Government. Geoff has also undertaken a strategic review of the FSA's approach to SMEs and was lead reviewer for the focus on enforcement review of OFSTED Early Years Inspection.

ROUND UP

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

Lambs produce healthier fats from varied diets

POLYUNSATURATED FATTY ACIDS

FEEDING lambs and sheep a diet rich in six common plants leads to meat with more polyunsaturated fatty acids (PUFA), including omega-3 and omega-6 fatty acids, which are considered healthy for humans, according to nutrition researchers at the University of Reading.

The team conducted two experiments to assess the profile of fatty acids found in six common plants. The first test assessed how these plants affect the amount of PUFA available to lambs after simulated digestion. The second, which involved lambs grazing on pasture which included the six plants, assessed the content of the 'healthier' fatty acids in lamb meat.

Dr Kirsty Kliem from the University of Reading, who was lead author of the paper, said: "This study is the first to focus on common British plants that are often found growing wild in meadows and biodiverse pastures. The results were really encouraging as we saw that by including these plants in pasture consumed by lambs, there were more 'healthy' fatty acids appearing in the lamb meat."

Tests revealed bird's-foot-trefoil and self-heal (Prunella vulgaris) had the greatest potential to increase the amount of 'healthier' polyunsaturated fatty acids, including omega-3 and omega-6 fatty acids, absorbed by the animal.

In the grazing study, although some of the six species did not establish, including bird's-foot-trefoil, the team saw effects in two of the three tissues analysed. In muscle (m. semimembranosus), total PUFA increased by 16 per cent (omega-3 by 18 per cent, omega-6 by 15 per cent) compared with control lambs. In subcutaneous fat, total PUFA increased by 27 per cent (omega-3 by 42 per cent, omega-6 by 27 per cent) when compared with the control. In addition, they observed an increase of 22 per cent in very long chain n-3 PUFA (those which are found in fish oil) when compared with control lambs.

Professor Ian Givens from the University of Reading said: "Despite all the confusion about saturated fats, the evidence remains that if saturated fats are replaced with PUFA there is a reduced risk of heart disease. 'Replaced' is the key word and whilst there was no significant reduction in saturates in the lamb meat, there would be a decrease in the ratio between saturated and unsaturated fat in the meat.

"It is normally long chain Omega 3 such as that found in fish that many people consume too little of, so it is therefore of interest that the fat of the meat contained more of these. However, arguably the downside is that most people will try to avoid eating that part of a meat cut as far as is possible." The study was published in *Animal*.

Switching to plant-based diets could feed millions more from same resources

'OPPORTUNITY FOOD LOSS'

SWITCHING to plant-based diets could allow hundreds of millions more people to be fed from the same resources as those currently nourished from meat-based diets, according to new research from the Weizmann Institute of Science.

Coining the term "opportunity food loss," the scientists said that while about a third of global food production was estimated to be lost or wasted, the biggest waste, which was not included in this total, may arise through dietary choices that favour meat-based diets rather than plant-based diets.

Opportunity food loss stems from using agricultural land to produce animal-based food instead of nutritionally comparable plant-based alternatives, they said. In the US alone, replacing all animal-based items with edible crops for human consumption would add enough food to feed 350 million additional people, or more than the total US population, with the same land resources.

The scientists compared the resources needed to produce five major categories of animal-based food – beef, pork, dairy, poultry and eggs – with the resources required to grow edible crops of similar nutritional value in terms of protein, calorie and micronutrients. Plant-based replacements could produce two- to 20-fold more protein per acre, according to their research.

The most dramatic results stemmed from comparing beef production with a mix of crops including: soya, potatoes, cane sugar, peanuts and garlic, which could deliver a similar nutritional profile. The same area of land could produce 100 grams of protein from plants but only 4 grams of edible protein from beef.

Consequently, dedicating agricultural land to beef production resulted in an opportunity food loss of 96 grams – that is, a loss of 96 per cent – per unit of land, the researchers concluded.

The estimated losses from failing to replace other animal-based foods with nutritionally similar crops were also huge: 90 per cent for pork, 75 per cent for dairy, 50 per cent for poultry and 40 per cent for eggs – higher than all conventional food losses combined.

The Weizmann researchers collaborated with Prof Gidon Eshel of Bard College and Dr. Elad Noor of ETZ Zürich.

The research was published in the *Proceedings of the National Academy of Sciences* (PNAS), USA.

WHO pledges to support 16 African nations over listeriosis outbreak

FOOD-BORNE DISEASE

THE WORLD Health Organization(WHO) has pledged to support 16 African nations, after the listeriosis outbreak which started in South Africa last year began to threaten other countries.

Nearly 200 South Africans have died since January 2017 as a result of eating contaminated ready-to-eat meat products. There are fears contaminated products may also have been exported to two West African countries and 14 members of the South African Development Community (SADC).

South African health authorities recently declared the source of the outbreak as a factory in Polokwane, South Africa, prompting a national and international recall of the food products.

More listeriosis cases are likely to occur, warned the WHO; given the long incubation period of the bacteria and the challenges of implementing nationwide recalls.

Namibia has reported one confirmed case of listeriosis and health officials are investigating whether that is linked to the South African outbreak.

WHO's Health Emergencies programme, the Global Outbreak alert and Response Network (GOARN) and the International Food Safety Authorities Network (INFOSAN) are working with the 16 priority countries to improve their ability to prepare for, detect and respond to potential outbreaks.

Measures included: raising awareness on listeriosis, enhancing active surveillance and laboratory diagnosis, ensuring readiness of rapid response teams, and strengthening coordination and contingency planning. Health experts have been deployed to South Africa, Lesotho and Swaziland to support these efforts.

WHO Regional Director for Africa Dr Matshidiso Moeti said: "This outbreak is a wake up call for countries in the region to strengthen their national food safety and disease surveillance systems."

The link between the contaminated products, the producing company and strains of listeria isolated from the patients was made by the use of whole genome sequencing of isolated strains of the Listeria bacteria. WHO is supporting further genome sequencing to determine which cases are linked to the outbreak.

Beating food fraud 'depends on meeting four key challenges'

FOOD FRAUD 2018

FIGHTING fraud more effectively depends on meeting four key challenges, Professor Elliott, Pro-Vice Chancellor of Queen's University Belfast, told *New Food's* Food Fraud Conference in London last month.

Those were: defining the nature of fraud, treating it more seriously, forging partnerships and predicting vulnerable sectors, he told delegates.

"Five years on from the European horse meat crisis, we still don't know how to define food fraud," said the author of two influential government-commissioned reports on the scandal. But within 12-18 months, a new United Nations' definition for food fraud will help to tackle the problem more effectively.

The second challenge was to treat food fraud more effectively. "We have a very long journey in thinking about food fraud as a criminal activity," he said. Increasingly, food fraud was a growing global problem. "Wherever you look for fraud, in developed or developing countries, you will find it."

Forging stronger partnerships to beat global fraud was the third challenge. "One of the fantastic things that happened in the past five years was the development of the Food Industry Intelligence Network," said Prof Elliott.

The fourth challenge was to predict the likely occurrence of fraud more accurately, since it could be found "from salt to saffron and everything in between". The most vulnerable sector at present was organic food production, where fraudulent activity was "very difficult to detect scientifically".

But food sectors that were particularly vulnerable to fraud could be predicted from events such as recent crop failures. For example, the recent failure of the garlic harvest in China, the world's biggest producer, had led to a significant increase in fraudulent activity involving this product.

"So, mapping crop failures and looking at supply chains could help to predict fraud six months to a year ahead of criminal activity," said Prof Elliott.

For a full review of the event, see page 36.

China targets American food exports as trade row grows

TRADE WAR INTENSIFIES

CHINA has imposed tariffs on 128 American exports, 96 of which are food products, in retaliation for the US government's levy tariffs on steel and aluminium imports.

Of the food items targeted, 61 per cent are fresh, frozen and dried fruits, which have been given a 15 per cent tariff, as have a number of wines and ginseng.

Pork products have been given a 25 per cent tariff. Last year China was the second biggest market for US pork after Mexico. In 2016, American pork exports were valued at US$578 million.

US Meat Export Federation (USMEF) President and CEO Dan Halstrom: "We regret the Chinese government's decision to impose an additional 25 per cent duty on imports of US pork and pork variety meat.

"The United States is a reliable supplier of pork products to China, and this decision will have an immediate impact on US producers and exporters, as well as our customers in China.

"We are hopeful that the additional duties can be rescinded quickly, so that US pork can again compete on a level playing field with pork from other exporting countries. Exports have been a key driver of growth in the US pork industry, and with nearly 27 per cent of US pork production exported last year, international trade is critical to the continued success and profitability of the US industry."

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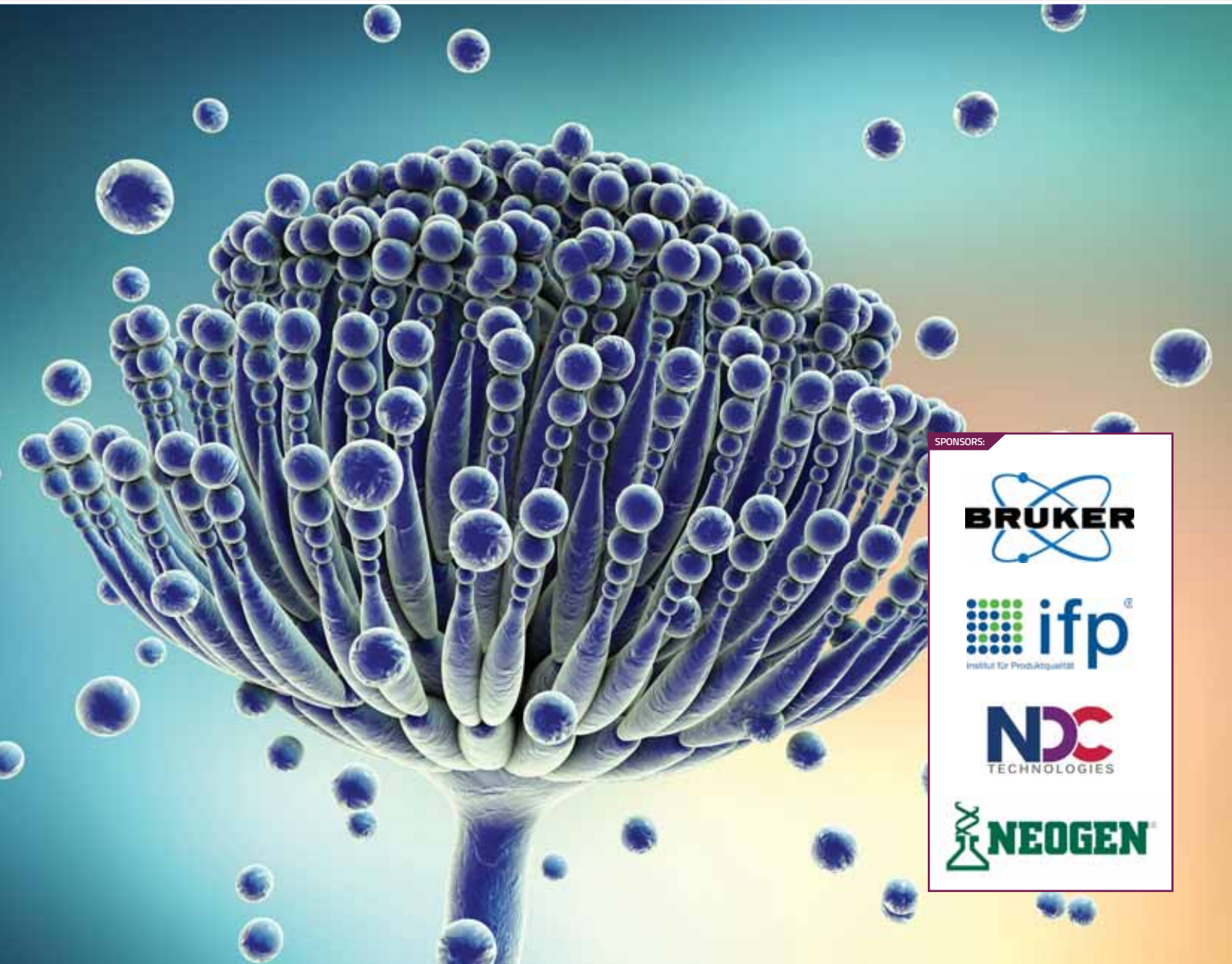
QA/QC

How can experts expand the detection and quantification of contaminants in food samples? Tania Portolés of the Research Institute for Pesticides and Water (IUPA) in Spain has some answers, particularly when it comes to seafood.

Lot-to-lot variation's use in method validation of LC-MS-based assays is too often neglected, say David Stadler and Rudolf Krska of the University of Natural Resources and Life Sciences, Vienna, as they discuss its impact on determining the accuracy of a multi-mycotoxin assay.



Expanding the detection and quantification of contaminants in food samples

Monitoring contaminants in seafood samples is crucial, but developments in regulations and marine feed mean the situation is constantly changing. *Tania Portolés* explains her work at the Research Institute for Pesticides and Water (IUPA), Spain, in ensuring food security in such samples.

FOOD contaminants are chemical substances that have been non-intentionally added to food or feed and can accumulate in the food chain through various stages of production, processing, transport or environment.

The European Union has limited and prohibited the use of many contaminants in order to prevent health problems. Monitoring these contaminants in food samples is therefore crucial to ensure that the levels do not exceed the permitted concentration.

> *"The changes in regulations drive the need for more accurate identification and quantification of contaminants in environmental and food-related samples"*

The need for contaminant detection

Three major groups of contaminants are of particular interest: brominated flame retardants (BFRs), polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs). BFRs are man-made chemicals that are used by manufacturers to reduce the flammability of products such as plastics, furniture and electrical equipment. These harmful compounds leach into the environment and pollute the air, soil and water through waste, residues or discharge from the factories that produce them.[1] As a result, the use of certain BFRs is banned or restricted.

When the contaminants reach the marine environment, they enter the food chain when they are consumed by fish and shellfish. BFRs cannot be excreted because they are lipophilic substances and, as a result, bioaccumulate in the food chain.

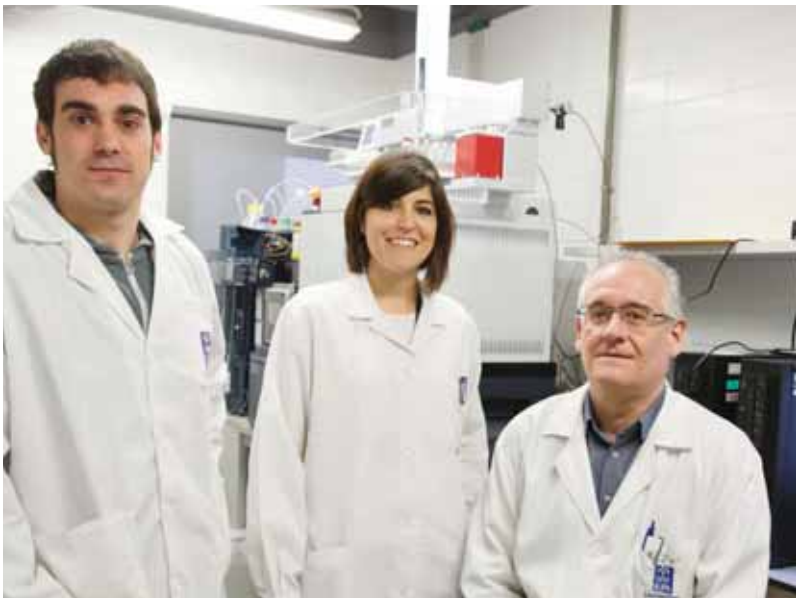
This means significant levels can be present in seafood destined for consumption.

PCBs were also widely used in a range of industrial applications until they were banned in most countries in the 1980s, but they can still be found in humans and animals today. At high levels, they are toxic and can cause health problems including carcinogenesis, endocrine disruption and neurological problems.[2]

PAHs originate mainly from anthropogenic processes, particularly from incomplete combustion of organic fuels.[3] PAH exposure and its effects on human health have also been the focus of many studies. Some PAHs have been shown to be carcinogenic and mutagenic. The scope of monitoring and regulation of PAHs is under constant change by advisory bodies such as the World Health Organization (WHO) and the European Food Safety Authority (EFSA).

The changes in regulations drive the need for more accurate identification and quantification of contaminants in environmental and food-related samples. Contaminants in the environment are not a new phenomenon, but as technology advances there is scope to resolve the problem effectively and remove them from the food chain. Obtaining unambiguous and highly accurate quantification of contaminants is essential to this process.

At the Research Institute for Pesticides and Water (IUPA), University Jaume I in Spain, the aim was to develop advanced analytical methodology to improve the monitoring of compounds in food samples. An innovative method was developed using atmospheric pressure gas chromatography (APGC) that is very effective for identifying and quantifying contaminants.



ABOVE: Tania Portolés and her team at IUPA, Spain

Improved identification and quantification

Traditionally, electron ionisation (EI) has been used as an ionisation technique to determine BFRs and other persistent organic pollutants. However, one of the drawbacks of this technique is extensive fragmentation and the specific molecular ion is either not present or has a low intensity. This lack of specificity makes the identification of these compounds difficult and can also reduce the sensitivity.

To overcome the limitations of EI ionisation, IUPA is utilising a new chemical ionisation source – atmospheric pressure gas chromatography (APGC) – that results in a 'soft' ionisation process.

The increased sensitivity enables quantification and confirmation of trace components at lower levels in the most complex samples.

The analysis of food samples by APGC enables improved selectivity when generating multiple reaction monitoring (MRM) transitions, compared to the significant fragmentation experienced with EI source. Operating the gas chromatography system at atmospheric pressure provides increased scope for ionisation modes – namely charge and proton transfer.

Method development

APGC was used to develop and test a method that would increase the number of contaminants detected, at much lower concentrations than previous methods reported, in a variety of food samples.

The method uses gas chromatography coupled to a tandem quadrupole mass spectrometer with an atmospheric pressure chemical ionisation source (GC-APCI-MS/MS). The method is based on a modification of the unbuffered QuEChERS method (Quick, Easy, Cheap, Effective, Rugged and Safe).

In this work, IUPA collaborated with the Institute of Aquaculture Torre la Sal in Spain and the National Institute of Nutrition and Seafood Research (NIFES) in Norway, and used the Waters Xevo TQ-S with APGC for GC-MS/MS analysis of polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and pesticides in 19 different matrices – including fish tissues, feeds, and feed ingredients.[4]

The development of sustainable plant-based feeds for marine fish farming introduces new

challenges concerning contaminants that were not relevant when using traditional marine feed ingredients. Unrefined plant oils obtained from oilseeds such as soybeans, rapeseeds, olive seeds, and sunflower seeds are known to contain elevated levels of polyaromatic hydrocarbons (PAHs).

The carcinogenic 'heavy' PAHs (> 4–6 rings) have received special attention with regard to food safety. Studies related to plant oil PAH contamination, however, mainly focus on 'light' (2–4 rings) PAHs such as fluoranthene, naphthalene, anthracene and phenanthrene, as they are most dominantly present in unrefined plant oils. These light PAHs are also on the US EPA (Environmental Protection Agency) list for environmentally relevant PAHs but are mostly not carcinogenic and genotoxic.

In addition to the 24 PAHs, researchers tested for 15 pesticides and seven PCB congeners to widen the scope of the method. The study was to determine trace levels (as low as 0.1 ng/L) of PAHs, PCBs, PBDEs, and some emerging flame retardants.

The team used a total of 76 samples from 19 different matrices. The list contains ingredients from different origins (plant, terrestrial animals and marine) and feeds based on these ingredients (PAPs not included), as well as fillets of Atlantic salmon and gilthead sea bream reared on these feeds.

The high sensitivity of this technique allowed the simultaneous quantification of 19 different complex matrices from aquaculture using solvent calibration. The excellent sensitivity and selectivity provided by GC-APGC-MS/MS allowed the dilution of the sample extracts and quantification using calibration with standards in solvent for all the 19 matrices tested.

Analysis of real-world samples revealed the presence of naphthalene, fluorene, phenanthrene, fluoranthene and pyrene at concentration levels ranging from 4.8 to 187 ng g^{-1}. Studied PCBs, DDTs and pesticides were not found in fillets from salmon and sea bream.

The aim of this work was the elimination of matrix effect. Even so, LOQs of the developed method were 2 ng g^{-1} for most analytes in the same order or better than those reported in previously published methods for similar matrices showing higher efficiency.

Capabilities of APGC

The study concluded that Atmospheric Pressure Gas Chromatography (APGC) is a robust and sensitive technique able to analyse a broad range of contaminants in several marine-based matrices.[5] The possibility of selecting the molecular ion or the protonated molecule as a precursor ion for MRM experiments provides greater sensitivity and selectivity. This allows for the dilution of the sample extracts and quantification using calibration with standards in solvent, so matrix-matched calibrations can be avoided in some cases. As a result of this increased sensitivity, IUPA scientists are able to quantify and confirm trace components at even lower levels in the most complex samples. The ability to eliminate the

matrix effect thereby eliminates the need for time-consuming purification steps, which provides huge time-saving benefits.

The APGC technique also reduces the cost of tests for contaminants because it is more sensitive and selective. It uses fewer solvents and materials compared with previously used techniques. The ability to determine compounds at a lower concentration allows compliance with regulatory limits and the ability to inject less sample matrix, thus reducing effects of contamination on the GC-MS system and therefore increasing uptime.

A core benefit of the technique is the 'soft' ionisation due to the reduced fragmentation for many compounds when compared with techniques such as EI. Reduced fragmentation can give higher sensitivity and specificity, therefore simplifying pre-cursor ion selection in MS/MS analyses.

A soft and reproducible ionisation is favoured in GC, being the protonated molecule and/or the molecular ion at the base peak of the spectrum in most cases. This notably facilitated the application of MS/MS methods (with triple quad or Q-Tof) and also the screening of contaminants, with GC-MS focusing the search to the highly diagnostic molecular ion.

The technique is highly versatile, as it is possible to have both GC and LC coupled to the same mass spectrometer, which is quick and easy to change. Many researchers are interested in understanding more about the capabilities of APGC and collaborative work often enables greater research findings. Low level detection is crucial as researchers are often searching for the unknown in complex and challenging samples.

Ultimately, the research undertaken by IUPA using APGC has yielded very useful information in identifying and quantifying contaminants in food samples. This provides significant scope to improve food security in the area of monitoring pollutants in food and meeting food safety standards.

ABOUT THE AUTHOR

DR TANIA PORTOLÉS is a PhD Researcher at the Research Institute for Pesticides and Water (IUPA), University Jaume I in Spain. The focus of her research is the determination of organic contaminants and residues by GC-MS with a variety of mass analysers in the environmental, food safety and biological fields.

FURTHER INFO

To find out more about APGC, visit http://www.waters.com/waters/en_GB/Waters-Atmospheric-Pressure-Gas-Chromatography-%28APGC%29/nav.htm?cid=10100362&locale=en_GB

A case study discussing the IUPA and Waters Partnership is available to download at: http://www.waters.com/waters/library.htm?lid=134968887

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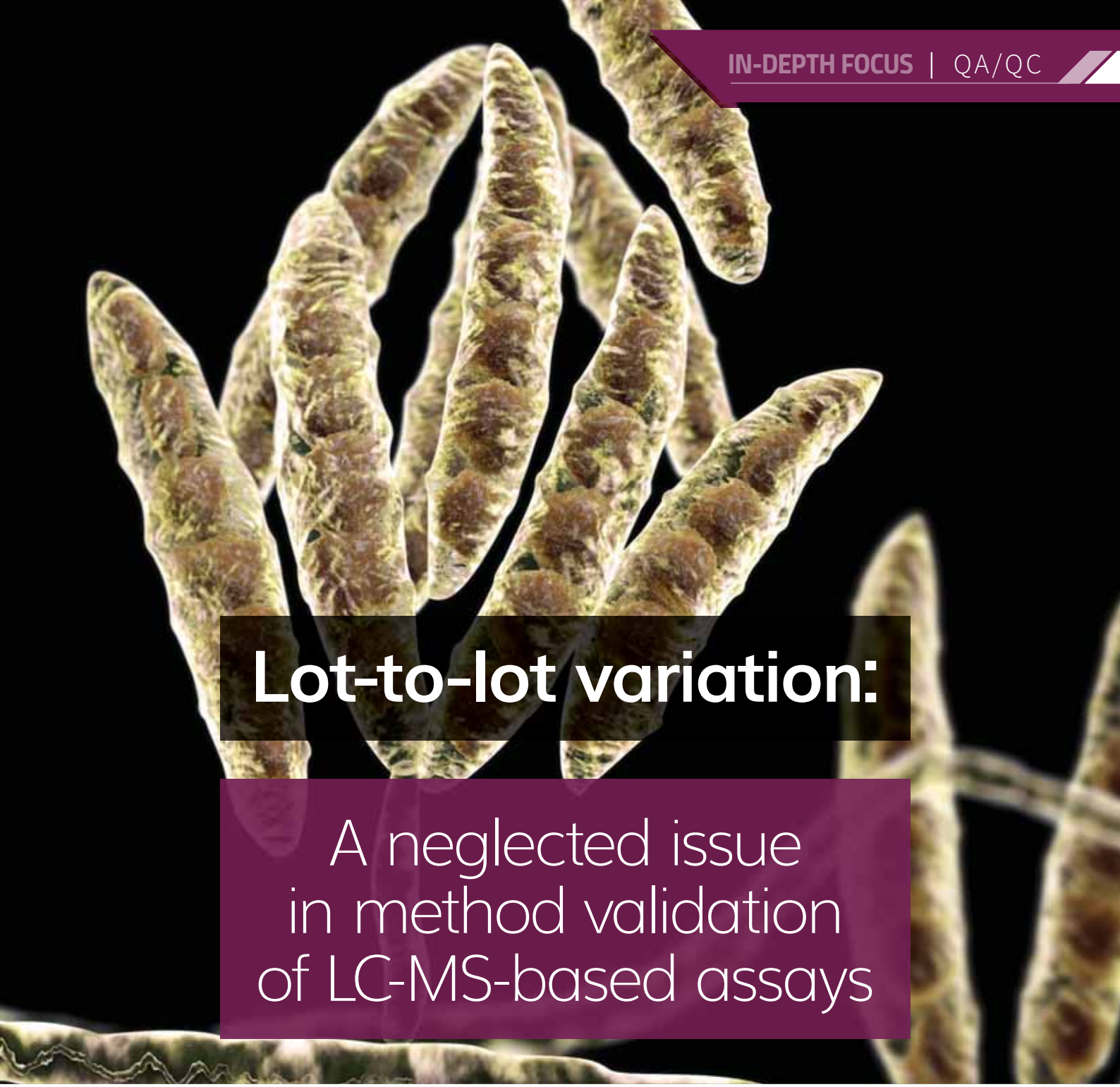


Lot-to-lot variation:

A neglected issue in method validation of LC-MS-based assays

Food analysis, particularly the determination of contaminants and residues, is often based on LC-MS methods in combination with external solvent-based or matrix-matched calibration. The performance of such methods is typically evaluated by in-house validation from replicate analysis of a single lot of a matrix. However, different lots of a matrix might have different extraction recovery factors (R_E) or signal suppression/enhancement (SSE) effects, resulting in lot-to-lot variation. Therefore, failing to consider this variation might lead to an underestimation of the uncertainty of the measurement result. Here, *David Stadler* and *Rudolf Krska* from the University of Natural Resources and Life Sciences, Vienna, discuss the impact of the lot-to-lot variation on the accuracy of a multi-mycotoxin assay.›

ABOUT THE AUTHOR

DAVID STADLER obtained a MSc degree in chemistry from the ETH Zürich and is currently working on his PhD thesis at the Center for Analytical Chemistry at the Department of Agrobiotechnology (IFA-Tulln) at the University of Natural Resources and Life Sciences, Vienna (BOKU) under the supervision of Prof Dr Rudolf Krksa.

"Mycotoxins belong to the category of most feared food contaminants"

ABOUT THE AUTHOR

RUDOLF KRSKA is full professor for (Bio-)Analytics and Organic Trace Analysis and head of the Center for Analytical Chemistry at the Department of Agrobiotechnology (IFA-Tulln) at the University of Natural Resources and Life Sciences, Vienna (BOKU). In MyToolBox he serves as the coordinator of 23 partners from 11 countries.

ENSURING food safety has become of increasing concern for food producers, especially due to the complexity of a globalised food-supply chain, increased public awareness and media attention on food quality, as well as – most importantly –potential health implications. Mycotoxins, (toxic secondary metabolites produced by fungi), can contaminate food commodities either on the field or during storage and belong to the category of most feared food contaminants. The potential health risk associated with a mycotoxin contamination of the food supply has been recognised by regulatory bodies, such as the European Commission (EC), which have imposed maximum levels for major mycotoxins[1,2]. Comprehensive multi-mycotoxin methods, covering several hundred analytes, allow for the simultaneous determination of the whole spectrum of mycotoxins that occur in food and feed chains.

Multi-mycotoxin methods are commonly based on liquid chromatography coupled to electrospray ionisation – tandem mass spectrometry (LC-ESI-MS/MS) in combination with an extraction procedure that recovers a broad range of analytes[3-6]. In most cases, raw extracts are diluted and injected with limited or even no sample clean-up, i.e, 'dilute and shoot', as clean-up steps would remove some of the analytes for further analysis. Quantification is commonly based on external solvent-based or matrix-matched calibration. Stable isotope dilution analysis is limited to mycotoxins for which ^{13}C-labelled isotopologues are available[7-8]. Standard addition would result in multiple injections per sample and is therefore not popular in routine analysis.

In our laboratory, we use external solvent-based calibration, as one calibration curve can be used for the quantification of the analytes in different matrices. For matrix-matched calibration, blank samples are often hard to obtain and a separate calibration curve must be made for each individual matrix. Using external solvent solvent-based calibration, the measured value is obtained by comparing the response of the analyte to the calibration curve and, if necessary, a correction for the method bias is applied. The method bias, expressed as apparent recovery (RA)[9], may be caused by losses during the recovery procedure (RE) or due to matrix effects, expressed as signal suppression/enhancement (SSE).

Method validation is an integral part of good analytical practice and ensures that the analytical procedure is suitable for its intended use. As external quality control schemes, such as proficiency test schemes or certified reference materials (CRMs), are mostly limited to the regulated mycotoxins, proper in-house validation is crucial. In-house validation includes the determination of linearity, R_E, *SSE*, R_A, limit of quantification and measurement uncertainty[3,5,10]. The extraction and LC conditions of multi-mycotoxin assays are optimised for the detection of a diverse set of analytes and not for individual analytes. Compromised extraction and sample work-up conditions may lead to low RE due to the low solubility and/or stability of an analyte during sample preparation. When a '*dilute and shoot*' method is used for the analysis of mycotoxins in complex matrices such as food, matrix effects might occur due to the comparably high amount of co-injected matrix. Therefore, proper validation of R_E, *SSE* and R_A is crucial. The described performance parameters are commonly evaluated based on replicates of a single lot of a matrix. However, different lots (quantity of material known to have uniform characteristics such as origin and variety) of the same matrix may have different R_E, *SSE* and R_A values resulting in '*lot-to-lot variation*'.[5,11-15]. Lot-to-lot variation can lead to a matrix mismatch in the case where the R_A of the lot used for validation differs from the R_A of the analysed lot. [15]. Ignoring the matrix mismatch leads to the introduction of an error of unknown magnitude.[16]. Although large differences in *SSE* have already been observed for mycotoxins in different varieties of sorghum and rice,[5,14], the lot-to-lot variation is often neglected during the validation of multi-mycotoxin assays.

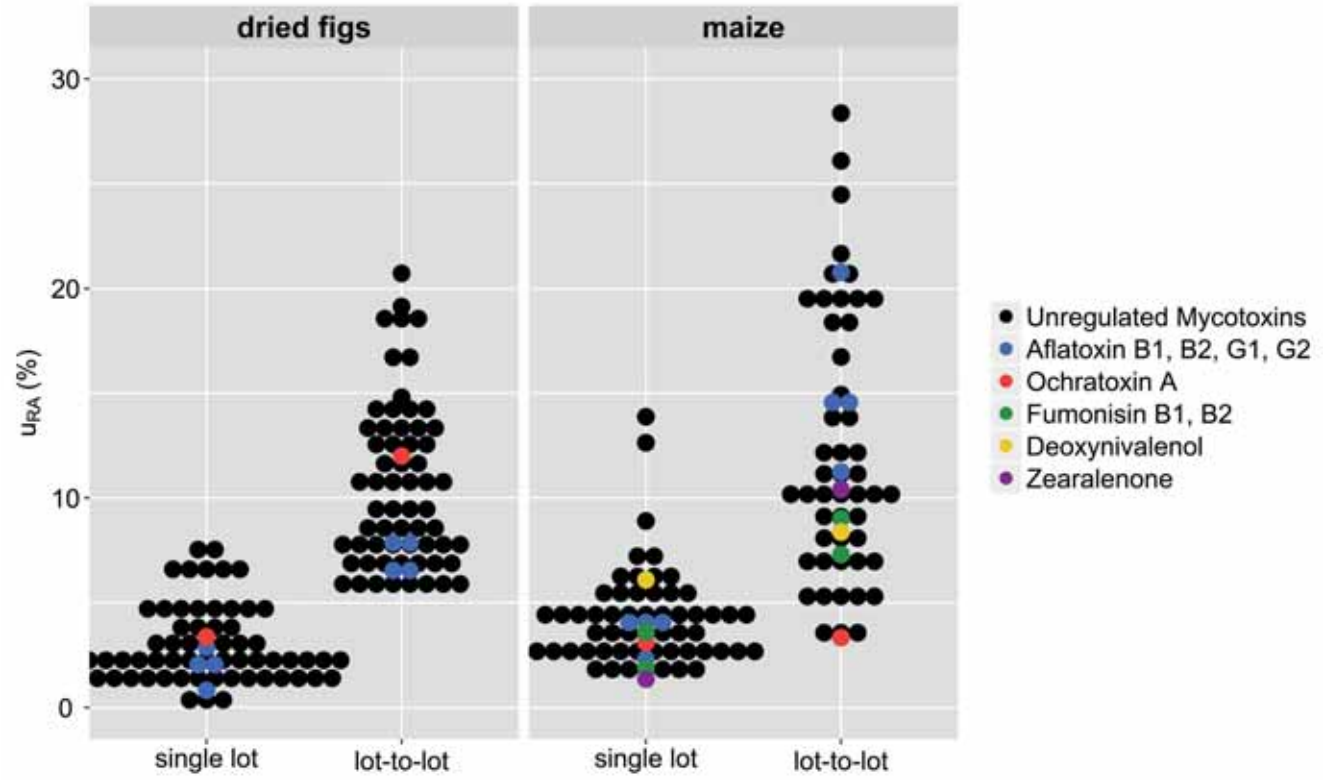
We hypothesised that the lot-to-lot variation, if not considered during method validation, can adversely affect the accuracy of measurement results. Therefore, we determined the impact of lot-to-lot variation on a validated LC-MS MS-based multi-mycotoxin method[3,14,17].

The contribution of the lot-to-lot variation to the accuracy of a LC-MS MS-based multi-mycotoxin assay

In the validation of multi-mycotoxin methods, the evaluation of the lot-to-lot variation is often missing, as they are commonly validated based on replicates of a single lot of a matrix. Therefore, the uncertainty associated with the lot-to-lot variation was estimated for the LC-MS/MS MS-based determination of 60 mycotoxins and fungal metabolites (including all regulated mycotoxins) in dried figs and maize[18].

Seven different lots of a matrix, possessing a diversity that typically occurs within this matrix, were assembled. For dried figs, seven lots differing in specification were bought in local supermarkets. For maize, seven lots differing in origin and variety were collected. A known amount of the analytes was spiked to an aliquot of the individual lots, which did not contain a natural contamination with the analytes under investigation. The R_A values were determined by analysing the spiked samples

FIGURE 1



ABOVE: Comparison of the uncertainty of the method bias RA (u_{RA}) calculated as the relative standard deviation of the RA values of seven aliquots of a single lot of a matrix ($u_{RA,single\ lot}$) and one aliquot of seven different lots of a matrix ($u_{RA,lot\text{-}to\text{-}lot}$), respectively. The evaluation was carried out for 60 mycotoxins (including all regulated mycotoxins[1]) in dried figs and maize.

by using the method under consideration, under repeatability conditions.

The relative standard deviation (RSD) of the R_A values of the seven different lots was used to calculate the uncertainty associated with R_A considering the lot-to-lot variation ($u_{(RA\ lot\text{-}to\text{-}lot)}$), which actually is a combination of the uncertainty of repeatability and the lot-to-lot variation. The uncertainty of the repeatability was calculated from the RSD of the R_A values of seven aliquots of a single lot of a matrix ($u_{(RA,single\ lot)}$). In order to estimate the contribution of the lot-to-lot variation to u_{RA}, $u_{RA,lot\text{-}to\text{-}lot}$ was compared to $u_{RA,single\ lot}$ for 60 analytes in dried figs and maize (***Figure 1***).

The increase of $u_{RA,lot\text{-}to\text{-}lot}$ compared to $u_{RA,single\ lot}$ was caused by different R_A values of the individual lots due to the lot-to-lot variation[18]. In dried figs, the increase was due to different R_E values of the individual lots. This was the case for the regulated mycotoxins aflatoxin B_1, B_2, G_1, G_2 and ochratoxin A.

> *By considering the lot-to-lot variation during method validation, a more realistic estimate of the uncertainty of the measurement result is obtained*

In maize, for most analytes (e.g,. aflatoxins) the increase could be ascribed to differences in *SSE* (relative matrix effects[12]). For the minority of analytes (e.g,. fumonisin B_1, B_2 and zearalenone) the lot-to-lot variation caused different R_E values for the individual lots.

In both matrices, the lot-to-lot variation contributed to u_{RA} either due to differences in analyte recovery or relative matrix effects. Thus, method validation that is based on a single lot might lead to overoptimistic uncertainties. Relevant validation guidelines, such as[15,19,20], call for the evaluation of R_E, *SSE* and R_A. However, it is often not specified whether these performance parameters have toshould be evaluated based on a single lot or different lots of a matrix. In extreme cases, analytes that might pass validation based on a single lot might may fail validation when the lot-to-lot variation is considered. When a result is corrected for *RE* (e.g,. analysis of patulin and aflatoxins in foodstuffs[21,22]), *SSE or RA*, the uncertainty of correction factor needs to be taken into account for thewhen calculation calculating of the measurement uncertainty. The increase in u_{RA} caused by the lot-to-lot variation was shown to lead to a higher measurement uncertainty.[18]. Therefore, the consideration of the lot-to-lot variation leads to a more realistic estimate of the uncertainty associated with the measurement result, and should be required by the official guidelines on mycotoxin analysis.

Conclusion

In summary, we found that for 60 mycotoxins in figs and maize, the lot-to-lot variation can contribute to the uncertainty of the method, as different lots of a matrix may yield different apparent recovery values. Thus, by considering the lot-to-lot variation during method validation, a more realistic estimate of the uncertainty of the measurement result is obtained. Furthermore, it can be assured that the method delivers reliable results for food samples differing in, for example, origin, variety, composition and processing conditions employed.

Acknowledgements

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To view references, please visit:
newfoodmagazine.com/2-18-Stadler

Maximising mass spectrometry capabilities in food analyses for multiresidues

Modern agriculture has a complex relationship with pesticides. While they are widely seen as necessary to ensure food security, the relative toxicity of different compounds means producers must be constantly vigilant of precisely what they are selling. But the variety of pesticides on the market can make it hard for manufacturers to easily test which chemicals have been used on the products they are selling.

ON TUESDAY 27 March, Kari Organtini, Senior Scientist at Waters Corporation, spoke in a *New Food*-hosted webinar about comprehensive analysis of pesticides in food using LC- and GC-MS/MS, and the key considerations and easy-to-use tools to maximise performance.

Here are some of the questions posted in the webinar Question and Answer session and Dr Organtini's answers.

Could you please give more detail on what specific pesticides were targeted using these methods? Where can I get a list of the compounds?

All of the pesticides that were included in both the LC and GC methods are all listed in the application note that was highlighted on the method slide. If you go to the Waters website and search that number, you can find the application note and all the pesticides should be listed in there.

How easy is inlet change over?

It's fairly easy. The actual process of changing the source door and putting ionisation chamber onto the source for APGC probably takes five to 10 minutes. We say the whole process takes about 30 minutes to allow the source to cool a bit then heat up again after you've done the changeover. It's really a very fast and straightforward process.

How does APGC maintenance (eg column, liner) compare with that for EI?

The column and inlet maintenance in APGC is pretty much exactly the same in EI GCMS. We are using the same sort of inlet. The only difference is the transfer line is going into the atmospheric pressure source so if we had to do any maintenance on the back end of the column and the transfer line it's fairly easy as well. You don't have to vent the instrument; you can just open up the source and there's an isolation valve to close off the mass spectrometer from the atmosphere and you are back up and running very quickly.

Are the spectra acquired by APGC compatible with NIST?

Since APGC is a different ionisation technique to electron impact, the NIS Library [The International Technology Alliance in Network and Information Sciences] contains all EI spectra. The spectra probably aren't 100 per cent searchable in NIS, though; there may be differences.

You usually see the same sorts of fragments but maybe the ratios are a bit different in APGC compared to what's in NIS Library. You could search if you really wanted to but it's not a direct link to the NIS Library.

How do I get access to the QuanPedia database you spoke about?

The QuanPedia database is a free database for anyone who has MassLynx. You would just contact anybody that you have contact with at Waters or a field representative in your area or any of the scientists at Waters and we could provide the database for use on your instruments.

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The future of biopesticide regulations

Alan Bullion looks at this growing market, its key drivers and applications, and asks if – in the wake of Brexit – the UK stands to lose its pivotal role in regulating biopesticides.

BIOPESTICIDES are experiencing significant market growth due to their increased use in modern farming, and public perception of their benign effect on the environment, and species such as bees.

The United Kingdom was one of the early pioneers of biopesticide regulation in Europe and, since 2006, successive governments have implemented a number of measures to support commercialisation and uptake of biopesticide products.

> *"The potential impact of Brexit on plant protection regulations in the UK remains uncertain but it is clear that there will be both threats and opportunities"*

Biopesticides are naturally occurring substances that control pests by non-toxic mechanisms. Conventional pesticides, by contrast, are usually synthetic materials that directly kill or inactivate the pest. In general, biopesticide products are being approved by regulators more quickly than synthetics, as they are perceived to have much more favourable environmental and human health profiles.

There have also been increased issues with conventional pesticide resistance as products age, for example where a small proportion of the pest can survive treatment with the pesticide, which therefore becomes less effective. With increased use of pesticides across the world, sometimes

applied indiscriminately, the number of cases of resistance has also grown dramatically, particularly in the United States.

The main response of agrochemical companies to resistance has been to provide products in mixtures that contain pesticides with different modes of action. Increasingly, though, the adoption by farmers of biopesticides is seen as a mainstream alternative for effective and more environmentally-friendly crop protection, either alone, or used in conjunction with other products in integrated pest management (IPM) systems.

Key drivers of growth include political and societal pressure for greener, safer and more sustainable crop protection technologies; food retailer and consumer demands for low or no residues on food crops; an increasingly tough regulatory climate for chemical products; resistance development to existing conventional chemical pesticides as described earlier, and a lack of novel chemistry to deal with these challenges.

Biologicals can offer effective solutions to many of these issues through multiple and novel modes of action to combat pest resistance; reduced residues on food crops; greater worker safety and flexibility, along with reduced regulatory costs and timelines. Additionally, technology advancements have improved product efficacy and reliability and increased confidence among growers and input suppliers.

As a result, the biopesticide market has shown remarkable growth over the last 15 years. In 2003 global biopesticide sales were a niche at just US$ 0.6 billion, today they are at US$ three billion, and sales are projected to reach US$ 11 billion by 2025. With a Compound Annual Growth Rate (CAGR) of 16-17 per cent, it is now the fastest growing crop-protection market sector, and at least double that of the conventional chemical pesticide sector.

North America and Europe together account for two thirds of the total market value, but Latin America is the fastest growing region and seems set to overtake Asia Pacific as the third largest regional market by 2025. The UK has also become an important and growing market within the EU-28.

UK innovation and pragmatism

As a result of the benefits outlined above, over the past 12 years the UK has developed an innovative regulatory approach to facilitate and incentivise registration of biopesticide products, and significant funding for research and development of alternative non-chemical methods of crop protection and integrated pest management, as well as technology transfer to end users.

Around 40 biopesticide active substances and 56 products are currently registered in the UK. Most of the products are targeted towards insect and disease control in high value protected horticultural crops although usage in outdoor field crops is increasing. Over 40 macrobial species are also commercially available for control of insect and mite pests.

The UK has some good examples of public-private partnerships where regulatory support combined with targeted biopesticide development is addressing clear gaps in the market and creating strong grower demand for biopesticide products. More broadly, the UK is widely regarded as a competent and pragmatic regulatory partner in the EU, and hence the potential impact of Brexit is also of interest.

The implications of the UK exiting the EU remain unclear, but industry commentators believe that the industry should be prepared for change in the regulatory framework in the medium term. The UK Chemicals Regulation Directorate (CRD) is currently viewed as a competent and pragmatic contributor to EU regulatory policy and processes and its departure will almost certainly lead to delays and additional pressure on other Member States post-Brexit.

Even before the Brexit referendum in June 2016, however, there was concern that the UK was losing its earlier pioneering role, as revealed by an ADAS survey conducted in 2013. Post-Brexit, the UK might also cede further regulatory influence to the Netherlands, which was another early pioneer in biopesticide development and registration. Backed by a government with strong green credentials and a highly developed horticultural and protected agricultural sector, the Netherlands is considered to be the EU leader in biopesticide regulation.

France is also the second largest market for crop protection products in the EU and a representative of the 'southern' European zone. A strong enabling

ABOUT THE AUTHOR

DR ALAN BULLION is Special Reports and Projects Director for Agribusiness intelligence, publishing one-off reports on the crop protection, animal health and fertilisers sectors. Alan has worked as a publisher, analyst, journalist and editor for Informa for over 18 years, having previously worked on specialist titles focusing on agriculture and food in Asia, and on organics, ethanol and biodiesel, particularly in Brazil. He also has expertise on the political impact of Brexit on UK agribusiness.

policy environment has been in place since 2014 with the French government introducing a number of measures to facilitate the development and registration of biocontrol products underpinned by a new national strategy and regulatory framework.

In central Europe, Hungary has an established history of biopesticide development and use with a well-organised and effective team of experts handling registration of biopesticides and other bio-based products.

"Complying with multiple regulatory systems creates additional cost, which could reduce pesticide availability and add cost to UK farmers"

Impact assessments

The potential impact of Brexit on plant protection regulations in the UK remains uncertain but it is clear that there will be both threats and opportunities, according to a new Agrow report on Global Biopesticide Regulations.

Several domestic studies have examined the options. Recent analysis by the Agriculture and Horticulture Development Board (AHDB) suggests there could be at least four possible outcomes: aligning with the EU, aligning with the US Environmental Protection Agency (EPA), adopting OECD global standards regulation or formulating a UK-specific policy.

Other policy options are also possible and the final outcome will depend on various factors including (most importantly) the UK's trading relationship with the EU post-Brexit and the issue of 'equivalence' of plant protection products, UK agricultural policy and the UK's obligations under international agreements.

Many pesticide approval holders already think the UK is a small market compared to other potential growth markets for their products. They would need to see the UK as a viable place to develop products for, and the likelihood of that will depend on how close the UK 'rules' are to other approval systems, such as the EU.

Complying with multiple regulatory systems creates additional cost, which could reduce pesticide availability and add cost to UK farmers.

UK-based SME biopesticide businesses such as Bionema are concerned about potential impacts on research and development. They fear losing access to a raft of important cash support measures from the EU on which they depend to take products to market. Increased development costs seem inevitable especially if they wish to become key players on the world stage.

Universities and other research institutions are concerned that a hard Brexit could seriously damage prospects for UK agri-science. One recent example involves notification to Cambridge-based plant science body NIAB that future EU variety testing contracts commissioned directly by the Community Plant Variety Office (CPVO), and which might last beyond the agreed Brexit date of 30 March 2019, would be no longer awarded to the UK.

This would affect work carried out by NIAB on testing of ornamental crop species, valued at around £600,000 per year. More significantly, NIAB is currently the only entrusted examination centre within the EU for 678 of the 864 ornamental species involved.

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Exciting opportunities

Conversely, leaving the EU could also present exciting opportunities for the some in the agri-tech sector, with more evidence-based and proportionate regulation of innovative technologies and particularly the new generation of gene editing techniques, some of which could be used in conjunction with biopesticides if approved.

According to NIAB chairman, Jim Godfrey, the politicisation of these issues at EU level has "acted like a drag anchor on EU investment and innovation and, post-Brexit, the UK could be well-placed to cement its position as an international centre of crop scientific expertise, attracting inward investment and developing an export market for technological solutions".

A final consideration is the possible impact of Brexit on the rest of the EU. The UK CRD currently plays a very important role as a Rapporteur Member State and as a zonal Rapporteur Member State in regulatory decision-making. It is widely regarded as competent and scientifically oriented. Its involvement in the EU AIR- 4 approval process covers 20 per cent of the active substances used in crop protection. Delays and higher workloads for other EU Member States can therefore be expected post-Brexit.

In conclusion, the concern is that although there are potential benefits for biopesticide producers in the UK post-Brexit from a new regulatory regime, this might well take several years to emerge, beyond the currently agreed transition period. The favoured outcome, then, will effectively be to continue existing regulatory protocols for the foreseeable future.

EXPERT VIEW

Dr. Debadeep Bhattacharyya
Senior Manager,
CMD Life Science

"Regulations regarding pesticides have become increasingly stringent in order to limit consumer exposure"

Pesticides in food: how much is too much?

Excessive pesticide use has been linked to health risks including increased incidence of asthma, some types of cancers and reproductive issues. Given the safety concerns, significant focus is placed on controlling pesticide use by testing foods for contamination and scrutinising those that are over the regulated limits.

LEGISLATION in the European Union known as Directive No 752/2014 sets statutory maximum residue limits (MRLs) for over 1,000 pesticides in food products of plant or animal origin. The strict MRL requirements warrant detectable pesticide concentrations at the parts per billion level. Analytical testing methods are required to meet or exceed these sensitivity demands.

So, how do food safety labs test for such low levels in so many foods?

Initially using sample preparation methods, compounds are extracted from food samples. Sensitive assays help detect and quantify the smallest amounts of pesticides, a triple quadrupole mass spectrometry (QqQ) coupled to liquid chromatography (LC-MS/MS), such as the Thermo Scientific TSQ Altis Triple Quadrupole Mass Spectrometer, offers the ideal solution.

In addition to robust assays, QqQs increase the sensitivity for trace detection. Leveraging high speed, short dwell times and timed selection reaction monitoring, labs can now analyse hundreds of pesticides across hundreds of perishable samples efficiently, with the highest levels of analytical performance.

Food safety compliance can be a daunting task, requiring comprehensive workflows and targeted quantitation. The selectivity, sensitivity and speed demonstrated by TSQ Altis allows for the achievement of desired separation among analytes. Sensitivity for every food safety lab beyond even the strictest current statutory limits allows food safety laboratories to confidently quantify compounds.

EPRW 2018: 12th European Pesticide Residue Workshop

22–25 MAY 2018

MUNICH, GERMANY

Since its inception in 1996 the European Pesticide Residue Workshop has evolved into an internationally recognised platform in the field of pesticide residues. The 12th workshop will cover the latest concepts and developments in the field of pesticides in food and drink, providing a platform for exchange of information and experience and connecting people from each of the relevant sectors. As an event, it is well known beyond its European borders and more than 500 participants are expected from about 50 countries.

FOLLOWING the success of 2008's event in Berlin, EPRW will take place once again in Germany. The 12th EPRW will run from 22-25 May 2018 in Munich, under the patronage of the Bavarian Health and Food Safety Authority (LGL – Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit).

Programme

EPRW's programme is designed for technical scientists, risk assessors and legislators. The conference will comprise presentations, discussions, daily poster sessions and vendor sessions. The scientific committee, under its current chair Dr Magnus Jezussek, was able to invite many well-known speakers. Residues in organic food are the main focus of EPRW 2018, which will be discussed throughout the Themed day. Topics covered include:

- Inspections/Differences in compliance-checks (J. von Kietzell; DG SANTE, Ireland)
- Analytical challenges for the evaluation of pesticide residues in organic crops (A. Fernandez-Alba, EURL-FV, Spain)
- Challenges in production of organic baby food (N. Fuchsbauer, HIPP, Germany)
- Endogenous formation of fosetyl in wine: conditions of vinification, refinement and role of yeast (L. Toninandel, Edmund Mach foundation, Italy)
- Illegal practices in organic farming: can occurrence of pesticide metabolites detected in crops provide the evidence? (J. Hajslova, University of Chemistry and Technology, Czech Republic)

Lectures on other days focus on risk communication, risk assessment, regulatory issues, monitoring and the development and application of analytical methods. Highlights will include:

- Risk communication (R. Solecki, Federal Institute for Risk Assessment, Germany)
- Analytical strategies in pesticide exposure assessment through human biomonitoring (H. Mol, RIKILT – Wageningen University & Research; The Netherlands)
- The design of Q-Orbitrap data independent acquisition experiments for target screening 850 pesticide residues in fruits and vegetables based on a compound database" (J. Wang, Canadian Food Inspection Agency)
- The Fipronil case – consequences for monitoring strategies (R. Lippold, EURL-AO, Germany)
- Routine quality control for validation and troubleshooting of residue monitoring methods, including sample processing (S. J. Lehotay, US Department of Agriculture, USA).

Pre-Workshop

For the first time, the EPRW committee is organising a Pre-Workshop one day before the official start of EPRW. This four-hour educational event offers the chance for participants to learn about efficient high-quality and high-throughput analysis of pesticide residues in food. Efficient and effective ways to conduct sample processing (comminution), sample preparation (extraction and cleanup), analysis (separation and detection) and data handling (peak integration, quantification, and identification) will be described and discussed.

Exhibition and Vendor Sessions

In an exhibition area next to the plenary hall more than 20 exhibitors will present products and services needed for pesticide analysis and quality control. All the important vendors of LC-MS/MS, GC-MS/MS and high-resolution MS instruments will be present, with many other vendors supplementing the offer.

In 12 vendor sessions exhibitor's latest developments will be presented and discussed.

Social events

In addition to the scientific program, a number of social events are planned. The Gala Dinner will be celebrated in the lively Augustiner Keller in the very heart of Munich and promises to exemplify all that's best about the Bavarian spirit. There will also be a one-day excursion after the Workshop, to the Royal Castles of Neuschwanstein and Linderhof, tucked away in the mountains – the fairytale vision of King Ludwig II of Bavaria. ■

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FOOD-GRADE LUBRICANTS

Lubricants are vital in mechanised food production – but what are the food-grade regulatory requirements and how can you be sure that you have the product to meet them? NSF International's Stephanie Ludwig has some answers.

Industry expert Andreas Adam explains the significance of food-grade lubricants and highlights their value in safe and effective food production. He also looks at the consequences of failing to opt for a quality product and – with an eye to the future – gives his thoughts on how these specialist lubricants might develop in the future.

Smooth solutions to risk management

Stephanie Ludwig explains why it's vital to choose a food-grade lubricant that conforms to all regulatory requirements – and how you can be sure that it does.

MENTION the word lubricant in whatever context and you will most likely be greeted by a raised eyebrow or giggle. Food-grade lubricants may not be sexy, but they are a vital part of a food manufacturer's food safety and risk management armoury. Product recall is a nightmare scenario that manufacturers go to great lengths to avoid through risk evaluation and implementation of strict hygiene measures – and yet they can often overlook the need to use the right food-grade lubricants in their equipment. Accidental contamination of food by the wrong lubricant may not always involve a full product recall but might well lead to costly product disposal and/or destruction of the batch involved.

A review by the UK Food Standards Agency of food withdrawal and recall processes published in September 2017 reported that in the period 2013-2016 about half (50 per cent) of food alerts were associated with allergens. Almost a quarter of the alerts (23 per cent) related to microbiological and hygiene issues, including pathogenic and non-pathogenic microorganisms and problems related to poor or insufficient controls implemented in food businesses. A further 18 per cent of food alerts were associated with physical contamination of food.

Food-grade lubricants address HACCP requirements

Nowadays lubricants are increasingly recognised for the important role they play in HACCP (Hazard Analysis and Critical Control Point) evaluation. The handling, preparation, processing and packaging of food products of all types inevitably involves the use of equipment and machinery with lubricated moving parts that come into contact with foodstuffs. Machines also need to be cleaned and maintained, involving the use of other chemicals such as those contained in cleaning products and anti-rust agents.

Using registered food-grade lubricants reduces the risk of cross-contamination by harmful chemicals. They are formulated to be innocuous and not pose a significant health risk should incidental food contact occur. Processors are increasingly recognising that using these registered

> *"Anti-microbial properties are no substitute for a rigorous inspection, cleaning and hygiene regime"*

products is a logical, practical solution to addressing critical control points.

H1 category registered lubricants are the only comprehensively established food-grade lubricants

Only H1 lubricant category registration (as defined in the U.S. Code of Federal Regulations or CFR) is formulated and therefore acceptable for incidental food product contact and can be pursued as a food-grade lubricant. Any other category registration is not appropriate. Independent third-party verification of the lubricant formulation is available only through NSF International in the US but is recognised worldwide. NSF's nonfood compounds programme was established specifically to evaluate the risk of contamination of chemical compounds used in and around food processing facilities.

Products eligible for registration include lubricants, cleaners and water treatment products.

An H1 lubricant is intended for use in applications where there is potential for incidental food contact, for example in the case of anti-rust agents or release agents on gaskets or seals of tank closures. Although this category encompasses the possibility of incidental food contact, it is still recommended that use of the lubricant is kept to the minimum amount needed for it to be effective for its purpose. Overuse can make the unwanted transfer of the material onto food, or the build-up of residual lubricant, more likely. For example, when a lubricant is applied as an anti-rust film, the application instructions usually recommend that residual material be removed by washing or wiping the equipment before going back into production.

H1 is the only category registered for incidental food contact. Sometimes H2 is cited as also being suitable, but this is not the case as H2 lubricants are

REGISTERED FOOD-GRADE LUBRICANTS – THE BENEFITS

- Registered food-grade products offer an effective and straightforward approach to risk mitigation
- Many modern products have functional properties, such as being formulated for use in difficult environments (higher temperatures, steamy or moist processing areas, in the presence of organic matter) and good products last for longer run times and have a longer shelf life
- Many lubricant formulators specialise in developing food-grade products for their customers' specific equipment needs
- Food-grade products provide a reliable prerequisite approach to complement HACCP plans and provide a path toward compliance with Global Food Safety Initiative benchmarked standards
- International acceptance of ISO 21469 and H1 registration promotes industry standards and lowers barriers to international trade.

A small but important cog in wider food-safety risk management

Today's high-performance lubricants are precision formulated in a way that goes well beyond just safety in food-contact situations. They play a small but important role in helping processors address wider issues, such as allergen and microbial contamination control. This is because their allergen-free ingredients and additives inhibit growth of microbial organisms and thus contribute to longer shelf life. This is a useful function in certain environments – where there is steam or moisture, for instance, or the area is difficult to clean. However, it is important to note that registration does not always guarantee allergen claims. The NSF registration process verifies label claims but does not specifically analyse for allergens.

Registration of lubricant ingredients provides important traceability evidence. Using registered products can even play a part in workforce management, as many reputable manufacturers provide well-constructed programmes of training and support for maintenance staff.

Choosing a lubricant supplier – what to look for

- Do your own due diligence on any claims such as anti-microbial properties and check that the product has the correct regulatory approvals for them, as these vary between countries and regions. In the EU you need to ask for verification from the supplier that they have the correct approvals for the relevant geographic markets.
- Check for registrations or certifications. Most reputable suppliers have products backed by independent registrations such as H1 or ISO 21469 as provided by NSF International. Registration can be easily checked on the website www.nsfwhitebook.org and ISO 21469 certification at www.nsf.org/certified-products-systems.
- Look for applications specialists with an understanding of HACCP and food safety principles
- Find out whether the supplier understands the unique challenges in your processing environment as well as your technical requirements and specific risk management responsibilities
- Enquire about training. Most reputable suppliers support their customers with workplace training, education and hands-on application support for the end user. This can be a significant benefit.
- Be aware of product limitations – for example, anti-microbial properties are no substitute for a rigorous inspection, cleaning and hygiene regime
- Finally, invest in a partnership with your supplier, not just a product.

acceptable **only** in non-contact applications, where there is a physical barrier or other measures in place to ensure cross-contamination is not possible. H3 is a more limited-use category in which certain oil ingredients are classified as safe. H3 lubricants are typically used to clean and prevent rust on hooks, trolleys and other similar equipment.

The easiest way to check if a lubricant is registered, and under what category, is to visit www.nsfwhitebook.org, which provides a list of all registrations.

Using food-grade lubricants does not, however, absolve manufacturers from any of their full food hygiene responsibilities. The term *incidental contact* means that the lubricant **is not intended** to come into direct contact with food under normal use conditions, but that in some instances, accidental contact with foodstuffs may occur. This means that production facilities must still take measures to ensure that the food product is not directly exposed to, and as a result becomes contaminated by, the lubricant. The most effective way to ensure this is to have a fully implemented HACCP plan in place, where exposed lubrication points are addressed as critical control points, together with detailed records of equipment cleaning and maintenance, as well as tracking and controlling the amount of lubricant consumed in processing operations and sourcing appropriately registered products from reputable suppliers.

International certification is well recognised and fast growing

The establishment of an ISO standard for lubricant use has given impetus to the growth of registered products, as it provides internationally recognised assurance of safety and quality and offers a standard that is readily accepted in most global markets.

The ISO 21469 standard builds on the basic H1 registration. Certified lubricants not only meet the formulation requirements established in 21 CFR, but they are also required to undergo risk assessment, testing, auditing and labelling review by an independent qualified third party such as NSF International. One of the key reasons that more lubricant manufacturers are certifying their products to ISO 21469 is that this broader international standard applies to lubricants used in sectors beyond food processing, including food packaging, pharmaceuticals and animal feed. Moreover, once a manufacturer has achieved H1 registration, it is relatively easy to progress to certification under the full ISO standard.

ABOUT THE AUTHOR

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Food-grade lubricants: **their significance explained**

Industry expert *Andreas Adam* answers some essential questions.

The significance of food grade lubricants can often by underestimated. What is their value in safe and effective food production?

Food grade lubricants, or lubricants for incidental food contact H1, are crucial in any HACCP. Mechanised food production is commonplace and any equipment used in that production needs to be lubricated. What any operator of such equipment wants to avoid is an undetected leakage, which can cause problems for manufacturers and consumers. There is a particular risk that smaller leakages might remain undetected for some time and, should this occur, if a non-H1 product has been used this would necessitate an immediate recall of foodstuffs. While repairs should never be postponed, when the lubricant (mineral oil or similar) represents a volume of less than ten parts per million in the food, repairs can be done without alerting consumers. Leakages can originate from many sources – from faulty seals,

a pin-sized hole in a heater, air coming from the compressor and so on. For that reason, full-plant H1 lubricants provide extra support for a plant's existing HACCP. Measuring and registering top-up should be part of the plan.

What should food processors look for in a food-grade lubricant?

Various departments should work together in making a choice. The buyer should verify that any lubricant considered is H1-registered. This can be done by going to the INS web site www.insservices.eu or to the NSF website www.nsf.org and looking for the supplier and the product. Additionally, a supplier that has the ISO 21469 standard should be the preferred choice. This standard not only guarantees that the products are H1 registered, but also that they are still of the formulation originally offered for registration. A further point for attention concerns the religious requirements that come from the market in the form of Halal and Kosher certificates. The technical department should make certain that the technical aspect of the lubricant meets the requirements of the equipment. A number of base oils are available, all with different properties, and the lubricant selection needs to be done via a knowledgeable supplier, so that the best technical and economical result can be reached. Selecting lubricants merely on price and strength of marketing is often not the best approach.

What might be the consequences of using sub-standard food-grade lubricants?

H1 food-grade lubricants differ from industrial lubricants as far as regulations are concerned; technically, they must do exactly the same as any industrial lubricant. Food-grade lubricants have less options of base oils and limitations with the type or amounts of additives that can be used. Cooperation between the supplier of the lubricants and the end user is very important. Many food-grade lubricants reach industrial performance levels, but in some applications, regulatory limitations might lead to a lower service life. Lubricants for food equipment are highly refined mineral oils, so it's worth remembering that the bitterness of a poor-quality product will remain long after the sweetness of a low price is forgotten.

How serious is the threat of residual lubricant build up?

In the US, lubricants for incidental food contact, H1, have very clear limitations under the Food and Drug Administration (FDA)-defined rules. These can be found in the 21CFR178.3570 (CFR=Code of Federal Regulations) and are for polyalpaholefin (PAO) and mineral oil-based products 10 p.p.m. or 1 kg in 100 tons of final food. Basically, lubricants should not be in the food. In the EU there is no specific legislation on lubricants in food. There is a category in both Europe and the US that addresses the use of highly refined base oils as a food additive. These products are mentioned in the 21CFR172.878 and EU EFSA journal 2009 and are not lubricants. Both Europe and the US have very strict limitations on maximum levels, where the US names levels in percentage terms, the EU in Acceptable Daily Intake (ADI).

How do you see the future of food-grade lubricants developing?

Food-grade lubricants will continue to develop alongside the best of the lubricant industry.

Due to the high impact that any safety breaches have on the consumer, the need for maximum safety and improved supplier responsibility via systems such as ISO21469, products will continue to improve. Technically the new equipment keeps pushing the need for better lubricants, a challenge that is taken seriously by those suppliers that have committed to be in this market. In recent years there has also been greater publicity regarding the risks of Mineral Oil Saturated Hydrocarbons (MOSH) and Mineral Oil Aromatic Hydrocarbons (MOAH). During a period of some years CONCAWE, an industry body, worked hard to provide health and safety authorities with evidence that highly refined mineral oils are safe products. Infact, very recently, the BFR (the German government body for risk assessment) reviewed its position on mineral oils (MOAH content), deciding that these were no longer a concern.

We need lubricants to produce food mechanically in the right quantities to support our population. Food-grade lubricants are safe products provided they are used as intended – and as long as we honour the descriptions and instructions on the pack.

ABOUT ANDREAS

ANDREAS ADAM is the International Sales Director at FRAGOL AG, a German based specialty lubricants developer and producer of private label products with a focus on food-grade lubricants and compressor and vacuum application fluids. A qualified marine engineer, he has more than 35 years' experience in the lubricant industry working for Castrol, Petro-Canada and Anderol in many countries. As Chairman of the H1 Global Food Lubricants Workgroup under the ELGI, as a member of CONCAWE-MOCRINIS work group and as chairman of the EHEDG sub-group lubricants, he continues to promote the interests of the lubricant industry in the food segment. Recently Andreas has given papers at the CONCAWE-MOCRINIS, UEIL, ELGI and ICIS conferences and has published a number of papers in leading industry magazines.

Clean air – the vital ingredient to food and beverage manufacturing

Air is the only ingredient that is involved in every aspect of food and beverage manufacturing. In this lively webinar, sponsored by Camfil, *Ross Dumigan* and *Patrik Jansson* of Camfil, and *Kassy Marsh* of Techni-K Consulting, discussed the importance of clean air in food manufacture and the associated regulations and answered participants' questions.

AIR COMES into contact with your product from storage of raw material up until, and including, packaging. In this webinar, participants learnt about:

- Regulations regarding air quality within food and beverage facilities
- How to protect against cross contamination
- How clean air can improve product shelf life
- The importance of clean air in protecting your employees.

Following the webinar, the expert speakers took questions from those listening. These included the following:

Do you feel the BRC guidelines are strong enough currently?

In answer Kassy Marsh said that although they were currently sufficient, they could be better. "It would be helpful if there was more detail, especially in the interpretation guide," she said. She pointed out that, as the guidelines stood, there was a chance of getting a non-conformance because of the many elements needed within the clause that needed to be adhered to. These elements do need to be documented within a risk assessment.

How can I assess the effectiveness of the air filter and measure the quality of the air once it's passed through? Is there any tool that I can use?

In answer, Ross Dumigan told the audience, "We have an air image sensor that we can install to verify the efficiency of the filter performance and ensure the quality of air is meeting the required standards,"

What happens to the filtered particles after filtering? Does shedding happen?

The questioner was reassured that particles are trapped within the filter's fine fibres and that shedding does not occur.

ABOUT THE SPEAKERS

ROSS DUMIGAN has worked with Camfil for over 15 years. This experience allows him to understand the clean air requirements in food and beverage facilities. Mr Dumigan engages and lobbies with standards committees to ensure air quality standards are improved globally.

PATRIK JANSSON specialises in identifying and reducing internal contaminants within food and beverage manufacturing plants. Working with world-leading producers has allowed Mr Jansson to gain valuable knowledge of air quality requirements within these facilities.

Since starting her own training and consultancy business, Techni-K, in 2012, **KASSY MARSH** has become well regarded in the field of food safety risk assessment and specialises in the Global Food Safety Initiative (GFSI) recognised standards. Ms Marsh is the author of 'Combine your HACCP & HARPC Plan, step-by-step' and co-author of 'Assessing Threat Vulnerability for Food Defence' and, 'Assessing Error Vulnerability for Food Integrity'.

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FoodFraud

Food Fraud 2018 gets to the heart of the issue

The notorious Beast from the East snow storm failed to frighten delegates away from *New Food's* second Food Fraud Conference on March 1 – some 250 made it to the central London event. Co-chaired by leader in the field, Prof Chris Elliott, it brought together a wide range of interested parties, from scientists and academics to technology experts and trail-blazing producers, each with their own ideas fitting in a collective mechanism to defend the integrity of food-supply chains. George Smith reports.

TO FRAME what they wanted to say, some of the speakers at Food Fraud 2018 began by defining what they meant by food fraud. While there were clauses over which all agreed, a few variations – mostly over the issue of intent – underlined one of the challenges faced by the food industry when it comes to the practice: a lack of cohesive definition. For Professor Chris Elliott, the progress towards a unified idea of food fraud was slow but he hoped the UN was perhaps a year or 18 months away from a definition.

In his opening address, he said: "Five years on [from the Horse Meat Scandal of 2013] we still don't really know how to define food fraud. [...] Food fraud is any action taken by businesses or individuals that deceives other businesses or individuals in terms of misrepresenting food ingredients or packaging that brings about financial gain. It's about cheating people."

Co-chair Helen Sisson of Greencore and FINN

Samuel Godefroy, Full Professor of Food Risk Analysis and Regulatory Systems at Université Laval, Quebec, said: "We seem now to be facing some challenges dealing with food fraud and some of these challenges are probably related to an absence of definition. If you look at the regulatory frameworks of today in a number of OECD countries and you do not find a clear definition of food fraud."

The Senior Scientist of NOFIMA, Petter Olsen's definition hinged on the idea of the claim. He said: "Food fraud is when someone intentionally causes a mismatch between the food product claim and the food product characteristic."

Information-sharing is key

Inspired perhaps by the presence of Co-Chairman Helen Sisson of Greencore and the Food Industry Intelligence Network (FIIN), much emphasis was placed on the role information-sharing had in tackling food fraud in the UK and further afield. Openly showing his enthusiasm towards FIIN, Prof Elliott said that any owner of a food business that was not part of the network was "crazy". In this spirit of collaboration, the Head of Technical at the Co-Op, David Oliver, spoke with the Technical Director of Huntapac Produce Ltd, Stephen Shields, providing a case study on how retailers and suppliers can work together against fraud. Huntapac is visited by analysts from Food Forensics who conduct isotope testing to gauge the geographical authenticity of the product, an arrangement that cuts the work the Co-Op must do down the line.

Co-Chair Prof Chris Elliott in action

Mr Shields said: "Without doing any testing, the risk to the retailer and the

Huub Lelieveld, President of the Global Harmonization Initiative

Blockchain panellists from left: Shane McCarthy, Chief Executive Officer, Ireland Craft Beers; Stephen Leng, Supply Chain Solutions Portfolio & Blockchain Leader, IBM; Petter Olsen, Senior Scientist, NOFIMA

The Conference enjoyed a packed house

Prof Samuel Godefroy

amount of due diligence they would have to complete is quite sizeable. What we do is come in half way through and do our own set of testing for authenticity and we will hold those results and make them visible to the Co-Op so then the level of due diligence for the Co-Op is a lot lower. [...] What we're doing is giving confidence back to the consumers; we're also guaranteeing British and we can guarantee it's from a specific county now. It's something that I think is worthwhile for us to do, something that going forward, as isotope testing and authenticity testing becomes more prevalent, all companies need to get on board with."

Unmissable blockchain

One of the most thought-provoking topics came at the close of the event, keeping delegates glued to their seats as travel disruptions mounted outside. Blockchain: Transforming Food Safety had garnered a great deal of pre-event interest, owing to the potentially paradigm-shifting nature of the technology. A panel discussion, the day's penultimate bill saw Shane McCarthy, the CEO of Ireland Craft Beers, the first company in the world to put beer on blockchain, Stephen Leng, Supply Chain Solutions Portfolio & Blockchain Leader with IBM, and Petter Olsen discuss the potential and, importantly, the limitations of the digital ledger.

Mr Olsen said: "Traceability is fantastic in many ways but it has its limitations. I was there when traceability really took off, and I think I recognise some of the same optimism, but also some of the same hype around blockchain. I'm a big advocate for blockchain but I think there's a danger of it being oversold. It will solve some problems, but it will not solve all problems."

Blockchain, he added, did not prevent people from entering erroneous data, it simply meant that it could not be tampered with once it had been added.

The success of the event, as reflected in everything from the number of delegates willing to attend in spite of the weather to the desire they had to pick the brains of the speakers in Q&A sessions following their presentations, is a testament to the significance of food fraud. As a key figure in analysing the fallout of the 2013 Horse Meat Scandal, which woke many European consumers up to the extent of the deception taking place on their door steps, Prof Elliott's contribution set the tone, that Food Fraud was a meeting of experts each of whom had something valuable to say covering the breadth of the subject. It will be interesting to see next year if blockchain has continued its march, if more suppliers and retailers are agreeing to work together on the problem, or whether a cohesive definition has been settled so real progress can be made.

IAFP2018
ANNUAL MEETING
Salt Lake City, Utah
JULY 8-11

8-11 JULY 2018

SALT LAKE CITY, USA

Latest science and innovation comes to Utah

Each year, the **International Association for Food Protection (IAFP)** hosts its Annual Meeting in North America, providing attendees from around the world with information on current and emerging food safety issues; the latest science and innovative solutions to new and recurring problems; and the opportunity to network with thousands of food safety professionals. IAFP 2018, 'Mountains of Food Safety,' will be held at the Salt Palace Convention Center in Salt Lake City, Utah, Sunday, 8 July – Wednesday, 11 July.

Salt Lake City will host IAFP 2018

THE IAFP Annual Meeting is attended by more than 3,600 of the top industry, academic and governmental food safety professionals from six continents. This renowned event owes its reputation and success to the quantity, quality and diversity of each year's program; the quality and relevance of exhibitors sharing the latest in available technologies; leading experts speaking on a variety of timely topics; and special recognition of outstanding professionals and students for their contributions in the food safety field.

Four **Pre-Meeting Workshops** will take place prior to the conference in Salt Lake City. They include a two-day workshop on Friday, 6 July and Saturday, 7 July: Hygienic Design and Sanitation; a 1.5 day workshop on Friday afternoon, 6 July and Saturday, 7 July: Whole Genome Sequencing: A Tutorial and Hands-on Workshop to Help Understand This Emerging Technology; and two one-day workshops on Saturday, 7 July: *Standardized Biofilm Methods for Laboratory Studies of Biofilms, and Food Genomics 101*. Led by experts in their respective fields, these pre-meeting workshops give attendees a jump start on their food safety learning experiences.

Saturday evening's **Welcome Reception** provides the chance for those who have arrived throughout the day to mingle, network and meet old and new acquaintances before four days of back-to-back meetings and events.

Committee and 27 Professional Development Group (PDG) meetings fill the day on Sunday, 8 July. Participation in any PDG is open to everyone and offers attendees the opportunity to share a wealth of knowledge and expertise, which helps guide the efforts of the Association.

Sunday evening's **Opening Session** includes an update on the IAFP Foundation and presentations to this year's Fellows Award recipients; Travel Award recipients; and Student Travel Scholarship recipients. The **Ivan Parkin Lecture** follows, with guest speaker **Gary Acuff**, Ph.D., Professor of Microbiology in the Department of Nutrition and Food Science at Texas A&M University, presenting Where Do You Put Your Chopsticks?

The evening continues with the Cheese and Wine Reception in the Exhibit Hall, where nearly 200 exhibitors will showcase the latest in food safety technology. Exhibits will be on display from a variety of companies, providing attendees with another avenue to exchange ideas and information on existing technologies and applications, new concepts and innovative designs, and the availability of products and services. And the popular 'Explore the Floor' event will offer contestants the opportunity to have an exhibitor card stamped while visiting with participating vendors to learn more about their products. Fully stamped cards will be included in a prize drawing at the conclusion of the event.

Attendees will also be able to bid on dozens of unique and desirable items included in the IAFP Foundation's Annual Silent Auction. Items are donated from around the world by Members, attendees, organisations, sponsors, exhibitors, and IAFP Affiliates. This lively event provides valuable funds for the Foundation to help support vital programs, which include (in part) key lectures at Annual Meeting; travel for speakers at IAFP global meetings; and travel for recipients of the Student Travel Scholarships and Travel Awards to attend IAFP's Annual Meeting.

Three full days of meetings, along with poster and technical presentations, take place on Monday, Tuesday and Wednesday. **IAFP 2018** will include 69 symposia; 19 roundtables; 702 poster presentations; and 136 technical presentations, all carefully reviewed and selected months in advance by the IAFP Program Committee. Educational sessions are dedicated to timely coverage of key issues and cater to multiple experience levels.

Special **IAFP 2018** presentations include a session devoted to the deadly listeriosis outbreak in South Africa, scheduled for 9 July. **Carmen Rottenberg**, Acting Deputy Under Secretary for the Office for Food Safety, US Department of Agriculture, and **Dr tephen Ostroff**, Deputy Commissioner for Foods and Veterinary Medicine, US Food and Drug Administration, will be part of a special presentation, "US Regulatory Update on Food Safety," on Monday, 9 July.

The **John H. Silliker Lecture**, scheduled for Wednesday afternoon, closes out another educational and informative conference. This year's guest speaker is **Ann Marie McNamara**, Ph.D., Vice President of Food and Essentials Safety and Quality Assurance at Target, Inc., who will present Heroes Past and Future.

IAFP 2018 comes to an end with Wednesday evening's **Awards Banquet**, where professionals will be honoured with various awards for outstanding contributions to food safety and IAFP throughout their careers. Students presenting winning posters during the Annual Meeting will also be recognised for their research in the field of food safety.

IAFP and its more than 4,300 food safety professional members are committed to **Advancing Food Safety Worldwide** through the mission: *"To provide food safety professionals worldwide with a forum to exchange information on protecting the food supply."* Now in its 107th year, IAFP is proud to produce the leading food safety conference worldwide.

www.foodprotection.org

The Belfast Summit on Global Food Integrity

28-31 MAY 2018

BELFAST, N.IRELAND

The Belfast Summit on Global Food Integrity will bring together food-security experts from all over the world.

THEY will grapple with the dilemma of how to feed a growing global population with integrity – amid such issues such as pollution, climate change, Brexit, food fraud and food terrorism.

The Summit will be chaired by Professor Chris Elliott, OBE, Pro-Vice-Chancellor at the Medicine, Health and Life Sciences faculty at Queen's University Belfast. Professor Elliott previously conducted the UK Government's inquiry into the horsemeat scandal. He also founded the Institute for Global Food Security (IGFS) at Queen's University Belfast, which is hosting of the Summit.

IGFS has an international reputation for excellence – Food Science at Queen's University was ranked Number One in the UK in the most recent REF (Research Excellence Framework) assessment.

Head of Bioeconomy at the Research and Innovation Directorate-General of the European Commission, Dr John Bell will open the Summit and a number of EU project representatives will be in attendance and hold meetings while in Belfast.

Keynote speakers already booked include international experts with experience spanning organisations like the World Health Organisation, Food and Agriculture Organisation of the United Nations (FAO), World Wide Fund for Nature (WWF), World Bank and a US Homeland Security Centre of Excellence.

Academics giving keynotes and chairing sessions come from some of the world's leading universities in the area of agri-food systems, such as Wageningen (The Netherlands), Laval (Quebec), BOKU (Austria), NTU (Singapore) and INRA (France). For example, Professor Michel Nielen, principal scientist at RIKILT (at Wageningen) who co-founded and co-chairs the Recent Advances in Food Analysis (RAFA) symposium, as well as co-ordinating the H2020 project, FoodSmartphone, will be speaking.

But although the Summit is attracting a high calibre of thought leader, it will be far from a typical academic gathering. For a start, it will be outcomes-focused and will formulate a number of recommendations to influence policy.

Secondly, big-hitters from the world of industry have got behind the event, for example Dr Ellen de Brabander, Senior Vice President at PepsiCo. Dr de Brabander leads the global R&D functions for PepsiCo including food safety, quality and nutrition science. She has also served as interim CEO of EIT Food, a unique European knowledge community.

Policy-makers and influencers will also address the Belfast Summit, including Renata Clarke, Senior Food Safety and Quality Officer at FAO and Duncan Williamson who, as well as being Food Policy Manager at WWF, advises companies including Tesco, M&S, Nestle, Sodexo and Alpro around food sustainability.

So what will the Summit focus on? According to FAO, the global food chain is under continued threat from outbreaks of animal/plant pests and diseases, as well as food-safety crises (sometimes occasioned by deliberate food fraud, sometimes accidental contamination).

The global food-security challenge is also linked to broader themes such as climate change, pollution, and loss of biodiversity, as well as cultural, social, political and demographic changes, eg. Brexit.

To meet these challenges and safeguard consumer confidence, it is vital that the best science, technology and intellect is utilised. The Belfast Summit will bring together a wide range of stakeholders from all parts of the food chain, and all parts of the world.

Discussion will be organised under four main themes:

1. Deliberate contamination of food
2. The threat from pathogens to the food system
3. Human exposure to chemical cocktails present in foods
4. Delivering the nutritional needs for the 21st century global population

Chris Elliott

Renata Clarke

This is a unique opportunity to contribute to a great debate – how we feed the world, going forward, with integrity. Please view the Summit website http://www.qub.ac.uk/sites/ASSET2018Summit/ and register today.

www.qub.ac.uk/sites/ASSET2018Summit/

INGREDIENTS

The market for plant proteins is on the up. Tage Affertsholt and Daniel Pedersen look at the findings of the new study, *The Global Market for Plant Proteins 2017 – 2021 – Competition with Dairy* and explain the reasons behind the current growth.

Algae can be relatively straight-forward and economical to produce and have proven nutritional benefits. It's not surprising that research and development into this latest functional food – and consumer acceptance of it – is continuing apace, as Andrew Dahl explains.

Plant-based proteins in competition with dairy

Tage Affertsholt and *Daniel Pedersen* present data and trends as outlined in the new study, *The Global Market for Plant Proteins 2017-2021 – Competition with Dairy*, published by 3A Business Consulting in February 2018.

> *"More than 200 million consumers are so-called flexitarians"*

WHILE a growing number of people across all demographics are taking a greater interest in their own health and well-being, different perceptions of what truly promotes good health and longevity have emerged. Plant-based proteins and ingredients have been around for a long time; however, only recently have they become the focal point of one of the most prominent food and health movements trending today. While plant-based proteins such as soy proteins have long been applied in food products and meat for their functional properties, increasing demand for nutrition and health purposes is now seen across a wide spectrum of food and nutritional products, which primarily has been the domain of dairy proteins.

The market for plant-based alternatives

Plant-based foods and beverages have been singled out as the number-one food trend in 2018, with growing sales of existing products and many new products expected to be launched. In the US, Germany and the UK alone, more than 200 million consumers are so-called flexitarians, actively avoiding animal-based foods at least once per week. The continuous growth in the plant-based alternative market can also be viewed as an indicator of development in the plant-based protein space, where supply and demand are expected to grow significantly. In order to meet the growing demand for plant-based options, several players are expanding production and introducing new product offerings. In addition, in realising the opportunities

within the plant-based segment, several major dairy and dairy ingredient companies such as Danone, Nestlé, Glanbia, Kerry and Agropur have been investing in this area. Other major dairy ingredient companies are known to be considering entering the category in the future, supporting the fact that the market for plant-based ingredients and consumer products is going to continue growing.

The evolution of plant-based dairy alternatives

The growth of the plant-based alternatives market is driven by several factors relating to either health or ethical concerns as well as income and population growth in developing markets. Meat and dairy are both staples of the Western diet, but concerns among consumers about the healthiness of consuming these products, due to issues such as saturated fat and lactose content and studies suggesting some meats to be carcinogenic, are becoming increasingly apparent. Lactose intolerance is a major driver of the world market for plant-based milk alternatives, particularly in Asia, which is estimated to have surpassed USD 16 billion globally in 2017 and is forecast to continue growing around three to four per cent on average annually. Around 65 per cent of the world's population is estimated to experience some form of lactose intolerance post-infancy, with the highest rates experienced in Asia where more than 90 per cent of the population is affected. Asia is also the major market, and despite showing degrees of maturity, contributes more than two thirds of the total milk alternatives market, though with the North American and European markets showing significant growth. Soy milk is the major type of milk alternative, with almond milk showing faster growth, particularly in North America. Additionally, a wide variety of milk alternatives based on different sources have been introduced in recent years, with options ranging from rice, cashew, coconut and oat milk to milk from peas, hemp, quinoa and flax seeds. Players in the plant-based dairy alternatives space as well as in dairy have also introduced alternatives to many other dairy products beyond milk, such as plant-based cheese, cream, yogurt, butter and ice cream.

From a nutritional perspective, many plant-based dairy alternatives are intrinsically lower in protein content as well as calcium and vitamin D, which has been pointed out repeatedly by major dairy players. However, several plant-based alternative players have been innovative in terms of fortifying products with plant-based proteins, vitamins, minerals and essential fatty acids to mimic nutrition of actual dairy as well as to cater to active nutrition consumers. Soy protein is the major plant-based protein ingredient used in the plant-based milk alternatives market; however, pea protein is increasingly being used in plant-based dairy alternatives to boost protein content.

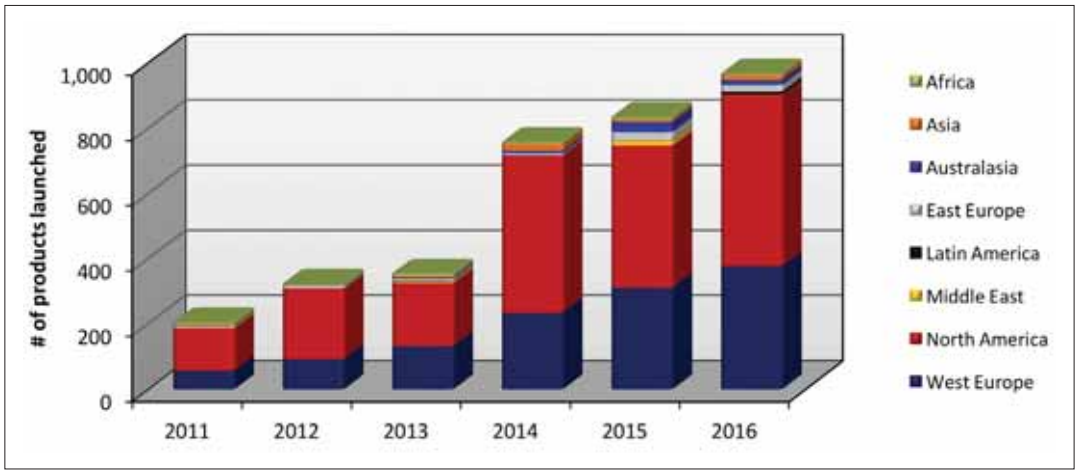
Protein trend continues with a 'natural' twist

High-protein products have been a major food and beverage trend for several years and since the beginning of this decade, the number of new product launches with high-protein claims has grown more than 20 per cent annually on average, not counting new launches of sports nutrition products. As the plant-based trend along with the trend for natural ingredients has gained prominence, the protein trend has evolved from consumers looking for high protein content by weight to also considering the source, ethics and naturalness of the proteins used. However, naturalness does not have an objective scale and while some consumers perceive dairy to be natural since it is not synthetic, others will find it unnatural for humans to consume milk or ingredients based on milk originally meant for calves, or that cows are fed GMOs and are not

> *"Pea proteins are quickly becoming the flagship of the plant-based-protein trend"*

LEFT: The evolution of plant-based dairy alternatives

RIGHT: The number of new products launched with either pea protein concentrate, Isolate or Hydrolysate



able to graze freely on pastures. While this trend for naturalness has benefitted plant-based proteins and ingredients, organic dairy ingredients has gained some momentum as well in several nutritional applications, particularly in infant nutrition and sports nutrition.

A selection of plant-based sports nutrition products available on the market

The sports nutrition market, valued at around USD 12 billion in 2017, is the major nutritional application of both dairy-based and plant-based proteins, with demand cemented by the fact that more than 80 per cent of the sports nutrition market value is attributed to protein-based products such as protein powder, protein bars and protein ready-to-drink products. Dairy, particularly whey protein, remains the major type of protein used in sports nutrition with a total volume of dairy protein applied amounting to more than 300,000 MT in 2017. Many plant-based sports nutrition products using several types of plant proteins have made inroads into the industry to challenge the supremacy of dairy protein in this application. In the US, one in five consumers of sports nutrition products say that they are influenced by natural claims when purchasing sports nutrition products. The number of new sports nutrition products launched using 'plant-based' or 'vegan' claims has grown more than 200 per cent, or 25 per cent annually on average in the past five years and 'plant protein' claims across all food categories have grown almost 50 per cent annually on average. Many of these plant-based sports nutrition products have been launched in green or brown packaging to signal naturalness to the consumer.

Many consider dairy the embodiment of protein quality, due to its specific amino acid profile containing all the essential amino acids. Apart from not being perceived as natural by some consumers, some also find the consumption of dairy and dairy proteins to be unethical in regard to sustainability, the environment and animal welfare. Though soy protein, like dairy, is in itself considered a complete protein, soy protein faces similar challenges in food and health applications for typically being GMO, inorganic and containing allergens. Some suppliers, though, have started to introduce non-GMO and organic soy protein, and soy protein remains the major plant protein in terms of volume usage in food, with DowDuPont being the key supplier of high-end soy proteins. Pea proteins are quickly becoming the flagship of the plant-based-protein trend, exhibiting significant growth. Current suppliers of pea proteins such as Roquette are expanding production, with other ingredient suppliers such as Cargill are investing in production of pea protein. While consumer perceptions on naturalness and ethics has strongly favoured demand for plant-based proteins, blending of various plant protein types, e.g. pea with rice or hemp protein, to adjust for shortcomings in certain essential amino acids, is extensively practised in some nutritional applications.

Despite suppliers of plant-based dairy facing some legal challenges in terms of labelling of products as 'milk' and 'cheese' and so on, plant-based products and proteins are set to perform strongly, with consumers increasingly looking to incorporate more plant-based foods in their diet. Likewise, more plant-based products are launched each year and greater focus on taste and indulgence is a clear trend within the plant-based segment.

ABOUT THE AUTHOR

TAGE AFFERTSHOLT obtained his M.Sc. in Economics and Marketing from the Aarhus School of Business Administration in Denmark. He has held managing positions as general manager and vice-president sales and marketing with different food companies working both B2C and B2B in Denmark and internationally. He founded 3A Business Consulting 25 years ago and is the senior partner. The company is mainly advising the food and dairy industry on strategy and business development as well as publishing selected multi-client reports.

FURTHER INFO

For further information regarding the report *'Global Market for Plant Protein 2017-2021 – Competition with Dairy'* by 3A Business Consulting, contact: Tage Affertsholt, Managing Partner, tel: (+45) 7021 0098, ta@3abc.dk

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THE STABILISER PEOPLE

Algae: Coming soon to a menu near you

In addition to their proven nutritional value, algae are increasingly being marketed as functional foods. As research and development into its production continues apace, *Andrew Dahl* looks at what they have to offer to both manufacturer and consumer.

> *"In terms of total fibre, some edible algae contain a level that is higher than that found in more highly evolved plant species"*

THE year is 2038. You enter a restaurant, sit down and open the menu. If fresh-pressed juices are available, that celery/carrot/kale mix might contain flavourful algae. When you order a seafood or vegetarian salad, its colour and flavour could be due to ribbons of dried algae. The spinach in your bowl of soup might be augmented with algae rich in protein, fibre and vitamins, and you might enjoy some matcha tea that is half tea and half algae with potent antioxidants and immune enhancers.

Algae will be appearing on menus on a large scale over the next few decades, driven by exciting advances being made today. With interest in functional foods riding high, the myriad health benefits of various algae strains are being spotlighted as never before. Along with the realisation of algae's benefits and adaptability as a functional food ingredient, the pace of research and development in growing and processing algae is making it an ever-more-attractive proposition for food manufacturers looking to expand their offerings.

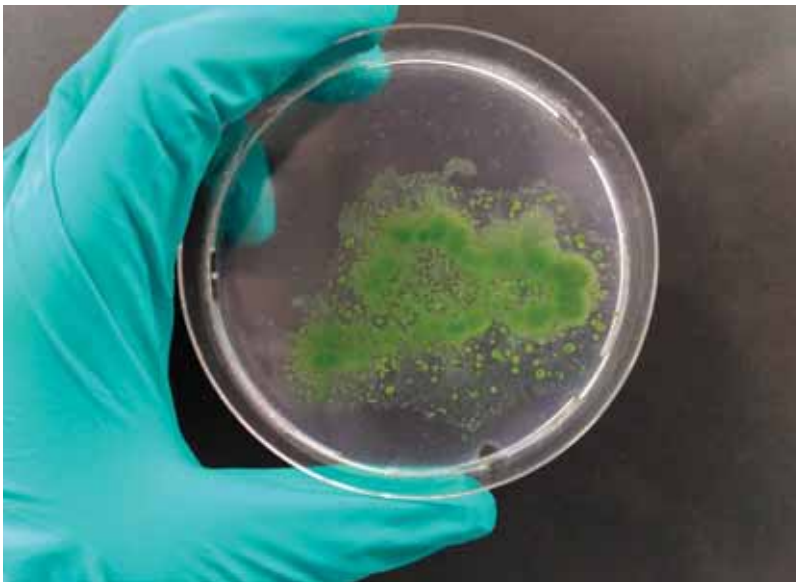
The benefits of algae-based foods

Microalgae have been utilised as a source of human nutrition for thousands of years[1]. In addition to their proven nutritional value, algae are increasingly being marketed as functional foods or nutraceuticals, terms that describe foods that contain bioactive compounds, or phytochemicals, that may benefit health beyond the role of basic nutrition[2].

For example, as many modern health-conscious consumers are aware, two of the key factors in achieving metabolic efficiency or optimal health are managing oxidative stress and minimising low-level, systemic inflammation in the body. These effects can be mitigated with carefully managed diets, exercise, hydration and sleep – but by ingesting a gram of the right strain of algae, this regimen can be relaxed to an extent not possible otherwise.

This is because algae are known to produce a great variety of biologically active compounds not commonly found in other individual organisms. In addition to antioxidant and anti-inflammatory properties, algae have also been studied for antitumour, anti-obesity and neuroprotective effects. Focusing on merely the first of these benefits, it is the sulphated polysaccharides from algae that have potential antioxidant activities, with fucoidan, ulvan, laminaran and alginic acid particularly shown to be potent antioxidants; fucoidan is also an inhibitor of inflammation[3]. Indeed, algae contain large amounts of polysaccharides and oligosaccharides. Interestingly, over the past half-decade, we have learned more about the abundance and variety of non-starch polysaccharides provided by algae that have functional properties relevant to gut health and digestive efficiency.

Overall, as a source of functional food ingredients, algae can be a significant source of Omega 3 oils, proteins and peptides, carotenoids, phenolic compounds and alkaloids. In general, algae contain up to one to three per cent in dry weight of lipids, with glycolipids being the major lipid class in all algae, followed by neutral lipids and phospholipids. The Omega 3 polyunsaturated fatty acids in algae (such as EPA, DHA and ARA) are claimed to have a range of beneficial effects such as improved heart health and reduced inflammation[4]. The protein content in algae can be as high as 60 per cent of the dry weight, depending on the season and the species involved. Further, great interest has been raised regarding microalgae protein as a source of bioactive peptides because of their therapeutic potential in the treatment of various diseases.



ABOUT THE AUTHOR

ANDREW DAHL is the President and CEO of ZIVO Bioscience, a biotech/agtech R&D company engaged in the commercialisation of nutritional and medicinal products derived from proprietary algal strains. He was formerly a principal consultant and managing director of Great Northern & Reserve Partners, LLC, a marketing strategy and business planning consultancy focused on the biomed and biotech sectors, since 2005.

> *While roughly on par cost-wise with other sources, algal strains allow manufacturers to simplify the ingredients list*

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In terms of total fibre, some edible algae contain a level that is higher than that found in more highly evolved plant species. As for carotenoids, the major varieties that occur include beta-carotene, lutein, violaxanthin, neoxanthin and zeaxanthin, to name a few. The presence of iron and iodine in various algal strains may also be beneficial in preventing the conditions that are triggered by deficiencies in these elements[5]. Algae-based food may also prove to be a superior choice to soy, since the lecithin soy contains is a common allergen, while its estrogen-like metabolites may also create hormone imbalance issues.

Meanwhile, the most highly consumed microalgae on the market today, *Spirulina*, has been shown to incorporate high protein content and added nutritional benefits, including anti-hypertension, renal protective, anti-hyperlipidemia and anti-hyperglycemic properties. As well as being a rich source of proteins, it also contains high levels of GLA, B-vitamins, and free-radical-scavenging phycobiliproteins[6].

Progress in algae research

Companies are building and refining production methodologies to drive down the cost of growing algal biomass and driving up yields. The biggest hurdle is startup, with the cost of building a one-acre pond potentially exceeding US$80,000 including necessary water management equipment. Yet, a one-acre algae pond can out-produce one acre of soybean by a factor of 10 in terms of available protein, vitamins and micronutrients.

There are a range of companies working in this sector engaged in a wide variety of algal cultivation and production research. For example, at one company, a bioreactor has been developed that can be operated indoors to shield algae from certain wavelengths of sunlight detrimental to algae growth; the sunlight is substituted with LED light, which allows a continuous production cycle. Elsewhere, algae are being cultivated under heterotrophic conditions in fermentation tanks rather than being photosynthetically grown in open ponds. Separately, paddle wheels are being used to enhance sun exposure in open culture ponds, with baking soda added to a mixture of fresh and ocean water to avoid contamination.

Some phototrophic growers have eschewed costly, complex fermentation systems and bioreactors in favour of a more basic and capital-efficient model – a covered, shallow pond constructed of inexpensive, readily available materials. This approach favours optimised, phototrophic, filamentous green freshwater microalgae strains that can efficiently capture solar energy and offer above-average production yields.

Algae produced for nutritional applications can be spray-dried, belt-dried, drum-dried or freeze-dried depending on the product formulation requirement, ranging from a fine powder for better mixing properties to a flaked form that looks and blends like pesto, parsley flakes or dried seaweed.

As demand builds, algal biomass can be grown by contracted cultivators and shipped to licensed drying facilities. From there, the product would be shipped to food manufacturers for use as a protein-enhancing food ingredient. Algal strains optimised for commercial production promise low startup cost and offer sustainability, high yield, continuous harvest, optimal levels of protein, micronutrient and non-starch polysaccharides (NSPs), ease of post-processing and the potential of multiple applications across animal species. Some commercial algae strains offer a significant fiber component, as well as natural, bioavailable vitamins A and C. A very few are developed to be nearly odourless and tasteless. Extracts and supernatants (consisting of non-starch polysaccharides, peptides and bioactive compounds secreted by the algae during the grow cycle) can be separated and concentrated to create high-value nutritional ingredients.

Advances are also occurring in academia, at notable centre of algae research such as the National University of Ireland in Galway. Over the past decade, NUI Galway has developed technical expertise in open-sea cultivation of macroalgae. For example, the institution has

developed a large-scale macroalgal pilot facility and is seeking greater insight into how macroalgal yield is influenced by surrounding habitat[7].

These advances certainly appeal to food manufacturers, who will look at the cost and nutritional density per kilogram of algae compared to other sources of protein, fibre and micronutrients that they would need to purchase separately and blend into their products. While roughly on par cost-wise with other sources, algal strains allow manufacturers to simplify the ingredients list, minimise unwanted interactions and streamline in-plant processes – while also touting algae as sustainably grown, non-GMO, non-animal and non-soy; and herbicide-, pesticide- and antibiotic-free.

Numerous scientific and logistical challenges remain before the algae era truly gets into full swing. For one thing, researchers are continuing to assess the extent to which algae's benefits, as measured in the raw product, can be incorporated into finished food items[8]. The taste of various algae strains is also being studied, with work being done to keep it as palatable as possible for the average consumer. But there is little doubt that the overwhelming positive features of algae will make it a mainstay of our diets in years to come. So, when you sit down for that meal in 2038, the thought running through your head probably won't be, "Why am I eating algae?" but rather, "This food is delicious!" And the experience will be a treat not only for your taste buds but for your entire body as well.

@NewFoodMag

Vitafoods™ Europe

The global nutraceutical event

15-17 MAY 2018

PALEXPO, GENEVA

Focusing on the Future – Vitafoods Europe 2018

With consumer awareness of functional nutrition higher than ever, and science and technology driving exciting new innovations, the future for nutraceuticals is looking bright.

A SURVEY by the organisers of Vitafoods Europe – which takes place between 15 and 17 May 2018 in Palexpo, Geneva – shows that 92 per cent of industry professionals feel either quite positive or very positive about the future for their company (up from 88 per cent last year).

Almost half (48 per cent) see increasing consumer awareness as one of the biggest opportunities for their business, followed by innovation through new ingredients (37 per cent) and growth in developing markets (27 per cent).

Vitafoods Europe has undergone a series of improvements to ensure the industry makes the most of such opportunities. The 2018 event will provide valuable insights into the big trends and scientific advances shaping the future, as well as offering expert advice to help visitors overcome challenges.

Evolving to meet visitors' needs

Vitafoods Europe is expected to attract over 21,000 visitors and over 1,100 exhibitors, but despite enjoying a record-breaking year in 2017, the event's organisers have not stood still. Based on feedback from visitors, the team has adapted and expanded popular attractions and resources.

For example, the **New Ingredients Zone** will for the first time include an **Ingredients Theatre** where visitors can find out more about specific ingredients, products and services through case studies and presentations.

Another feature that has expanded and will offer more content is the **Omega-3 Resource Centre** in association with GOED. This focused knowledge hub for everything Omega-3-related will help visitors learn about various Omega-3 formats and sources, reach consumers and connect with the right Omega-3 supply-chain partners. The **Sports Nutrition Zone**, sponsored by Friesland Campina DMV, is also growing. This engaging and interactive demonstration area will offer a new **Sports Nutrition Theatre**, as well as a sampling bar and product showcases.

Tackling the issues at the top of the agenda

This year's survey reveals a three-way tie at the top of the nutraceutical agenda. Healthy ageing, general wellbeing and digestive health, each chosen by 23 per cent of survey respondents, ranked jointly as companies' most important health benefit areas.

Reflecting the importance of healthy ageing, the **Vitafoods Life Stages Theatre** will offer expert sessions on nutrition requirements, from infancy to later life. Speakers will include Dr Astrid Stuckelberger of the Institute of Global Health at the University of Geneva & Lausanne, who will give the keynote presentation, *Beauty and Health: Going from anti-aging to advanced health*, while Dr Emma Schofield, Global Food Science Analyst at Mintel, will discuss food, drink and healthcare for seniors of different age groups.

While healthy ageing has long been a key focus for the industry, this is the first time that digestive health has topped the poll, reflecting the current boom in the global probiotic industry. Accordingly, probiotics

will be a major focus at Vitafoods Europe. The **Probiotics Resource Centre**, in association with the International Probiotics Association (IPA), will help visitors understand everything there is to know about probiotics in one area, from the latest breakthroughs in probiotic technology to consumer analysis and market trends. In the Education Programme, the Probiotics R&D Forum, sponsored by DuPont Health & Nutrition, will explore challenges such as ways to incorporate beneficial bacteria into a food matrix.

Another key area will be cardiovascular health, which was the main health focus for 22 per cent of respondents. The role of anthocyanin for vascular function will be explored in the Polyphenols R&D Forum.

A platform for innovation

The Vitafoods Europe survey shows how the industry is investing heavily in research and development. Almost half (46 per cent) of respondents said their companies will spend at least ten per cent on R&D in the current financial year, and over a third (37 per cent) said their investment would be even higher next year.

Reflecting this spirit of innovation, Vitafoods Europe will offer visitors a range of opportunities for discovery. For those looking for something new for their business, the **New Ingredients Zone** will showcase the latest ingredients and raw materials, and the **New Products Zone** will display the latest functional foods and beverages – from teas, bars and powders to health shots and chewable vitamins.

In the Education Programme, there will be a stream of R&D Forums devoted entirely to emerging ingredients. Speakers will include Rimantas Venskutonis of the Kaunas University of Technology who will discuss industrial hemp as 'an old-new' source of functional ingredients, and Miomir Niksic of the University of Belgrade on the potential of Kombucha and other ingredients from fungi.

Visitors will be able to engage with entrepreneurs at the cutting edge of the nutrition sector at the **Springboard Pavilion**. Alternatively, they can meet experts on innovative ingredients, products and technologies by taking one of the themed **Innovation Tours** or self-guided **Discovery Trails**.

For those who want to see, touch and taste before they buy, the **Tasting Centre** offers opportunities to sample the latest retail-ready products; and visitors will be able to gain one-to-one advice at the **Packaging Zone**, where they can discover creative new packaging solutions, with an overarching theme of simplicity and convenience

Exploring the consumer trends shaping the future

Vitafoods Europe always focuses on new trends and hot topics, with a focus on how businesses can apply them. This year, clean label chosen by 49 per cent of survey respondents, topped the poll of the most significant trends, overtaking scientifically supported health claims on 39 per cent.

Vitafoods Europe will provide a range of opportunities to learn more about these key trends, as well as providing a window on emerging issues for the future. Speakers at the **Vitafoods Centre Stage** – a one-stop shop for industry insights at the heart of the event – will include Suzanne Robinson of Happen UK on the growth of the free-from trend, and Monica Feldman of Consumer Health Strategy Inc. on fasting.

Elsewhere, experts from Innova Market Insights will showcase a series of poster and iPad presentations, with specialists on hand to offer independent advice on emerging trends at the **Market & Trend Overview**. Meanwhile, companies will be seeking strategic partners in the **NCN Investor Meeting** and the **NutraIngredients Awards** will take place for the fourth year.

The new and improved Vitafoods Education Programme

In a fast-moving consumer-led industry, the importance of marrying future trends with the latest scientific research has never been greater.

The Vitafoods Education Programme, which runs alongside the main trade show, brings together big names from academia and industry. The interaction between them, and the value it creates for businesses, is a core element of the event. After securing in-depth feedback from delegates through research and interviews, Vitafoods Europe is proud to present a new, improved, more interactive Education Programme in 2018.

One major focus area will be personalised nutrition, which ranked in the poll as one of the most important industry trends for 2018 but is yet to conquer the mass market. To find out why, the Education Programme will include a new **Personalised Nutrition Workshop**. This half-day, interactive event will explore issues such as ways to improve consumer awareness.

For delegates with a professional interest in science and technology, a series of **Research & Development Forums** will introduce ingredient benefits from recent studies, as well as exploring ingredient application and product development. The Forums will focus on eight key topic areas: Probiotics; Vitamins and Minerals; Marine Ingredients; Protein; Polyphenols; Up-and-Coming Ingredients; Botanicals; and New Technologies and Approaches for Nutraceutical Product Development. Speakers will include Professor Philip Calder of the University of Southampton, who will discuss a review of the factors influencing the bioavailability of Omega-3; Dr Steffen Oesser of the University of Kiel on advances in collagen research; and Dr Emma Wightman of the University of Northumbria on the cognitive and mood effects of resveratrol.

Meanwhile, five **Business & Marketing Forums** will help delegates understand marketing strategies and benefit from consumer trends in a regulatory environment. Jeff Hilton of Brand Hive will discuss digital strategies to drive awareness, engagement and conversions.

For the first time, both the R&D Forums and the Business & Marketing Forums will include seven **Interactive Round Table Discussions** to encourage the sharing of best practice and peer-to-peer networking. And a new one-day pass option will allow time-pressured delegates to take part in the forums on a cost-effective basis.

Unrivalled Networking Opportunities

Over the past two decades Vitafoods Europe has earned a reputation as the place where professionals from across the global nutraceutical supply chain meet to create products that deliver optimal health.

The event's expected 21,000+ visitors are able to connect with leading manufacturers, distributors, buyers and high-quality suppliers across the four key nutraceutical industry areas: Ingredients & Raw Materials; Branded Finished Products; Contract Manufacturing & Private Label; and Services & Equipment.

For both established brands and smaller companies with products, ingredients or services to launch or showcase, Vitafoods Europe is the perfect platform.

Register now to attend Vitafoods Europe for FREE and find out more.

! www.vitafoods.eu.com

Catering to the **less-sweet tooth**

As consumer demand for healthier options continues to rise, confectionary and soft drink managers are meeting the challenge with increasingly innovative reformulations and product developments. The *New Food* team looks at what's happening across the marketplace.

WHEN it comes to sugar consumption, one thing is clear: most of us are trying to cut down. Recent figures reveal that 49 per cent of global consumers are trying to limit their sugar intake, while 23 per cent try to eat a moderate amount of sugar and 14 per cent avoid it entirely[1].

Manufacturers are responding by offering innovative ways of reducing sugar wherever possible. Nestlé has recently hailed a "breakthrough" in the structure of sugar that's enabling it to make healthier chocolate. Inspired by candy floss, the technique creates aerated, porous particles of sugar that dissolve more quickly in the mouth. This allows consumers to perceive the same level of sweetness as before while consuming less sugar. The first product to use the technique is Milkybar Wowsomes, which have 30 per cent less sugar than similar chocolate products and contain no artificial sweeteners, preservatives, colours or flavourings.

> *"In the UK, it's not just chocolate that's seeing stevia play a role in reformulation"*

Stefano Agostini, CEO of Nestlé UK & Ireland said: "We have an unrivalled research and development network and the experts at our Product Technology Centre in York have been instrumental in this breakthrough. Teams across our UK business and around the world have been working incredibly hard to make this launch a reality."

Nestlé claimed to have removed more than 60 billion calories and 2.6 billion teaspoons of sugar from its food and drink portfolio during the past years. Milkybar Wowsomes means greater choice and allows parents to 'treat' their children with reduced sugar products, said Agostini.

"We are demonstrating how we can, and will, contribute to a healthier future and that we take our public health responsibilities very seriously," he added. Developing the new product took Nestlé researchers in Switzerland, the UK and the Czech Republic a little over a year. As we go to press, the new product, which is the first in Milkybar's 81-year history to contain both milk and white chocolate in the same bar, is due to be launched shortly.

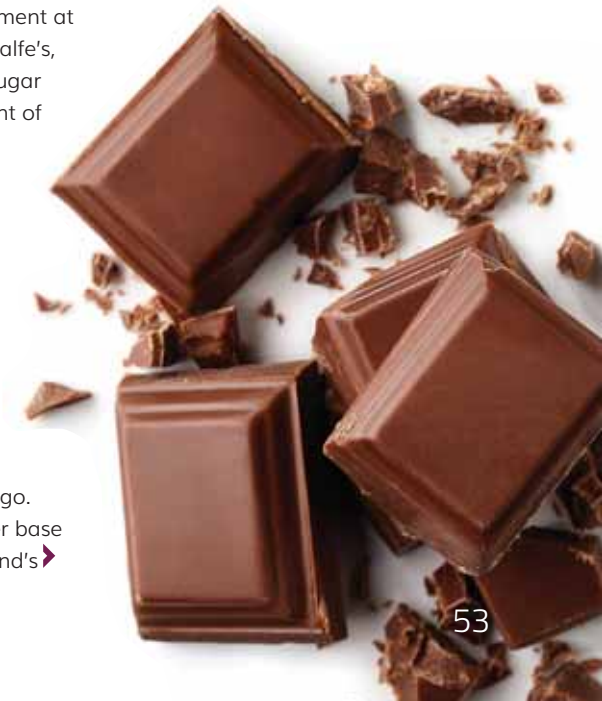
Meanwhile, B2B chocolate and cocoa manufacturer Barry Callebaut says it has been working on chocolate reformulation since 2007. According to Leen Allegaert, head of the company's Wholesome Choice innovation programme,"Throughout the years, we have built a proven track record in sugar reduction. We developed a toolbox of sugar-substituting technologies that is ready for customer-specific developments as well as a complete range of chocolate and filling recipes that are either reduced in sugar or free from added sugar."

At the Food Ingredients Europe (FiE) trade event at the end of last year, the company offered visitors an in-depth look at its five sugar solutions. Its first sees sugars reduced by at least 30 per cent in any given product, if that product is aiming to be labelled as 'sugar-reduced'. To achieve this, a dietary fibre blend replaces part of the sugar content, with the company assuring customers that the chocolate keeps it sweet-tasting flavour even when a significant amount of sugar is taken out. In addition is has, says the company, "a balanced taste profile, a good workability, and is also digestive tolerant. Another option sees the ingredient polyol malitol used as a one-on-one sugar replacer. This is a sugar alcohol that contains fewer calories but preserves 90 per cent of a product's sweetness, according to Barry Callebaut. Malitol can, however, have a laxative effect – but for recipes that combine no more than 10 per cent polypols combined with dietary fibre, there's no need to declare this possible side effect. Other ranges in the portfolio utilise natural sweetener stevia to replace sugar altogether.

In the UK, it's not just chocolate that's seeing stevia play a role in reformulation. Premium snack provider Metcalfe's skinny popcorn won the 'Best Sugar Reduction Through Reformulation' category at last year's UK-based Sugar Reduction Awards, for the successful redevelopment of its top selling Sweet 'n Salt variant. The new recipe, which includes stevia, removes almost 25 tonnes of sugar a year from purchasers' diets, as well as delivering a product that is more popular with consumers, say its makers.

Metcalfe's skinny was the first in the category to launch a Cinema Sweet variant in January 2016, using a sweetening blend including stevia leaf extract, which delivers 32 per cent less sugar than the average sugar content of sweet popcorn. The sugar replacement is now used in all Metcalfe's new recipes. For example, its new Salted Caramel flavour includes stevia to achieve a 57 per cent sugar reduction compared to other Salted Caramel popcorns on the UK market. Says Sue Cook, Head of New Product Development at Kettle Foods, which owns Metcalfe's, "Public health concerns over sugar have increased, with 62 per cent of adults now checking the sugar content on food and drink product labels.[3] Striving to reduce sugar continues to be a key consumer trend, so the reformulation of our top-selling variety of Sweet 'n Salt popcorn was an important next step. Metcalfe's skinny was the first to bring Sweet 'n Salt to the UK market eight years ago. Over this time, a loyal customer base had built up, making it the brand's

ABOVE: New Product Development Manager Sue Cook with Metcalfe's award-winning skinny popcorn



biggest volume variety, any change in which needed to be handled very carefully. Many trials took place over the 18-month development project to ensure the new reduced sugar recipe would continue to delight customers. In fact, using independent sensory testing, the stevia formulation outperforms the old recipe on all measures, yet contains 37 per cent less sugar than other Sweet and Salt products on the market."

Andrew Slamin, Marketing Director, comments: "Since the reformulation, sales of Metcalfe's Sweet n' Salt, which was already the UK's favourite, have grown by 12 per cent[3], indicating that even more consumers are enjoying our popcorn, so it's a win-win situation."

Popcorn in the UK has seen huge growth, with Ready to Eat sales up by over seven per cent year on year[4].

As *New Food* goes to press, the new sugar tax on soft drinks is set to be enforced in the UK. This will force manufacturers to pay levies on all sugary drinks (excluding milk-based drinks and pure fruit juices) – with the cost expected to be passed on to consumers. The sugar tax is made up of two rates: a levy of 18p per litre on drinks that contain more than 5g of sugar per 100ml and a higher rate of 24p per litre on drinks that contain more than 8g per 100ml. Head of Soft Drinks at Tesco, Phil Banks, points out that the company became the first retailer to reformulate its own-brand soft drinks to below 5 grams of sugar per 100ml. "Across the country, Britain's shoppers will be looking to see how the levy has changed the price of their favourite soft drinks. But at Tesco, things won't be so very different. All our own-label soft drinks are already below the threshold for the levy. This means that there will be no price increase in Tesco soft drinks after April 6. Over the past decade, we've been working in partnership with our suppliers to make our own-label soft drinks healthier, by reformulating them to reduce sugar content. This work has meant that we've been able to cut over nine billion calories from customers' annual diets. The result? All Tesco-brand soft drinks were below the threshold for the new sugar levy some seventeen months before the levy comes into force."

But of course it's not just the giants who are reformulating. Danish company Little Miracles produces soft drinks that blend teas with organic fruit juices and natural superfoods. These are stocked throughout Europe and North America, launching in the UK in 2011 and in the US in 2014. The company has recently reduced its sugar content by 50 per cent, by replacing cane sugar with as sweet but less viscous agave syrup. Explains Frederik Senger, CEO and co-founder of Little Miracles, "We started by removing cane sugar, as we were able to source enough agave in a Fairtrade-certified manner. We could only make that change once we were confident that the produce was farmed properly. Our other juices had to be tweaked and amended slightly to blend perfectly with agave, as there's a subtle change in flavour. Customer feedback has been positive, though, with Little Miracles sales increasing by 14 per cent throughout Europe following the reductions".

In terms of sales uplift and health benefits, it's a win-win situation for retailers and consumers alike. Whether the positivity of those consumers who see prices driven upwards as the tastes of their favourite soft drinks alter stays intact remains to be seen.

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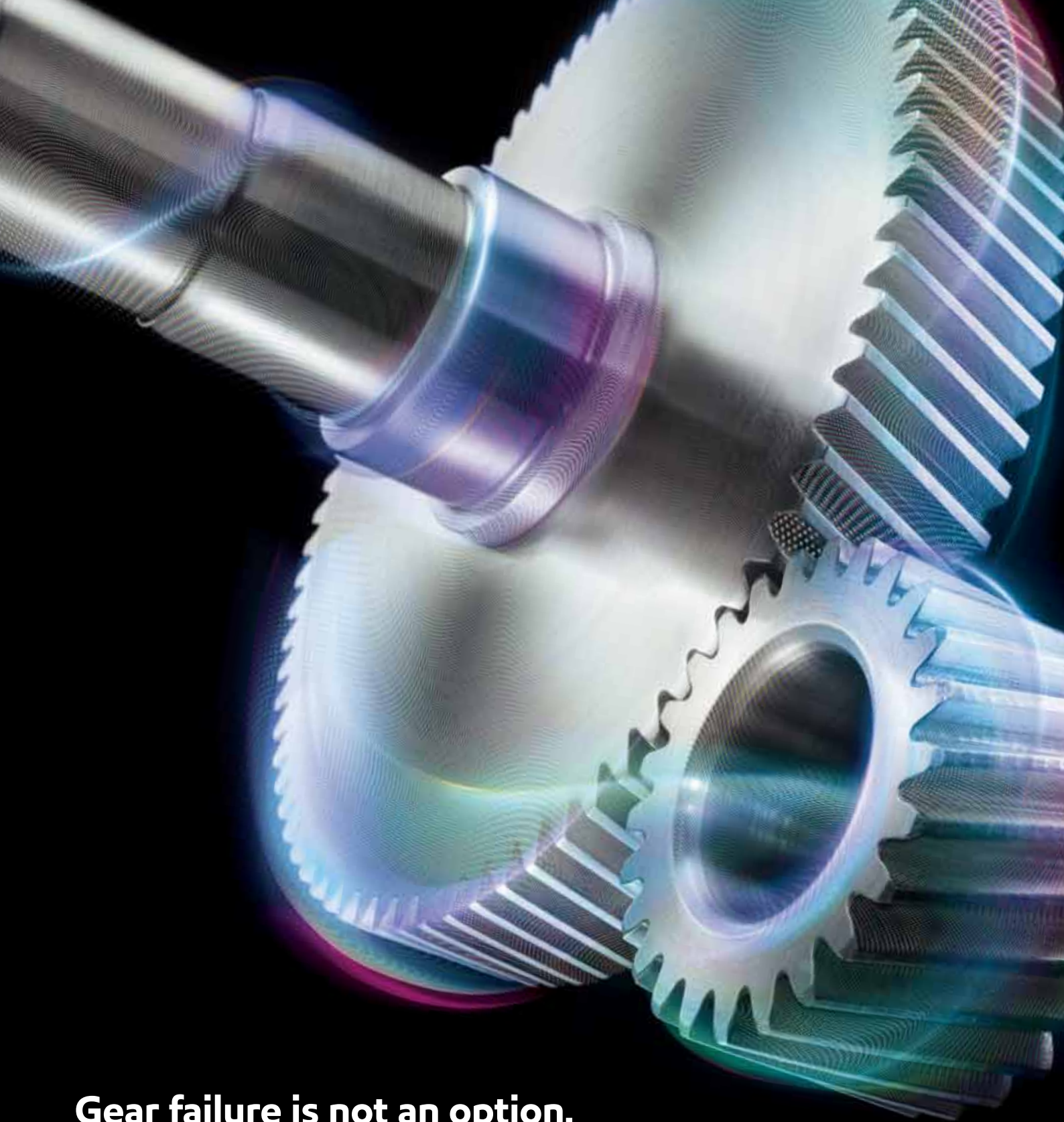

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UNITED KINGDOM

What is it about Brits and spuds? The nation's love affair with their carb of choice hasn't cooled, even in the face of competition from pasta and rice. Phil Britton looks at the current picture within the UK potato sector in terms of market share, product diversification and breeding developments.

Confidence has been shaken by high-profile product recalls and withdrawals within the meat industry. Nick Allen of the British Meat Processors Association looks at what manufacturers can do to protect themselves.

Potatoes: A lasting affair for the UK consumer

Even in the face of competition from pasta and rice, the UK's affection for the humble spud shows little signs of abating. *Phil Britton* assesses the current picture in terms of market share, product diversification and breeding developments.

ABOUT THE AUTHOR

PHIL BRITTON is a potato agronomist with experience across the fresh, processed and seed sectors of the industry.

IT IS NO SECRET that the British love potatoes, and Kantar World Panel figures (published in the AHDB 2017/18 Market Intelligence report for GB potatoes) suggest that potatoes account for a whopping 46 per cent of UK consumers savoury carbohydrate consumption. Bread is a poor runner up, accounting for just over a quarter of consumption, while savoury snacks, rice, noodles, and pasta make up the remainder of the carbohydrates consumed (***Figure 1***).

The dominance of potatoes in the carbohydrate market is probably due to the huge range of meals that can be derived from the humble spud, as can be seen from the number of sub-sectors into which the potato market is divided (***Figure 2***). The market growth and consumption of pasta, rice and noodles continues to grow slowly at the expense of fresh potatoes, but it could be argued that we might have reached 'peak pasta' in the UK and that potatoes are fighting back by launching new, more interesting and more convenient products to satisfy the needs of the time-poor consumer looking for quick, tasty and nutritious meal solutions.

The processed potato market has been innovating and diversifying for years to satisfy demand for quick and easy meal solutions. Since the introduction of the ubiquitous oven chip by McCain in 1979, the company has developed fresh and frozen chips, wedges, roasts and waffles in all shapes and sizes, and it recently introduced the pre-cooked, frozen baked potato; ready after just five minutes in the microwave.

Further diversification in the processed potato market led to the development of fresh (chilled) potatoes and, since Mash Direct introduced a premium fresh, prepared mash potato in 2004, this sector has proliferated to include fresh prepared chips, wedges, new potatoes and many other convenient ways to eat potatoes.

Snack attacks satisfied

Crisping is the part of the potato industry that satisfies our desire to snack, and it accounts for over one third of the UK snack market, with a value of £1,077 million for potato-derived snacks, according to the Snack, Nut and Crisp Manufacturers Association (SNACMA). This industry has seen significant diversification over recent years with the advent of 'pan-fried' crisps, initially championed by Kettle Foods, and latterly by Tyrells. There are now quite a number of specialist crisp producers and a proliferation of flavours – Onion Bhaji or Wagyu Beef anyone?

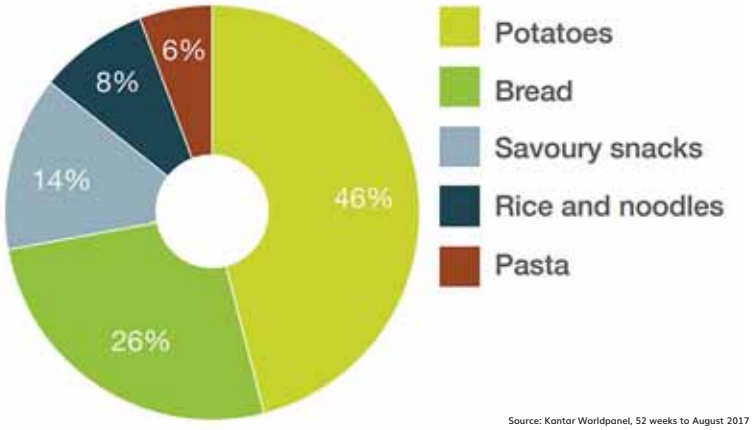
While the overall consumption of fresh potatoes (that is, uncooked as purchased from your local supermarket or similar) has been declining for a number of years, some areas of the fresh market have seen growth and diversification. A good example of this is the baby or salad potato market. Salad potatoes are a product that meets consumer requirements for quick, convenient and nutritious food, and there have been some interesting developments in recent years. Indeed, specialist companies have been formed specifically to grow and market salad potatoes into both the fresh, fresh-prepared and wholesale (catering) markets.

With such a wide range of cooking options for potatoes, and, by association, a wide range of processes required to make potato products, it is little wonder that so many potato varieties are utilised throughout the industry. Indeed so diverse is the potato industry in the UK that there were 260 different potato varieties grown and certified for seed in Scotland in 2016, and some estimates put the UK variety catalogue at more than 500 varieties.

This number of varieties creates a quandary, however, as one of the main drivers for potato product development is consistency. This means that a crisp, chip, roast or boiled potato eaten in September, March or July should be more or less the same in terms of flavour, texture and appearance on each occasion. Indeed, utopia for a crisp factory manager would be to cook the same variety throughout the year, with no variation in product quality. This utopia does not (yet) exist, however, and crisp manufacturers must therefore compromise by using a range of varieties that have strengths and weaknesses in the field, in the potato store and in the factory, but do give a consistent product if used at the correct time of year, when they can perform at their best.

While product consistency is important to the users of potatoes, potato growers and other involved in the supply chain are more concerned with a consistent agronomic and economic performance – will it grow? Can it be stored?

FIGURE 1



Source: Kantar Worldpanel, 52 weeks to August 2017

ABOVE: Breakdown of the share of the carbohydrate sector market by value of sales

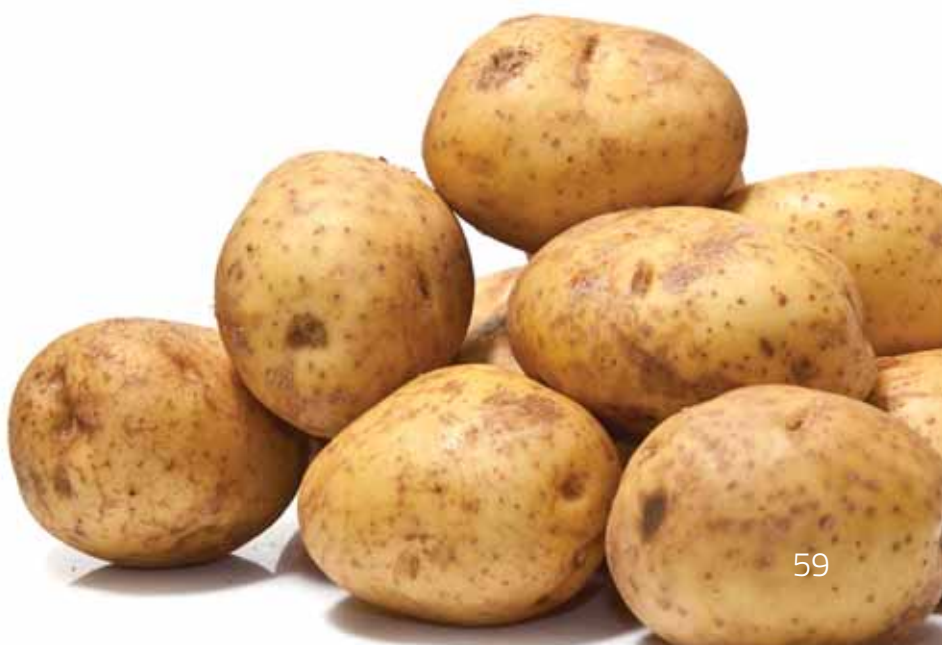
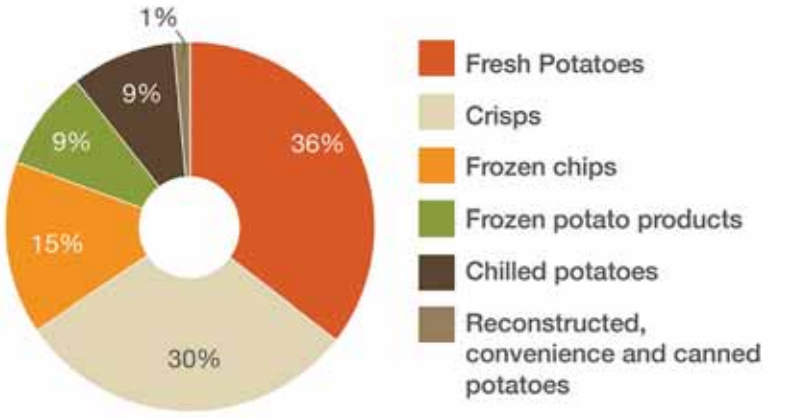


FIGURE 2



Source: Kantar Worldpanel, 52 weeks to August 2017

ABOVE: Breakdown of the share of the potato sector market by value of sales

"Potato breeders have been working on low-sugar varieties for many years and the crisp industry is well served with established low acrylamide varieties such as Lady Claire"

Will it be profitable? With a near infinite number of variables affecting variety choice, such as pests, diseases, soil types, market requirements, farm infrastructure and so on, growers must be careful to match the right variety to their prevailing circumstances. This requirement for a consistent performance on the farm and in the factory has driven, and continues to drive, potato-variety breeding and development, and there are numerous opportunities for breeders to replace the existing portfolio of varieties. All varieties have weaknesses in their performance, and a new variety that brings a benefit to any part of the supply chain can be quite lucrative for a breeder, as plant-variety rights (essentially a patent that lasts for 30 years) ensure that anyone growing a controlled variety must pay a licence fee to the breeder to do so. After 30 years the variety rights expire and the variety can be grown by anyone without paying the original breeder for usage.

Laborious process

To produce a new potato variety using traditional potato breeding techniques is a laborious process that uses educated guess-work to select parents with traits that would be desirable in their offspring. Plants are cross-pollinated by transferring pollen between flowers manually using a small paint brush. A cross-pollinated flower will in time develop into a potato berry that can contain up to 200 seeds, each of which is a new variety that must be grown into a mature plant and tested to establish if the desirable traits have been passed on from parents to progeny.

While the initial growing and crossing of parents is quite laborious, the subsequent testing of the progeny requires much more resource, as the new offspring must reproduce themselves (as tubers) to provide plants for the myriad tests that a new potato variety must pass in order to make it to the market place, a process that traditionally took 10 to 14 years.

While one potato berry can typically yield up to 200 seeds and therefore 200 new varieties, a typical commercial breeding program will produce hundreds of thousands of new clones for testing each year. A breeding program of this scale traditionally used huge amounts of resources for trialling and testing, and breeders needed to be ruthless in their selection of clones to take forward and clones to eliminate from their program, always bearing in mind that while a clone may not make it as a commercial variety, it could be a useful parent if some traits are expressed.

The sequencing of the potato genome in 2011 gave potato breeders a whole new tool box that initially allowed them to 'cut and paste' the genes that controlled the expression variety traits in the form of genetically modified potatoes. The use (and possibly abuse) of this technology, however, led to the well-documented consumer resistance to GMOs and their failure thus far to gain acceptance in Europe. Plant breeders have, though, been able to use this genetic tool box to enhance the process

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> *"Breeders are investing heavily in robotic technology"*

of traditional breeding by identifying which genes, or combinations of genes, control specific traits in potato clones. This knowledge allows breeders to select parents that express these genes and cross them with a greater degree of confidence that the progeny will also have the appropriate genes and will therefore express the desired trait or traits.

While this new process of selecting parents for the initial crossing process is far more precise and should give a higher success rate, the laborious and resource-hungry process of testing the progeny to establish if desirable traits are present has largely been replaced by a simple DNA test that can be conducted on a leaf sample from a progeny plant. If the genes that control the desired trait are not present the clone is eliminated in year one, rather than in year three or four, thereby shortening the process of variety development from 10 to 14 years to seven to 10 years. The volume of DNA testing required has led to this process becoming mechanised, and breeders are investing heavily in robotic technology to further speed up this process.

An example of where this technology is being deployed is to accelerate the development of low acrylamide potato varieties. Acrylamide forms naturally when sugars transform during high-temperature cooking processes, such as frying, roasting and baking, and they are present in foods such as coffee, bread and potatoes. Food businesses in the UK are required to put into place practical steps to manage acrylamides within their food safety systems from April 2018, and the first step listed in the FoodDrinkEurope Toolkit[1] is 'Only use suitable (low sugar) potato varieties'.

To date, the potato processing industry has been very active in driving down acrylamide levels and this has led to some varieties being rapidly eliminated from raw material supply programs. Fortunately potato breeders have been working on low-sugar varieties for many years and the crisp industry is well served with established low acrylamide varieties, such as Lady Claire.

The fluid landscape of consumer legislation, consumer demands, agronomic challenges, depletion of soil and water resources, and a growing population who want reliable and nutritious food mean that the sequencing of the potato genome, and all the new technologies that this has enabled, could not have come at a better time. The breeding industry is now well equipped to increase the speed of variety development to meet the demand for new varieties. How the industry as a whole will respond to Brexit remains to be seen – and speculation could fuel an entirely separate feature...

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EXPERT VIEW

Sue Springett
Commercial Manager, Teknomek

Cutting costs without compromising on hygiene control

The UK food industry is one of the most tightly regulated in the world. This means maintaining hygiene standards invariably takes a significant chunk of the operating budget for food processing facilities. In fact, as much as five per cent of a business's staff are permanently assigned to cleaning.

THE alternative can be inconvenient and expensive in the case of a failed audit, or positively disastrous if a food poisoning outbreak is traced back to the facility.

Against this background, managers are often under significant pressure to meet cost-reduction targets. Striking a balance between meeting standards while controlling costs is one of the greatest challenges facing hygiene and quality control in this sector.

Thankfully when it comes to making cost savings, we've seen many companies successfully drive efficiencies by enabling the cleaning to be smarter, thus reducing overall clean down times. The secret lies in selecting furniture and equipment that have fewer 'dirt traps' – ledges, seams, raised welds etc – and that offers easy access from all angles, making it, and the areas around it, inherently easy to clean. Many amber alerts revealed by audits could be eliminated at the point of purchase by conducting a few basic design checks.

However, managing hygiene is a mindset as much as a process, and instilling a hygiene culture is key to reducing risk. This goes beyond signage and the outcome should be that staff put hygiene first in everything they do – and without having to think too hard about it.

Creating a hygiene-first working environment, coupled with a smarter approach will cut down clean-down times. Even if you're reducing the number of staff permanently engaged in cleaning from five to 4.9, the cost savings will soon add up, which makes any initial outlay required a very worthwhile investment.

> *"As much as five per cent of a business's staff are permanently assigned to cleaning"*

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Meat use-by dates: An exercise in both risk and crisis management

Recent high-profile product recalls and withdrawals have shaken the confidence of retail buyers and consumers alike. To complicate matters, there has been considerable confusion when trying to distinguish between failures to follow guidance (which can be remedied) and serious, fraudulent or criminal activity. *Nick Allen* looks at what processors and manufacturers can do to protect themselves.

THE larger retail and hospitality chains have in-house technical teams they can call on to navigate their way through the complicated, and in some cases overly precautionary, official food safety guidance. They can separate fraud from less serious enforcement issues and work constructively with their suppliers to ensure they are applying the right rules to different meat products.

However, smaller groups, intermediate food manufacturers and individual buyers often lack that detailed information and have been imposing a blanket restriction on product use-by dates without understanding the full facts. This has led to needless food waste and disruption to the supply of products that would actually comply with the FSA's guidance.

Responsibility falls on meat processors and manufacturers not just to ensure they are compliant with FSA guidance but to communicate clearly and openly with their customers to demonstrate that compliance.

Managing the risks

Whether a Food Business Operator (FBO) is compliant or not revolves around being able to demonstrate to an FSA auditor that the company's food safety management procedures are based on

Hazard Analysis and Critical Control Point (HACCP) principles; that a plan is in place; and that it is being applied correctly.

FBOs must demonstrate that the risks have been considered and understood and also provide evidence of relevant control procedures. This can be done by gathering internal documents, FSA 2017 guidance and other existing scientific data as evidence to support your manufacturing process decisions.

A number of methods can be used to gather this evidence, which range from predictive microbiology modelling through to historical data and specific laboratory shelf-life studies.

Know your entire supply chain

C. botulinum will not grow below 3°C. As part of a company's HACCP plan, consideration must be given not just to the temperature during manufacture and packaging, but also the likely temperature a product will be held at throughout the *entire supply chain*. This includes distribution, retail and the end customer.

Manufacturers will need to satisfy an auditor that the risk of C. botulinum growing has been considered during the whole shelf life of the product.

In addition to considering what happens to meat products when they leave the factory, manufacturers must also take into account what happened before they arrived. This means understanding how those products have been processed and stored at every step of the way.

A spokesman for the FSA confirmed that: "A food business in another EU country or a third

EXPERT VIEW

Colin Maher
Country Manager UK & Ireland, Minebea Intec

"Service engineers should use a starting reference to determine the dynamic weight"

How do you check the accuracy of an inline checkweigher?

There is widespread misunderstanding on how to measure the accuracy of a checkweigher, and even greater confusion as to how to comply with regulations.

THE most common misunderstanding when it comes to inline checkweighers is that they should be calibrated in the same way as a static scale, meaning you stop the transport system, place weights on the weighing conveyor and, if this is OK, the checkweigher is accurate. However, you have to consider the additional errors introduced when you start the conveyor, and the checkweigher is working with additional vibration and in motion. Only a checkweigher that has a weigh cell designed to work in this way will meet the required accuracy standard.

Service engineers should use a starting reference to determine the dynamic weight. For example, the checkweigher can weigh a product at 500g statically but when in motion the display shows 502g. Thus the checkweigher would need to correct the dynamic by -2g. Ideally, a checkweigher's auto dynamic calibration will adjust for this by taking a static reference first and then measuring the difference.

The other misunderstanding concerns calibration weight. Even if this is the same as your product it will have a different dynamic effect, due to its difference in length and shape.

One of the first checks is to determine the Zone of Indecision (Zoi); a globally accepted calculation and simply six times the standard deviation of a number of readings with the same product.

This test will determine the repeatability of the checkweigher with the product – essential because the other test to a known mass cannot be determined without it.

Find out how to do the test in the next issue of *New Food*.

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The true measure

country supplying businesses in the UK should ensure the food products they supply are safe, should have control factors in place to justify the shelf lives they apply and should ensure that the product will remain safe during the shelf life they apply.

"UK food businesses ordering vacuum-packed or modified-atmosphere-packed cured meat products from another country should ensure their supplier has appropriate controls in place."

Firms must satisfy themselves that they've looked at the technical details, understood what they need to do and then implemented the right measures.

Official guidance and the 10-day rule

The '10-day rule' can be confusing and the date it is applied from will depend on how products have been processed and stored.

The FSA has published full guidance (https://www.food.gov.uk/business-industry/manufacturers/shelf-life-storage/vacpac) as well as a shorter fact sheet that provides details on what manufacturers should have in place to remain compliant. The BMPA has also issued information about the elements that should be considered when assessing adequacy of risk mitigation for C. botulinum in chilled vacuum / MAP foods.

The following check list is intended as an overview:

- Below temperatures of 3°C, C. botulinum will not grow
- A maximum 10-day shelf life (use-by date) is recommended for VP/MAP foods stored at temperatures between 3-8°C if other controlling factors are not used
- For a shelf life of more than 10 days, in addition to chill temperatures, controlling factors should be used either on their own or in combination

Controlling Factors

- Heat treatment of 90°C for 10 minutes, or a time and temperature combination sufficient to kill C. botulinum spores. This must be reached in the part that takes the longest time to heat up, e.g. in the centre of the food, and have been applied to the product in the *sealed final* pack
- PH of five or less in all parts of the food. Foods containing meat or fats are very difficult to acidify uniformly and extra care should be taken
- Minimum salt level of 3.5 per cent in the water phase throughout all parts of the food
- Water activity of 0.97 per cent or less in all components of the food

- Combination of the controlling factors can be used at lower levels or with other preservative factors, such as nitrite. These must be shown to be safe using expert scientific advice, however.

Further processing and re-wrapping

Rewrapping VP/MAP foods: if a VP/MAP product is unwrapped for slicing or portioning and then rewrapped as a VP/MAP product, the shelf-life should not be extended beyond the shelf-life of the original VP/MAP product.

When VP/MAP foods are used as ingredients in other products, the shelf-life should not be extended beyond the shelf-life of the original ingredients, unless it has received a treatment that is sufficient to kill or stop the growth of harmful bacteria.

Frozen food

In the case of meat that has to be frozen and then sold on after the original use-by date has expired, companies must be able to demonstrate when freezing was undertaken and provide instructions on how the product can be further used.

If the freezing date is not documented there will be no proof that this was undertaken prior to the use-by date expiring and the product cannot be sold on.

Managing expectations

To put the risks into perspective, over the last 30 years the UK's chilled food industry has produced an estimated 20 billion chilled ready meals and a similar number of other vacuum packed raw and cooked products. In that time there have been no reported cases of C. botulinum food poisoning from meat with shelf lives up to

EXPERT VIEW

Alison Johnson
Managing Director,
Food Forensics

"Salad crops tend to show good differentiation between organic and conventional production"

Validating organic claims

As a growing high-premium sector with few validation tools in support of paper traceability, Organics would seem an obvious high-risk area.

THERE is no 'test' for organic per se, but there are tests to verify and support organic production techniques. These do not prove that a product is organic, but can be used in support of other evidence.

The core principle of organic production is that it should be sustainable, and as such there are restrictions on use of GM material as well as pesticide treatments and the use of artificial fertiliser. The presence of all three of these can be tested for. For artificial fertiliser use, Stable Isotope Ratio Analysis is useful. Artificial N is manufactured using the Haber process to fix N from the air. Air has an isotopic composition of 0 per mil and so artificial fertiliser N is similarly around ±0 mil.

When nitrogen moves up the trophic scale or undergoes any kind of microbial degradation the nitrogen composition becomes more positive. Therefore, it is expected that most organic produce would have a positive nitrogen isotopic composition. It would be unusual to find organic products with a zero to negative nitrogen isotopic composition.

There are some products that demonstrate exceptional segregation – these tend to be protected crops where the inputs are completely controlled. Salad crops tend to show good differentiation between organic and conventional production.

Field crops often have greater variation. Crops pick up the isotopic signals from their nitrogen sources (soil, fertilisers), so unexpected results should be followed up with investigations into the isotopic composition of nitrogen sources – do not forget to check any foliar sprays that are being used.

There have been reports of fraudulent fertilisers in Spain this year, so the risks are not limited to final product substitution – the risks include the inputs, too.

For further advice or support on organic testing contact Food Forensics.

ABOUT THE AUTHOR

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www.britishmeatindustry.org

10 days and more. Issues have only ever arisen when foods have not been stored at the correct temperature either during sale or in the home, which is not a production issue. This clean track record has been demonstrated by an extensive review commissioned by the FSA[1].

One of the major findings of a series of recent publicly funded, peer-reviewed studies[2] (producing the largest data set of its kind in the world) is that fresh meat actually had the lowest spore loading of *any* food category. This adds to a growing body of evidence that suggests vacuum- and modified-atmosphere packed meat (VP/MAP) is a much lower risk than previously thought.

How can manufacturers reassure meat buyers?

The British Meat Processors Association advises suppliers to provide clear information about the products they sell in the form of a technical specification for each product. This should include information proving that the product has been processed and stored according to FSA guidelines to justify the use-by date quoted.

Buyers may also want to check a supplier's latest FSA audit results on the 'Approved Establishments' register. If you have had any breaches, you should be prepared to discuss this with your customer to clarify what kind of breach it was and what has been put in place to remedy it.

With all the negative publicity surrounding certain high-profile manufacturers, it's sometimes difficult for buyers to understand what is a serious (often criminal) breach and what would be considered less serious and, above all, rectifiable.

Open, clear and honest communication backed up by documented evidence is key to this kind of expectation and crisis management.

An evolving situation

This is a complicated and changing issue and the latest guidance has imposed extremely precautionary restrictions on the shelf life of meat and meat products.

Working closely with the FSA, the British Meat Processors Association (BMPA) is currently conducting four research programmes that will help regulators to understand better the risk of botulism from chilled VP/MAP fresh meat and assist in setting more technically appropriate restrictions that, in turn, will provide confidence to producers, buyers and consumers.

BMPA has comprehensive and detailed information for its members, as well as a helpline to assist member companies to understand and apply the FSA's guidance. As findings become available from ongoing research projects, the results and further advice will be made available to both members and non-members that wish to participate in these projects.

REFERENCES

1. M.W. Peck *et al* 'Clostridium botulinum in vacuum packed (VP) and modified atmostphere packed (MAP) chilled foods", Project B13006, July 2006

2. Barker *et al* 'Quantification of non-proteolytic Clostridium botulinum spore loads in food materials', http://aem.asm.org/content/early/2016/01/04/AEM.03630-15.

EXPERT VIEW

John Lee
Regulatory Specialist, Premier Analytical Services

"Very small amounts of BPA are known to be able to transfer from packaging to food or drink products"

All about bisphenol

Bisphenol A (BPA) is a chemical compound used in the production of some plastics and resins. These materials are often used within the food industry as either food containers/bottles or as protective coatings/ lining in cans for foods or beverages.

Very small amounts of BPA are known to be able to transfer from packaging to food or drink products. EFSA published is re-evaluation in January 2015 when it reduced the Tolerable Daily Intake (TDI) for BPA from 50 to 4 µg/kg bw/day, as well as stating that in EFSA's opinion there is no concern to public health from current levels of BPA.

Commission Regulation (EU) 2018/213 on the use of BPA in varnishes and coatings intended to come into contact with food and amending Regulation (EU) No 10/2011 as regards the use of BPA in plastic food contact materials was published in the EU Official Journal on 14 February 2018.

The Regulation introduces a specific migration limit (SML) of 0.05 mg/kg food for the migration into or onto food of BPA from varnishes or coatings applied to packaging materials. Migration of BPA from varnishes or coatings applied to packaging materials intended to come into contact with products intended for infants or young children is not permitted.

The SML for migration from plastics is lowered from 0.6 to 0.05 mg/kg food. BPA is not to be used for the manufacture of polycarbonate infant feeding bottles or spill-wproof drinking cups intended for young children.

The new regulation will apply from 6 September 2018 across the EU. Packaging that is lawfully placed on the market before 6 September 2018 but does not comply with the new requirements may remain on the market until exhaustion of stocks.

Bisphenol A analysis is available from PAS in food products and packaging (using stimulants) with a limit of detection between 1-3 ppb.

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

april

10 Analytica
Date: 10-13 April
Location: Munich, Germany

16 Alimentaria
Date: 16-19 April
Location: Barcelona, Spain

may

15 Vitafoods
Date: 15-17 May
Location: Geneva, Switzerland

22 EPRW 2018
Date: 22-25 May
Location: Munich, Germany

28 The Belfast Summit on Global Food Integrity
Date: 28-31 May
Location: Belfast, N. Ireland

june

07 Sustainable Food Summit
Date: 7-8 June
Location: Amsterdam, Netherlands

11 ACHEMA2018
Date: 11-15 June
Location: Frankfurt, Germany

19 Global Dairy Congress
Date: 19-21 June
Location: Warsaw, Poland

july

08 IAFP 2018
Date: -11 July
Location: Salt Lake City, USA

15 IFT 2018
Date: 15-18 July
Location: Chicago, USA

august

26 Dioxin 2018
Date: 26-31 August
Location: Kraków, Poland

november

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