

Research Needs 2022

Project Priorities



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Food Safety Authority of Ireland
The Exchange, George's Dock, IFSC,
Dublin 1, D01 P2V6

T +353 1 817 1300
E info@fsai.ie

www.fsai.ie

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Research needs 2022

Project priorities

The Food Safety Authority of Ireland (FSAI) has a mandate to enforce food law and protect consumer health in relation to food marketed and produced in Ireland. Its brief covers food safety, hygiene, and certain aspects of nutrition. Food safety research is essential in order to address any gaps in food safety knowledge, and also in order to support food safety regulations as well as identify emerging issues and threats to the food system in Ireland.

The FSAI is not a research funding body and therefore it is essential that it communicates areas of priority research to state bodies that fund research and also to scientists in research institutes. These areas can be incorporated into research calls by funding bodies, or they can be the subject of researcher-led funding proposals submitted to research funding bodies.

This document outlines priority research areas that would advance the risk assessment and risk management work of the FSAI and support the protection of public health. They are listed under broad topic headings and they include suggestions for major research projects as well as smaller desk research studies. Research funding bodies and/or researchers are invited to cite this list as supporting documentation for their calls or proposals. In addition, researchers should be aware of relevant projects already funded in the areas listed, in order to reduce overlaps and address gaps in the evidence base.

The FSAI would be happy to discuss the detail of proposed research topics with researchers who wish to make applications to research funding bodies in these areas of interest. Where projects are underway or are planned in these research areas, the FSAI would be grateful if researchers and/or research funding bodies could notify the Authority via the FSAI Advice Line (info@fsai.ie).

Project priorities

Exposure assessment

Research area	Research need	Relevant Irish research projects in progress or completed
<p>Generate specific food consumption and analytical data on food supplements targeted at body image and body composition</p>	<p>Irish legislation defines food supplements as:</p> <p>“Foodstuffs the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination, marketed in dose form, namely forms such as capsules, pastilles, tablets, pills and other similar forms, sachets of powder, ampoules of liquids, drop dispensing bottles, and other similar forms of liquids and powders designed to be taken in measured small unit quantities.”</p> <p>Consumption of food supplements is increasing globally, driven by their use in sport and also by consumers’ desire for improved body image aimed at weight loss/muscle gain goals. Food supplements can contain excess nutrients, e.g. protein, vitamins, and minerals, as well as hazardous chemical constituents such as DNP (2,4-Dinitrophenol). The value and demand for these products can also act as an incentive for fraudulent activity by illegitimate operators, including the substitution of ingredients and the addition of illicit active substances.</p> <p>Food safety risk assessment requires good data on consumption and composition of these supplements. Specifically, data are required on:</p> <ul style="list-style-type: none"> • The frequency of consumption and intake of these supplements in those aged 9–65 years • Official/self-reported harmful effects associated with these supplements • Composition, particularly the possible presence of illicit substances 	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<ul style="list-style-type: none"> • Toxicity of substances that exert a physiological effect which are included in food supplements. 	
<p>Generate specific food consumption data on seafoods for children</p>	<p>Ireland's seafood industry is expanding and has a significant impact on rural development. However, seafood consumption is not a frequent occurrence in Ireland and as such the data generated in the major food consumption studies (e.g. those carried out by the Irish Universities Nutrition Alliance (IUNA)) do not deliver enough data on seafood consumption to enable accurate exposure assessments for food safety risk assessment.</p> <p>A 2016 FSAI Scientific Committee report on marine biotoxins highlighted the need for a specific food consumption survey on shellfish (LINK), in order to better characterise the risk from exposure to biotoxins and other contaminants from consuming shellfish.</p> <p>A Food Institution Research Measure (FIRM) project (SCaRES) funded by the Department of Agriculture, Food and the Marine (DAFM) and carried out by University College Dublin (UCD) generated information on seafood (fish and shellfish) consumption in adults (aged 18 years and over).</p> <p>Similar detailed data are required for toddlers (aged 12–35 months) and children (aged 3–12 years). Particular attention should be paid to capturing consumption data on bivalve molluscs.</p>	<p>None notified</p>
<p>Use and consumption patterns of seaweed and</p>	<p>Seaweed is a relatively underexplored source of human nutrition in Ireland. Market research has indicated that the number of seaweed-flavoured foods and drinks available in Europe increased by 7% between 2011 and 2015, mainly due to the perceived health benefits of seaweed. In 2020, the FSAI Scientific Committee published a report titled <i>Safety considerations of seaweed and seaweed-derived foods</i></p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
<p>halophytes in Ireland</p>	<p><i>available on the Irish market.</i> The report noted several gaps in information that would be necessary in order to conduct a comprehensive risk assessment.</p> <p><i>Research needs:</i></p> <ul style="list-style-type: none"> • Generate quantitative information about direct consumption of seaweed and consumption of seaweed as an ingredient in other foods (not additives, e.g. thickeners) for all age groups, ranging from those aged 12 months upwards • A survey on seaweed preparation techniques, coupled with information on how the consumed seaweed was obtained (foraged, purchased at farmers' markets, purchased in health food shops, online or retail) • A study into the effects of food processing on the presence of harmful chemicals (e.g. heavy metals) should be conducted to underpin advice to consumers on how to minimise exposure to such chemicals. • A market survey in Ireland on the availability of edible seaweed species and halophytes will inform the need for risk management actions. 	
<p>Codifying national food intake data in the FoodEx2 food category system (EFSA)</p>	<p>This work needs to be undertaken in order to enable food and dietary intake habits to be considered in European Union-wide programmes that aim to create a healthier food environment. It also enables European Union-wide risk assessment by the European Food Safety Authority (EFSA), which takes eating habits in Ireland into account. (Currently, only adult food intake data are codified to FoodEx2).</p> <p>Recent developments at global level (Food and Agriculture Organization of the United Nations (FAO)/World Health Organization (WHO)) have resulted in the adoption of the FoodEx2 food intake categorisation systems. Without action to fund the codification of the rich dietary intake datasets available</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<p>in Ireland for all age groups (including preschool children, school children, and teenagers), the population of Ireland is missing out on European Union (EU) and global programmes which assess risk from nutritional and food safety perspectives.</p> <p>In addition, without codifying to FoodEx2, the detailed dietary intake data available in Ireland for almost all age groups will not be considered when establishing EU policy measures to reduce diet-related diseases.</p>	

Emerging risks and threats

Research area	Research need	Relevant Irish research projects in progress or completed
<p>The availability and mining of open source data to predict emerging food safety risks</p>	<p>The FSAI needs automated systems to identify signals of emerging risk in the food chain and present them in a dashboard for evaluation by experts as the first stage of an emerging risk identification system.</p> <p>The drivers of emerging risk can be categorised into the traditional PESTLE format: P for Political, E for Economic, S for Social, T for Technological, L for Legal, and E for Environmental. Any single driver can result in the emergence of a new food safety risk, however, it is likely that more than one will combine to create an emerging risk</p> <p>When looking for emerging risks it is important to seek data that signal their emergence. Such data can be in either a structured or unstructured form; in addition, they often need to be collated and combined before data analysis, in order to reveal patterns and correlations.</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<p>Trade flows, weather patterns, media reports, social media exchanges and peer-reviewed literature are all examples of data sources that can be used to seek signals of emerging chemical and biological risks to food. Insights into examples of emerging risks can be gained through the EFSA emerging risk exchange network reports: www.EFSA.europa.eu</p>	
<p>Food chain vulnerability assessments</p>	<p>Since the 2013 horse meat incident, competent authorities and the food industry have become more aware of the impact of food fraud. At industry level threat/vulnerability assessment is now a required feature of the supply chain. At government level, vulnerability assessment is necessary in order to prioritise monitoring and surveillance activities and to understand the security of the food chain.</p> <p>There are key supply chains in Ireland. These should be mapped, and points of vulnerability should be identified. Data monitoring and analysis approaches to signals emanating from vulnerable parts of supply chains should be developed for early warning purposes.</p> <p>Current priorities are the beef, pork, poultry, and white fish product supply chains in Ireland. It should be noted that a vulnerability assessment on the Irish dairy chain has already been completed by contractors on behalf of the FSAI.</p>	<p>None notified</p>
<p>Development of methods to detect food authenticity issues relevant to Ireland</p>	<p>Food authenticity has become an increasing feature of consumer demand and industry focus. Methods to test ingredients and validate authenticity claims are important tools for the food industry and regulators.</p> <p>With regard to the development of methods to detect food authenticity issues relevant to Ireland, the following are examples of priority areas for further research:</p> <ul style="list-style-type: none"> • Use of molecular methods to identify and quantify plant species in wet and dried mixtures of plants, e.g. herbs, botanical supplements 	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<ul style="list-style-type: none">• Metagenomic approaches for accurate geographical source identification of farmed shellfish, particularly mussels, in order to verify the origin and growing site• A reliable method or suite of methods for verifying the authenticity of Irish meat and fish, e.g. Irish grass-fed beef, Irish farmed salmon, in order to verify origin claims.	

Food science and technology

Research area	Research need	Relevant Irish research projects in progress or completed
Reduction of fat, sugar and salt in consumer foods	<p>Obesity and cardiovascular diseases are major threats to the health of the Irish population. Reformulation, with a focus on reductions in calories, total fat, saturated fat, sugar, and salt to improve the nutritional profile of food, is an important long-term activity to combat these threats. Reformulation improves public perception of the food industry, addresses health issues without requiring behavioural change, and facilitates nutritional claims, which can lead to improved sales.</p> <p>Research should focus on the feasibility of producing food products that meet all reformulation targets set by the Department of Health (i.e. total fat, saturated fat, sugar and salt) across all consumer foods categories, and particularly in those foods considered to be part of a healthy diet.</p> <p>Reformulation should simultaneously address all nutrients of concern in a product; for example, reducing sugar at the expense of fat and calorie content fails to achieve the healthier product outcome goal. Reformulation research on sugar should seek to identify practical options for the replacement of sugar with nutrients containing much lower calorific value (e.g. fibre), so as to ensure an energy reduction in the product as well as a reduction in sugar content. Such replacement options need to be rigorously researched, in order to ensure safety for all population cohorts, including children and those with fibre-sensitive conditions such as irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD). Research to identify potential adverse effects need to be quantified and such research should also include exploration of mitigating measures (e.g. warning labels, etc.).</p>	None notified
Future trends and food safety risks	Genetically engineered food and feed take desired genes from one organism and ‘cut and paste them’ into another organism. Synthetic biology, on the other hand, treats genes like computer code, remixing DNA	None notified

Research area	Research need	Relevant Irish research projects in progress or completed
<p>of synthetic biology in food production</p>	<p>sequences to create foods that are not found in nature. Research has gained momentum, with the development of high-speed automation and the falling cost of gene sequencing and synthesis. Food will inevitably be a target for the application of this technology, in order to meet sustainability targets and future global food demand.</p> <p>However, as with many new technologies, food safety aspects are rarely addressed during the development phase. A report that looks at synthetic biology, its potential use in the food sector, potential food safety aspects and articulates food safety research needs, would be a very useful resource for regulatory scientists.</p>	
<p>Rapid traceability of fresh produce farm to retail</p>	<p>Fresh produce has been associated with an increasing number of food safety incidents worldwide. In Ireland, a definitive epidemiological link has never been established, but available evidence suggests the potential involvement of fresh produce. Fresh produce moves rapidly through the fresh food chain, and the outputs of single farms can be incorporated into multiple products. Therefore, contamination at source can affect many finished products. Moreover, the protection of public health relies on rapid traceability backward and forward through the food chain to remove affected product from the market before human consumption.</p> <p>At present, traceability systems are maintained in individual companies and only list customers and suppliers. Therefore, they do not facilitate the speed of traceability and recall required for fresh produce. Consequently, research that will facilitate rapid identification and recall of unsafe fresh produce is needed in order to develop a whole-chain traceability system that is accessible by all parties and the competent authorities. Such a system should also be capable of incorporating food safety information regarding the foodstuff (e.g. results of testing for biological/chemical hazards along the chain).</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
<p>Safe land spreading of organic agricultural and organic municipal material</p>	<p>In 2008, the FSAI Scientific Committee published a comprehensive report on the food safety implications of land spreading of organic agricultural waste and organic municipal/industrial waste on land in Ireland. (LINK)</p> <p>Today, new data are needed on the concentration of chemicals and the type, numbers, prevalence and survival of pathogens in organic agricultural (OA) material, and in particular organic municipal industrial (OMI) materials used for land spreading in Ireland.</p> <p>A comprehensive review of the literature on mitigation measures to reduce identified hazards is required, and any gaps in knowledge need to be addressed by suitable research studies.</p>	<p>Assuring the Chemical and Microbial Safety of Organic Waste Spread on Land in Ireland.</p> <p>Lead: Declan Bolton, Teagasc</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure</p> <p>Start year: 2022</p>
<p>Improvements in detection methods for chemical and biological hazards</p>	<p>Contaminants, residues and microbiological hazards in foods represent a threat to the sustainability of the food industry and the health of consumers. There is a need for more accurate methods for detection of hazards, online methods for processing applications, and multiple hazard methods that are capable of simultaneously detecting a number of concurrent hazards in food. Methods need to be cheaper, simpler and faster to allow for product protection and use for hazard analysis and critical control point (HACCP) verification and monitoring in the manufacturing plant.</p>	<p>None notified</p>
<p>The safety of plant-based meat alternatives</p>	<p>Globally, there is a general desire to move to a more sustainable food system which, among other actions, requires us to embrace a more sustainable diet. Some research suggests that this may require people to consume less meat and, as a consequence, there has been an increase in the development and availability</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<p>of plant-based meat alternatives. These comprise plant proteins that are processed to mimic the properties of meat (e.g. texture, mouthfeel). Research is needed to establish the safety of plant-based meat alternatives, both in terms of microbiology and chemical safety. Issues such as allergenicity, the presence of pathogenic microorganisms, chemical contaminants arising from the protein source and its processing, and the role, if any, of antinutrients in nutrient availability require further study, in order to address the gaps in the literature.</p>	
<p>A food safety chemical profile of hemp as a food</p>	<p>Hemp is a botanical class of <i>Cannabis sativa</i> cultivars grown specifically for industrial or medicinal use. It is a versatile crop and different parts of the plant have different uses (e.g. fibres as rope, and seeds as food). In the EU some foods derived from hemp by certain processes are classed as novel foods and their safety must be evaluated by EFSA before they are authorised by the European Commission to be placed on the EU market. According to the General Food Law (EC 178/2002), even if hemp is not classified as a novel food, all hemp-derived foods must be safe before being placed on the EU market.</p> <p>The properties of hemp-derived foods and a full profile of their chemical composition would help to establish the safety of all foods derived from the hemp plant. For example, profiles should cover desirable chemicals, such as nutrients, and undesirable chemicals, such as antinutrients, contaminants, and toxins. Of particular use would be information on the detection and quantification of the 120+ cannabinoids that can be present, especially with respect to foods derived from different parts of the hemp plant. Processing, including extraction, effects on chemical composition and quantification, would also be valuable for any food safety risk assessment. The literature is a good source of information on some of these aspects, but it does not appear to be fully comprehensive.</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	The Organisation for Economic Co-operation and Development (OECD) has developed a <i>Consensus Document on key compositional considerations for various plants</i> for a number of crop species, such as rice, maize, apple, etc., and this hemp research proposal could use the OECD <i>Consensus Document</i> format to guide the type of research needed (An apple example can be found here LINK).	

Biological safety

Research area	Research need	Relevant Irish research projects in progress or completed
Reduction of antimicrobial resistance (AMR)	<p>The development of antimicrobial resistance (AMR) in pathogenic bacteria remains one of the biggest threats to human health in the 21st century. Ireland has embarked on a national action plan on AMR, which is designed to prevent, monitor and combat AMR across the health, agricultural and environmental sectors.</p> <p>Research is required in order to improve animal health and reduce the reliance on antimicrobial usage on farm. Further, research should be aimed at monitoring antimicrobial resistance development in zoonotic bacteria throughout the food chain.</p>	<p>PigNutriStrat: Novel nutritional and management strategies to reduce antimicrobial reliance and antimicrobial resistance on Irish pig farms</p> <p>Lead: John O’Doherty, UCD</p>

Research area	Research need	Relevant Irish research projects in progress or completed
		<p>Funded by: Department of Agriculture, Food and the Marine, Food Institutional Research Measure</p> <p>Start year: 2020</p> <p>Developing genetic parameters for resistance to gastrointestinal nematode infections in lambs and their incorporation into the Irish national breeding programme</p> <p>Lead: Nóirín McHugh, Teagasc</p> <p>Funded by: Department of Agriculture, Food and the Marine, Food Institutional Research Measure.</p> <p>Start year: 2022</p>

Research area	Research need	Relevant Irish research projects in progress or completed
<p>‘One Health’ mitigation measures to reduce the risk of shiga toxin-producing <i>E. coli</i> (STEC) infection in humans in Ireland</p>	<p>Ireland has the highest rate of shiga toxin-producing <i>E. coli</i> (STEC) infections in Europe. Multiple serotypes are involved, in addition to O157 and O26, which are the most common. While the high reported rate is in part due to the active surveillance of all STEC infections in Ireland, it is clear that infection from environmental sources (for example private well water and on-farm exposure) is a major contributor. Food appears to play a lesser role in human STEC infection, but environmental contamination of food produce and food animals, (for example, cattle, and sheep) can still cause outbreaks.</p> <p>Control of STEC requires a ‘One Health’ approach that involves mitigations with an environmental, animal health and human health dimension. Research is needed in order to identify practical measures that can be taken throughout the food chain and its environment to reduce the risk of STEC infection in humans.</p>	<p>Detection and Risk management of Verotoxigenic <i>E. coli</i> in the water Environment (DERIVE)</p> <p>Lead: Dr Liam Burke, NUIG</p> <p>Funding body: Environmental Protection Agency</p> <p>Start year: 2022</p>

Allergens

Research area	Research need	Relevant Irish research projects in progress or completed
<p>Development of data for allergen risk assessment</p>	<p>Currently, detection of any of the 14 food allergens listed in EU legislation (EU14), leads to withdrawal and recall if the foods are unlabelled due to the application of the precautionary principle. The FSAI Scientific Committee has published a scientific approach to risk assessment which aims to provide a scientific basis for a more proportionate approach, while still protecting consumer health (LINK). One element of the risk assessment requires the application of reliable data on the prevalence of immune-mediated reaction to the EU 12 (EU 14 minus gluten and sulphite) allergens.</p> <p>Research is required in order to provide an accurate baseline of prevalence of immune-mediated reaction to the EU 12 (EU 14 minus gluten and sulphite) allergens in Ireland, as well as a scientifically robust methodology for updating such data in a national register.</p>	<p>None notified</p>

Chemical safety

Research area	Research need	Relevant Irish research projects in progress or completed
Development of rapid test kits for detection of mycotoxins	<p>Consumer protection from the harmful effects of mycotoxins requires good mitigation measures to prevent contamination on farm and during storage of plant-based foods and feed. At manufacturing level, it is important that supplies of these ingredients are safe at the point of delivery. Due to climate change, it is expected that mycotoxin contamination of Irish crops will increase in the future, as warmer but wetter weather prevails.</p> <p>There is a need for the development of affordable, reliable, and portable testing methodology that can be applied at an early stage during food production, and that provides rapid results for food businesses to enable them to protect their ingredient supply and use as part of HACCP systems to protect consumer health.</p>	<p>Mycotox-I: field to fork assessment and mitigation of mycotoxin exposure risk on the Island of Ireland</p> <p>Lead: Fiona Doohan, UCD</p> <p>Funded by: Department of Food, Agriculture and the Marine, Food Institutional Research Measure.</p> <p>Start year: 2022</p>
Development of new toxicological methods to address food safety concerns	<p>Methods to assess the safety of chemicals are evolving, with a shift from solely end point-oriented studies to mechanistic and adverse outcome pathway studies. New approach methods and in silico models are becoming more important, with a view to providing faster assessments and reducing the use of animals in toxicity studies. There is also a need to further develop methods to assess exposure to multiple chemicals.</p> <p>Research into the suitability and validation of such methods for regulatory risk assessment is needed.</p>	None notified
The impact of the circular economy on food safety at	<p>The desire to reutilise scarce resources and focus on the valorisation of waste materials is driving the expansion of the circular economy in Ireland and abroad. Recent food safety incidents have highlighted the use of recycled materials in animal husbandry that has led to subsequent contamination of meat and milk</p>	None notified

Research area	Research need	Relevant Irish research projects in progress or completed
<p>farm and manufacturing level</p>	<p>with persistent organic pollutants. Similarly, inappropriate use of recycled materials (e.g. plastics recycled from electronics, etc.) could lead to contamination of food, with contaminants leaching out of these materials (e.g. flame retardants, plasticisers).</p> <p>Recent research has indicated that persistent organic pollutants like PCBs, PBDEs, PCDD/Fs, PCNs and PFAS, showed the highest potential transfer into animal tissue/organs in laying chickens and pigs when these animals were exposed to recycled material used as bedding or for environment enrichment, or from exposure to land treated with fertiliser using recycled materials.</p> <p>Establishing the prevalence and nature of use of recycled materials (e.g. plastics, board/paper, rubber, insulation, wood) on farms where they can be in contact with animals, coupled with research into chemical risks associated with particular recycling streams relating to transfer into the final food and/or farm animal, could inform interventions to minimise these risks.</p>	
<p>Generation of migration data for chemical substances that move into foods from proposed/new food contact materials</p>	<p>Some categories of food contact materials are subject to specific requirements under EU regulations, including migration limits to protect public health. Testing for migration is generally done in simulants. However, this is a fast-changing field of work and new materials are being proposed or are being researched that may pose food safety risks as yet unknown. This is an issue for so-called active and intelligent packaging.</p> <p>Two major food issues arise. The first is the more general issue of risk assessment, which requires an understanding of the actual migration of the constituents of approved food contact materials into real foods. The second issue is the migration of potentially unsafe chemicals from these new and emerging food contact materials that may also include recycled plastics and board.</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<p>Research on recycled or compostable plastics, board, and intelligent/active packaging is needed in order to investigate their potential food safety implications when in contact with food. Studies investigating the safety of emerging alternatives to plastic materials are also required in order to safeguard consumer health and build competence for regulators to evaluate these materials.</p>	
<p>Influence of good agricultural practices and processing on mycotoxin prevalence in Ireland</p>	<p>There is some indication that differences in agricultural and processing practices employed within the cereal sector in Ireland can lead to considerable differences in prevalence and/or formation of mycotoxins in cereal grains.</p> <p>In light of climate change and the tightening of regulatory measures, it is important to fully elucidate the importance of the various stages from field to fork on the formation of individual and co-occurrence of various mycotoxins.</p> <p>Research into the currently implemented agricultural (e.g. fungicide use) and manufacturing practices (e.g. cleaning, sorting and drying procedures), including intermediate transport and storage on formation of mycotoxins, would help identify critical control points and support the development of codes of practice tailored to the Irish context.</p> <p>A survey on the prevalence and co-occurrence of mycotoxins (such as Fusarium mycotoxins, which are of relevance in the Irish context) in cereals grown and produced in Ireland could also be used to assess the exposure of Irish consumers to mycotoxins from Irish cereals.</p>	<p>Mycotox-I: field to fork assessment and mitigation of mycotoxin exposure risk on the island of Ireland</p> <p>Lead: Fiona Doohan, UCD</p> <p>Funded by: Department of Agriculture, Food and the Marine, Food Institutional Research Measure.</p> <p>Start year: 2022</p>
<p>Prevalence of natural toxins in</p>	<p>Increased knowledge on the toxicological risks posed by naturally occurring substances (e.g. tropane, pyrrolizidine, opium, ergot, glycoalkaloids, erucic acid, and cyanogenic glycosides) has led to the implementation of several regulatory measures. There is therefore a need to establish the seasonal</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
<p>Irish horticulture crops</p>	<p>prevalence of these hazards in Irish-grown crops, and to develop valid and practical mitigation strategies, where required (e.g. good agricultural practices, variety development).</p> <p>Furthermore, due to changing EU policies with regard to reduced use of pesticides and enhanced biodiversity, the potential impact on the occurrence of plant toxins (which can originate from weeds) needs to be examined.</p>	
<p>Study on nitrates/nitrites to ensure product safety, taking into consideration Irish production methods (e.g. injection/immersion curing of meat along with tumbling in some cases)</p>	<p>Nitrates (NO₃) and nitrites (NO₂) are chemicals that can be found naturally in our food and water. In nature, nitrates are readily converted to nitrites and vice versa. Nitrates and nitrites are currently authorised as food additives within the EU. These additives function as preservatives in food and they are both used extensively to enhance colour and flavour and extend the shelf life of processed meats. Nitrite is considered the active curing ingredient responsible for the preservation of food in combination with other ingredients like salt. Nitrite also prevents the growth of a harmful bacterium called <i>Clostridium botulinum</i> and it may also have preservation effects on other harmful and spoilage bacteria. Nitrate, when added to food, converts to nitrite before exerting a preservative function.</p> <p>The use of nitrates and nitrites in food products must comply with the provisions set out in Annex II part E of Regulation (EC) No 1333/2008 on food additives, which has been in force since 1 June 2013. Use of two main nitrite and nitrate salt forms is allowed. These are sodium and potassium nitrite, and sodium and potassium nitrate. These substances have been assigned E numbers (E250, E249, E 251 and E 252, respectively).</p> <p>Controls on nitrate and nitrite in cured meat products are generally based on the ingoing amount of additives, unless there is a specific derogation contained in the legislation for a particular product which</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<p>permits levels to be based on residual amounts in the product (e.g. Wiltshire cured bacon and ham, and dry-cured bacon and ham).</p> <p>The European Commission has proposed reductions in the maximum permitted levels for these additives and, as a result, there are concerns among Irish food industry representatives about what impact this may have on cured meat products – and particularly on traditionally produced meat products – in terms of their stability and shelf life.</p> <p>A study should be undertaken to assess the minimum amounts of these additives that are required in order to ensure microbial safety and stability throughout the shelf life of meat products, while at the same time ensuring that there are no unacceptable effects on colour. The extent of protection against microbial growth provided to cured meats has been attributed to many factors, including the ingoing concentration of these additives, residual nitrite concentration, salt concentration of the product, addition of sodium ascorbate or isoascorbate/erythroate, heat treatment applied, storage temperature, initial pH of the meat, and initial spore load of the meat.</p> <ul style="list-style-type: none"> • This study should take into account a number of factors, such as the size of the meat pieces cured, production methods (e.g. immersion, tumbling), shelf life of the products, and low-salt meat products. • The study should also determine the residual levels of these additives, in order for products to be placed on the market, as new proposed legislation will now set levels on both an ingoing and residual basis. <p>Nitrite in food (and nitrate converted to nitrite in the body) may also contribute to the formation of a group of compounds known as nitrosamines, some of which are carcinogenic. A study should assess the level of</p>	

Research area	Research need	Relevant Irish research projects in progress or completed
	<p>nitrosamine formation in different meat products based on the known amounts of added nitrites/nitrates and the variation that can occur within the same meat product type.</p>	
<p>Risk of increasing paralytic shellfish poisoning events in Ireland</p>	<p>Since 2018, the potent neurotoxin saxitoxin (and its family of compounds known as paralytic shellfish toxins (PSTs)), which are responsible for the human illness syndrome, paralytic shellfish poisoning, through the consumption of contaminated shellfish, have been observed to be increasing in their abundance, geographical distribution, and occurrence in Irish coastal waters, leading to the contamination of shellfish in classified production areas.</p> <p>When paralytic shellfish poisoning (PSP) monitoring originally began in the 1990s, it was confined to Cork Harbour. Since then, the causative toxigenic and non-toxigenic species of the genus <i>Alexandrium</i> has been observed to be increasing all around the Irish coastline, usually resulting in no or very low PSP concentrations in shellfish. Since around 2019 extremely high levels of PSP have been found in Castlemaine Harbour in Co Kerry. These are approximately three times above EU recommended regulatory levels, resulting in prolonged closures of growing areas and the prohibition on placing shellfish on the market. This has also led to the issuing of a number of press releases highlighting the dangers of the recreational harvesting of shellfish along the shoreline. Such contamination levels were unprecedented and were the highest PSP concentrations recorded since monitoring for PSP commenced in Irish waters. As a result, there is genuine concern that these PSP occurrences will increase, both on a more regular basis and in terms of their geographical distribution.</p> <p>Required research:</p> <ul style="list-style-type: none"> • A full-scale study of Castlemaine Harbour, in order to investigate the environmental conditions and physical dynamics that are leading to the increased PSP toxification events 	<p>Increasing Risk of Paralytic Shellfish Poisoning Events in Ireland</p> <p>Lead: Dave Clarke, Marine Institute</p> <p>Funded by: Department of Agriculture, Food and the Marine, Food Institutional Research Measure.</p> <p>Start year: 2022</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<ul style="list-style-type: none"> • Similar studies in other important areas of aquaculture, particularly those that are subjected to blooms of <i>Alexandrium</i> species, where little or no resultant PSP toxicity is observed • An assessment of the risk of PSP events and human illness through recreational harvesting of shellfish along unmonitored coastlines. <p>This work would fill research gaps identified in the FSAI Scientific Committee report, <i>The Occurrence of Marine Biotoxins and Risk of Exposure to Seafood Consumers in Ireland</i>.</p>	
<p>Emerging novel toxins in Irish waters – characterising toxigenic benthic organisms and their potential impacts, due to climate change, on human health</p>	<p>There is concern about the emergence of marine biotoxins in geographical areas where they have not been reported previously. This is coupled with concerns about the impact of contamination by such biotoxins on seafood and, consequently, on public health. Several groups of marine biotoxins, in particular tetrodotoxins, ciguatoxins, pinnatoxin and palytoxins, are included among the relevant marine biotoxins that have emerged in several coastal areas in Europe. The majority of these novel toxins are produced by benthic species of phytoplankton. It is not known whether they occur in Irish waters; this is because the current phytoplankton sampling does not include benthic sampling, and therefore these organisms could be present and could pose a contamination risk to shellfish.</p> <p>Currently in Irish waters we are aware of a known shellfish toxin, a diarrhetic shellfish poisoning isomer-producing benthic organism, <i>Prorocentrum lima</i>. However, because several other benthic species found off coastal Europe that are classed as emerging novel toxin groups are having an effect on human health through consumption of contaminated shellfish and fish, it is essential to determine their presence/absence in Irish coastal waters. Ciguatoxin (CTX), tetrodotoxin (TTX) and palytoxin (PLTX) are classed as neurotoxins, whereas TTX is grouped with the other potent neurotoxins.</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<p>Research needed:</p> <ul style="list-style-type: none"> • A sampling programme using artificial substrates around Irish aquaculture production areas for the collection of benthic organisms • A study using molecular methods, qPCR, to detect the following known novel toxin-producing species, <i>Gambierdiscus</i>, <i>Ostreopsis</i>, <i>Vulcanodinium</i>, and the respective toxins from these substrates • An assessment of the risk of these emerging novel toxin groups and their potential impact on human health, and specifically on the health of the Irish consumer, coupled with their impact on Irish aquaculture • An investigation into benthic harmful algal blooms, which seem to be following the trends of other harmful algal bloom species that are increasingly reported in both temperate and tropical regions. This increase may be due to more effective detection through improved observation and monitoring capacities, but it may also be due to anthropogenic forcing and global climate change. These findings have implications for disease prediction, surveillance, and public health preparedness in light of warming ocean temperatures. <p>This work would fill research gaps identified in the FSAI Scientific Committee report, <i>The Occurrence of Marine Biotoxins and Risk of Exposure to Seafood Consumers in Ireland</i>.</p>	
<p>Monitoring of risks not common to Irish waters in light of climate change</p>	<p>Issues that should be assessed include the potential impacts of a changing environment (via climate change or ballast water) leading to range expansion or the alien introduction of non-native harmful algal blooms and the emergence of other potential contaminants (e.g. increased conversion of mercury to methylmercury and its bioaccumulation in aquatic systems driven by ocean warming and acidification).</p>	<p>None notified</p>

Research area	Research need	Relevant Irish research projects in progress or completed
	<p>Long-term data for new and emerging toxins and contaminants should be collected and mitigation strategies should be put in place to protect consumers potentially exposed to such hazards through consumption of contaminated seafood or seaweed.</p>	
<p>Develop a framework for a nutrivigilance system in Ireland</p>	<p>A nutrivigilance system is an adverse event reporting system that provides early signals of emerging chemical risks where foods or food supplements are reported to be causing harm in the community. The system builds capability around recording adverse events and systematically identifies food trends and risks, in order to help protect consumers and the food chain.</p> <p>While a nutrivigilance system already exists in European countries and the concept is proven, there is no nutrivigilance system in Ireland at present. There is, however, evidence of poisoning incidents, such as wild mushroom poisoning, apricot kernel poisoning and the presence of illegal steroids in sports supplements, and there are documented examples of poisoning events that have occurred in recent years in Ireland.</p> <p>As the range and diversity of foods increases to reflect factors such as changing consumer preferences, health considerations, consumer demographic shifts (i.e. the ageing population), and rapidly evolving technology (3D printed foods), coupled with the demand for regionally or locally sourced food, the basis for risk in the food chain has grown enormously.</p> <p>The development of a framework which articulates how to build a food reporting system – and which also identifies partnerships and networks, and defines the legal framework, governance structure, management system, data handling and personnel needed in order to operate the food reporting system – would help to establish the foundations for a nutrivigilance system in Ireland. The costs of creation and maintenance of such a system should be included in a cost-benefit analysis.</p>	<p>None notified</p>



Food Safety Authority of Ireland

The Exchange, George's Dock, IFSC,
Dublin 1, D01 P2V6

T +353 1 817 1300

E info@fsai.ie



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