THE PROBLEM WITH PLASTIC

Plastic pollution of the oceans is an environmental disaster, but is there a food scare lurking beneath the waves too? Journalist David Burrows reports.

Last year’s Volvo Ocean Race lasted eight months and covered 45,000 nautical miles. En route, one of the teams – “Turn The Tide On Plastics” – diligently collected water samples that could be tested for the presence of microplastics – small pieces of plastic measuring less than 5mm. The data was used to create a microplastics map of the world’s oceans, which highlights just how ubiquitous these particles are: only three of the 75 samples collected contained no microplastics.

Few of those close to the topic of plastic pollution – arguably the environmental issue of 2018 – will have been surprised by the findings. However, it’s worth recapping what we know so far. Each year, at least eight million tonnes of plastics “leak” into the ocean, according to the Ellen MacArthur Foundation (EMF), a think-tank dedicated to driving a “new plastics economy”. To put that in context, that’s about five garbage truckloads in the time it takes to read this article (a rate of one truck per minute). Plastic packaging represents a “major share” of this leakage, according to the EMF; indeed, carry on like this and by 2050 there will be more plastic in the sea than fish (by weight).

“Plastic is everywhere, and suddenly we have decided that is a very bad thing,” noted Stephen Buranyi in an article for The Guardian in November 2018 (“The Plastic Backlash: What’s Behind Our Sudden Rage – And Will It Make A Difference?”). The public is up in arms – thousands of them posted crisp packets back to Walkers, and many more have ripped off excessive packaging at supermarket checkouts in “plastic attacks”. And in the past 12 months only animal welfare and caged poultry attracted more activity from campaign groups, according to tracking firm Sigwatch.

Those in the food sector have been forced to react – many have whipped up new packaging policies and been quick to sign up to industry commitments like the UK Plastics Pact. The development
What exactly do we mean by food security? It’s a widely recognised concept – in fact, the average world supply of calories was over 2,800kcal per person per day in 1961 to 83g in 2013 and is almost double that figure in North America. This, in turn, has come at a significant cost not only to our own health but to the environment already. Food safety issue or not, it’s certainly an issue that everything is fine just because we don’t know for sure.

Indeed, wherever researchers have looked in our food and drink chain, they’ve found plastic: honey, beer, bottled and tap water, sea salt and of course seafood. “The problem is wide-scale and the concentrations are low,” Richard Thompson, professor of marine biology at Plymouth University, UK, told me in an interview for EU Observer in December 2017, “but if we carry on as normal and have this conversation again in 20 years’ time we may well have reached concentration levels that are a concern.”

It was Thompson and his team who, all the way back in 2004, showed that waters around the north-east Atlantic had become contaminated by microscopic fragments of plastic and that the abundance of this material had increased significantly over time. In 2013, their research published in the journal Marine Pollution Bulletin showed plastics in 184 of the 504 fish they examined from the English Channel. Species assessed included whiting, horse mackerel, John Dory and red gurnard. There is now a rich library of similar research. In 2016, for example, a study published in the journal Nature, showed that 28% of fish and shellfish on sale in Indonesia had eaten man-made debris – and all of it was plastic. The authors said that because anthropogenic debris is associated with a “cocktail of priority pollutants”, some of which can transfer to animals upon ingestion, their findings support concern that chemicals from man-made debris may be transferred to humans via diets containing fish and shellfish. This, they added, raises important questions regarding the bioaccumulation and biomagnification of chemicals and consequences for human health.

Indeed, the tiny plastic particles floating about in the sea can act like sponges for persistent bioaccumulating toxins, so anything that mistakenly eats them gets a shot of this chemical cocktail. The plastics sector has played this effect down, but the impact this could have further up the food chain is not yet clear. Last year, the Journal Current Opinion in Environmental Science & Health ran a special issue on micro- and nanoplastics – the latter measured in the millions of a millimetre. A paper by Messika Revel, Amélie Châtel and Catherine Mouneyrac reviewed the evidence to date. They concluded that the adverse effects from micro- and nanoplastics may result from a combination of the plastic’s intrinsic toxicity (such as physical damage); chemical composition (for example, the leaching of additives); and ability to adsorb, concentrate, and release environmental pollutants into the organisms. Microplastics could also serve as a vector for pathogens, they said, and since they have been detected in various trophic levels, additional studies are needed to assess the bioaccumulation of adsorbed contaminants and eventually biomagnification, which “may occur in higher trophic levels, and could eventually affect human health”.

“THOSE IN THE FOOD SECTOR HAVE BEEN FORCED TO REACT”

In October 2018, experts at the Medical University of Vienna and the Environment Agency Austria published the results of a pilot study involving a small group of participants (eight) from countries across the world, including Finland, Italy, Japan, the Netherlands, Poland, Russia, the UK and Austria. Each person was put on a diet for two weeks leading up to a stool sampling. The diaries showed that all participants were exposed to plastics by consuming plastic wrapped foods or drinking from plastic bottles. None of the participants were vegetarians and six of them consumed sea fish. Up to nine different plastics, sized between 50 and 500 micrometres, were found, with polypropylene (PP) and polyethylene terephthalate (PET) the most common. On average, the researchers found 20 microplastic particles per 10g of stool. Microplastic may impact human health via the gastrointestinal tract, the team noted, where it could affect the tolerance and immune response of the gut by bioaccumulation or aiding transmission of toxic chemicals and pathogens. Dr Philipp Schwabl led the research. “While the highest plastic concentrations in animal studies have been found in the gut, the smallest microplastic particles are capable of entering the blood stream, lymphatic system and may even reach the liver,” he said.

“So that we have first evidence for microplastics inside humans, we need further research to understand what this means for human health.”

The evidence is stacking up that the bountiful supply of cheap, uniform, largely safe food. And plentiful supplies of cheap, uniform, largely safe food. And so the answers are there. But what do the regulators and governments do? Who looks after us? Is the establishment of a ‘safe’ threshold for plastic in water and food on the cards? The most recent opinion published by the European Food Safety Authority (EFSA) on this subject was in 2016. Are they harmful to consumers? “It’s too early to say but it seems unlikely, at least for microplastics,” said Dr Peter Holman, a member of the working group that helped EFSA’s Panel on Contaminants in the Food Chain (CONTAM) draft the statement. However, nanoparticles, which have received less attention to date, could pose more problems. “Knowledge on the toxicity of nanoparticles is particularly needed because these particles may penetrate all kinds of tissues and eventually end up in cells,” he said. “Research should generate data on the occurrence of microplastics and especially nanoparticles in food, their fate in the gastrointestinal tract, and their toxicity.” Researchers at Lund University, Sweden, have since discovered that nanosized plastic particles can accumulate in fish brains and cause damage.

In the UK, the chief medical officer has been keen not to rock the boat and create a food scare based on current evidence. In her 2017 report, “Health Impacts Of All Pollution – What Do We Know?” – Professor Dame Sally Davies dedicated just six paragraphs of the 187-pages to microplastics. “Exposure to microplastics through food is possible, based on studies of seafood; however, it is unknown if this translates into meaningful exposure in the population,” the report reads, whilst human exposure, hazard and therefore consequences of exposure to these microplastics are “largely unquantified”. This is not just about plastic in the sea, either. In fact, dietary exposure to microplastic particles is likely to be relatively low compared with inhalation of microplastics, according to Food Standards Agency evidence submitted to an Environmental Audit Committee enquiry in 2016. “We need to establish toxic characteristics of microplastics, their behaviour in the body, and what constitutes a safe threshold for exposure when plastics are either ingested or inhaled,” explained Stephanie Wright from King’s College London in an article for the British Medical Journal in September 2017. “We must also relate these data to the different sources, types of plastic, and concentrations we are currently exposed to and, importantly, will be exposed to in the future thanks to the growing global addiction to plastic in all its forms.”

Indeed, production of plastic packaging is forecast to double in the next 15 years, to more than 150 million tonnes. Currently, 32% of what is produced leaks into the environment – and whatever toxic effects are discovered in the future, it is going to be impossible to withdraw all those particles floating around in the environment already. Food safety issue or not, it’s certainly an uncomfortable thought.

ABOUT DAVID

David is a freelance writer specialising in sustainability and food/tech. A graduate in agricultural sciences, and a postgraduate in periodical journalism, David is currently freelance writer, editor and researcher for several food/ business publications, including Poultry Business, Farmer’s Guardian and Retail Week.
Facilitating the transfer of research knowledge to SMEs is at the heart of what online magazine tasteofscience.com aims to do. Here, Dr Helena McMahon – External Service Manager at Institute of Technology, Tralee, and co-founder of the website – explains the importance of this resource.

There are huge amounts of really valuable technology developments going into literature that food entrepreneurs are either not aware of, or can't decipher from the knowledge that is presented,” explains Dr Helena McMahon. Collaboration between researchers and industry is key to drive innovation within the food sector. However, as Helena points out, many SMEs cannot access developments in research easily or understand how to apply these findings to their everyday business. With this in mind, Helena and a group of peers who were working on the European project TRADEIT – aimed at protecting Europe’s food heritage – were tasked with addressing this issue and the launch of www.tasteofscience.com followed in 2015.

Helena’s own career began with a keen interest in the human genome and how it worked. “I’ve always been fascinated with science and biology, and how things work,” she says. “I completed a degree in biomedical science in UCD, followed by a Masters in genetics in Trinity, examining why alterations in genetic code lead to particular disorders and how to leverage your genetic code to develop therapeutics in the whole area of personalised medicine.” Helena went on to do a PhD in gene and cellular therapeutics, focused on brittle bone disease before moving into the area of nutrigenomics, examining the impact of diet on the quality of pork at Teagasc. Her career in the area of food and food ingredients progressed at Shannon Applied Biotechnology Centre in Tralee where she spent time extracting polysaccharides from algae to use in functional foods. “The whole area of creating novel ingredients isolated from plants led me to the issue of funding to support technological transfer and innovation into food companies with the TRADEIT project.” The TRADEIT project was developed to support small scale food producers, particularly those that produce traditional or artisan food products. “Working on this project was enlightening in terms of the challenges that food companies encounter when dealing with technology from universities. A lot of the technology produced can be easily applied by large scale food companies however the vast majority of food businesses are SMEs and 80% have less than 10 employees. So, we decided to launch an online open innovation platform for the food industry that would present very technical scientific developments in a way that is more accessible to individuals who run SMEs. It offers the information in a journalistic style, explaining how the research can benefit businesses.” When Helena started working on tasteofscience.com she held the role of principle investigator within Shannon Applied Biotechnology Centre, working in the area of research and securing funding at a national level. Today,

The taste of science website is constantly growing and Helena views it as an important resource for Ireland’s SMEs working within the food sector. “We are growing our network and evolving our content. It started out with just a small group of partners and now we have grown our reach to over 10,000 SMEs across Europe.”

Commenting on the practical success of the website, Helena points to an example of one company that accessed research through the site. “A small Irish ice-cream producer was having trouble with its supply chain and managing the export of ice-cream from Ireland to Europe. The challenge was that the ice-cream was thawing en route and the company could not identify the point at which this was happening. With the research they accessed on the site they were able to get a sensor that could be placed on their packages and therefore identify the break in their supply chain.”

The website is supported by social media accounts, which is a key part of the communication strategy: “Social media is a really powerful way of delivering short pieces of information to our readers and a lot of our engagement comes through Twitter and Facebook.” Users can also create a profile on tasteofscience.com to ensure they receive more targeted information and they can sign up for summary newsletters with articles that are in line with the company profile.

Looking forward, Helena says that they are keen to develop partnerships with universities: “It’s a tool that universities can use to promote their research output to the industry and also use it as an open science platform. And we would also like to start partnerships with food associations looking to get high quality content to their members.”

For more information visit www.tasteofscience.com

ABOUT HELENA

Childhood: Born and raised in Tralee. Educated locally and emigrated for a number of years before the Kingdom called her back to Ireland in 2009.

Hobbies: “I’ve recently taken up golf and there is nothing better than a good podcast and running by the sea with friends.”

Favourite foods: “I’m not big on cooking but am really big on eating. Come to my house, bring a dish, and we can sit around chatting for hours.”

Dr. Helena McMahon

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What exactly do we mean by food security? It’s a widely recognised concept – in fact, the average world supply of calories was over 2,800kcal per person per day in 1961 to 83g in 2013 and is almost mean average world fat supply has grown from 48g per person per day to 23g in 2013. These are both legitimate viewpoints; but there’s a growing realisation among governments, academics and the public that a more effective approach is needed to ensure long-term food security.

Dr Mairead McCann (safefood) attending the “Women In The Sciences” reception, marking International Women’s Day hosted by the President Michael D. Higgins and his wife Sabina.

The safefood Knowledge Network recently sponsored the Food Safety Champion Award at the Northern Ireland Food and Drink Awards 2019. Pictured: Dr Gary Kearney (safefood) presenting the winner Hilary Faith from Pritchills with her award.

FSA: Regulating Our KNOWLEDGE NETWORK NEWSLETTER APRIL 2018

The safefood Food Safety Skills Fund Programme enables safefood Knowledge Network members to enhance their skills, broaden their expertise and create linkages between those involved in food safety on the island of Ireland. Members can visit other laboratories, attend conferences, centres of excellence and other training events that are food safety related.

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NEW FOOD SAFETY DEVELOPMENT AWARD

The safefood Knowledge Network will shortly launch a Food Safety Development Award. It is to recognise food safety research carried out on the island of Ireland that has been successfully implemented along the food production chain (from farm to fork) and that has clearly had a positive impact on food safety. The competition will open on Friday 10th May 2019 with a final date for receipt of entries of Friday 7th June 2019. For the entry form and competition guidelines please go to www.safefoodkn.eu.

In partnership with the Environmental Health Service in Northern Ireland, the safefood Knowledge Network organised training workshops across the region. The aim was to help food businesses operators understand the various factors that can influence the shelf life of the food products they produce and how to validate a food product’s shelf life. Four one-day workshops were held in Antrim (11th March), Newtownabbey (12th March), Cookstown (13th March) and Newcastle (14th March).

Participants at the laboratory training in Belfast.

Participants at the Shelf Life training in Newtownabbey.

In March, the Knowledge Network ran four one-day training workshops for staff in food testing laboratories (public and private) entitled “Transition to ISO 17025:2017”. The workshops took place at the following locations: Belfast (7th March), Cork (26th March), Galway (7th March) and Dublin (28th March).

They were designed to give laboratory management and staff a good understanding of the new Laboratory ISO 17025:2017 standard. The workshops covered its aims, status and relationship with other standards and how, through international agreements, accreditation to this standard continues to provide worldwide recognition.

FOOD SAFETY TRAINING WORKSHOPS FOR SMES

safefood has launched the 2019 series of workshops for small and medium-sized food businesses in association with Teagasc, entitled ‘Food Safety: Helping You To Get It Right’. These workshops will provide practical advice and cover areas such as:

- Food Allergens In A Nutshell
- Food Labelling: What You Need To Know
- The Role of Packaging In Food Safety
- Food Hygiene Essentials: A Clean Regime
- Controlling Food-POisoning Bacteria

Workshops are free, but places are limited, and allocated on a first come, first served basis. To register to attend, please visit www.safefood.eu/events

22nd May 2019 Cork
23rd May 2019 Killarney
4th September 2019 Dublin North
5th September 2019 Belfast
17th September 2019 Sligo
18th September 2019 Ballinasloe

For more information please email novinevents@safefood.eu

In honour of its 20th anniversary, in 2019, the Food Safety Authority of Ireland (FSAI) is hosting a two-day international food science conference. “The Science of Food Safety – What’s Our Future?” takes place in Dublin’s Convention Centre on 21st and 22nd August and will focus on microbiological safety and chemical safety. Attendees will hear from international and national keynote speakers, speakers chosen from abstracts and student posters, and enjoy social event, with a chance to network with others in the industry. For more information go to www.foodsafety2019.com.

The Science of Food Safety - What’s Our Future? 21st & 22nd August 2019 The Convention Centre, Dublin

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The productionist model of food supply that has gone largely unchallenged since WWII has been hugely successful in producing plentiful supplies of cheap, uniform, largely safe food. And the evidence is stacking up that the bountiful supply of cheap, convenient food that many of us now take for granted has come at significant cost not only to our own health but to the health of the planet too. In 2009, a group of 28 internationally recognized experts concluded that if the current pace of obesity continues, it will result in doubling the number of deaths worldwide that are overweight or obese with the result that non-communicable diseases such as heart disease, strokes and diabetes will be the leading cause of death in all regions except Africa.

Future FSA: Regulating Our Food Fortress

The answer to the previous crossword was FESTIVE

CONGRATULATIONS TO THE WINNER OF OUR LAST CROSSWORD COMPETITION, DR. LEONIE WALLACE, PUBLIC ANALYST’S LIBRARY, GALWAY. The answer to the previous crossword was FESTIVE

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We’d love to hear from you. Would you like us to feature your research or industry sector? What else would you like us to cover in the world of food safety? Send your article ideas, feedback and suggestions to knowledgenetwork@safefood.eu.

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