

Research Needs 2023

Project Priorities



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Research needs 2023

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 aspects of nutrition. Food safety research is essential to address any gaps in food safety knowledge, to support food safety regulations and to 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. The FSAI has listed the projects that it is aware of, but cannot rule out that others have been completed or are in progress.

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 since 2010 that FSAI is aware of
1. Food Consumption Data for the Irish Population	<p>Food safety risk assessment requires accurate and comprehensive data on the food consumption habits of the Irish population including types of food, quantities consumed and frequency of consumption for all age groups. These data are also essential for nutritional analysis including identification of nutrient deficiencies, development of dietary advice and programmes on food reformulation.</p> <p>Ireland has developed excellent food consumption data sets for all age groups using the food diary approach which generates data that is both fit for risk assessment and dietary analysis purposes. However, as data becomes older at a time when consumption habits change quickly, up-to-date data is continually required on a rolling programme basis. The National Preschool dietary survey, conducted in 2010-2011 is the oldest data set and should be prioritized for updating.</p> <p>Biomonitoring samples e.g. urine, are also useful for subsequent dietary analysis and analysis of chemical contaminant exposure and it would be desirable to include this aspect in any research programme such that biomonitoring samples are taken from participants during the survey and stored along with their metadata for future analysis.</p>	<p>1. NANS II- National Adult Nutrition Survey</p> <p>Lead: Dr Janette Walton, Cork Institute of Technology (Technical University Munster)</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 2019R445</p> <p>Start year: 2019</p> <p>Report when available: Here or Here.</p> <p>2. NTFS II- National Teen’s Food Consumption Survey II</p> <p>Lead: Dr Breige McNulty, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 17F231</p> <p>Start year: 2017</p> <p>Report available: Here.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
		<p>3. NCFS II- National Children’s Food Consumption Survey II.</p> <p>Lead: Prof Albert Flynn, University College Cork</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 15F674</p> <p>Start year: 2015</p> <p>Report available: Here.</p> <p>4. BIO-Tilda study- The Irish Longitudinal Ageing Study (TILDA) Nutritional Biomarker Database Enhancement Initiative</p> <p>Lead: Dr Anne Molloy, Trinity College Dublin</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 13F492</p> <p>Start year: 2013</p> <p>Report available: Here.</p> <p>5. NUTRIDATA- National nutrition databases for public health and new product development</p> <p>Lead: Prof Dolores O’Riordan, University College Dublin</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
		<p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 13F542</p> <p>Start year: 2013</p> <p>Report available: Here.</p> <p>6. National Pre-School Nutrition Survey</p> <p>Lead: Dr Janette Walton, University College Cork</p> <p>Funded by: Food for Health Research Initiative. Supported by the Department of Agriculture, Food and Marine, the Department of Health and Children and the Health Research Board (HRB)</p> <p>Start year: 2010</p> <p>Report available: Here.</p>
<p>2. 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>None notified.</p>

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	<p>Consumption of food supplements is common in sports people and also consumers who seek to improve their body image aimed at weight loss/muscle gain goals. The food supplement market is global with products easily available on the internet from jurisdictions outside the EU where different rules are in place. Sometimes supplements can contain excess nutrients above physiological need, e.g. protein, vitamins and minerals. They may also contain hazardous chemical constituents such as DNP (2,4-Dinitrophenol) despite the work of Authorities to control the supplement market. The value and demand for food supplements 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 • Toxicity of substances that exert a physiological effect which are included in food supplements. <p>NOTE: Nutrient declarations on labels of food supplements are based on average values and there are acceptable tolerances above and below the</p>	

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	labelled level in Europe. Therefore, tested nutrient levels in supplements may be within these tolerances without breach of legislation.	
3. Generate specific food consumption data on seafood for children	<p>Ireland’s expanding seafood industry has a significant impact on rural development. However, seafood consumption is not a frequent occurrence in Ireland. The data generated in the major food consumption studies , such as 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, 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. Similar detailed data is needed 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>1. SCaRES- Seafood Consumption and Risk Exposure Study</p> <p>Lead: Prof Eileen Gibney, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 17F264</p> <p>Start year: 2017</p> <p>Report available: Here.</p>
4. Use and consumption patterns of seaweed	<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,</p>	None notified.

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<p>and halophytes in Ireland</p>	<p>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 available on the Irish market</i>. The report noted several gaps in information that would be necessary to conduct a comprehensive risk assessment.</p> <p>Research needs:</p> <ul style="list-style-type: none"> • Quantitative information about direct consumption of seaweed and consumption of seaweed as an ingredient in other foods (not including 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. 	

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<p>5. Codifying national food intake data in the FoodEx2 food category system (EFSA)</p>	<p>FoodEx2 consists of descriptions of a large number of individual food items aggregated into food groups and broader food categories. This work needs to be undertaken to ensure food and dietary intake habits present in Ireland’s population are 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 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> <p>This project would suit a desktop study approach.</p>	<p>None notified.</p>

Emerging risks and threats

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
<p>6. 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>Trade flows, weather patterns, media reports, digital 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>Research is needed to identify suitable data sources, to test them for their ability to identify emerging risks, to provide tests for validity of these data</p>	<p>None notified.</p>

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	<p>and to develop suitable dashboards and alerts for ongoing monitoring and surveillance.</p>	
<p>7. 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 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 identifying the relevant stakeholders and the points of vulnerability. 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 for vulnerability assessments include the beef, lamb, 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>8. 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>	<p>1. Opti-Probe - Optical Fibre Probe for Assessment of Authenticity and Quality Of Alcoholic Beverages</p> <p>Lead: Prof Yuliya Semenova, Technological University Dublin</p>

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	<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. • 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 (<i>in progress – see project 2 and 3</i>), Irish farmed salmon, in order to verify origin claims. • Use of proteomics (SDS-PAGE, 2-D PAGE, chromatography, mass spectrometry, western blotting, etc.) in detecting food fraud or anomalies in food or food ingredients. • Use of validated rapid testing platforms to indicate early signals of food authenticity issues. 	<p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 17F284</p> <p>Start year: 2017</p> <p>Report not available.</p> <p>2. BEEF-SIG - Signature of Irish Grass-fed Beef</p> <p>Lead: Prof Frank Monahan, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 17F252</p> <p>Start year: 2017</p> <p>Report not available.</p> <p>3. GENOTRACE - Genomic Strategies for Animal and Meat Provenance, Authenticity and Traceability</p> <p>Lead: Dr. Donagh Berry, Teagasc Moorepark</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 13F403</p> <p>Start year: 2013</p> <p>Report available: Here.</p>

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<p>9. Food safety risks associated with EU Farm to Fork Strategy targets and Irelands Climate Action Plan</p>	<p>The EU Farm to Fork Strategy specifies reductions in the use of inorganic fertilisers, pesticides and veterinary medicines as well as an increase in organic agriculture. Ireland’s Climate Action Plan has set stringent targets for the agriculture sector. It is looking for a 25% reduction in the emissions of greenhouse gases, a significant reduction in nitrogen as a fertiliser and an increased uptake in use of protected urea on grassland farms. It also looks for an increase in organic farming to up to 450,000 hectares and tillage to up to 400,000 hectares. An expansion in the production of biomethane through anaerobic digestion is also part of the approach being pursued.</p> <p>Alternative approaches and/or innovative products aimed at addressing these targets are being encouraged by an active Government research programme. However, research into mitigations throughout the food chain to address sustainability and climate action tend to focus solely on solving the problem at hand. Unfortunately, food systems are complex and without systems thinking during this research unintended consequences for food safety may inadvertently ensue.</p> <p>Therefore, it is essential that research in these areas actively generates the data needed for an assessment of the possible food safety risks and public health impact, if any, from adoption of sustainable approaches to food production.</p> <p>An evaluation of Ireland’s active research programme is needed in relation to the EU Farm to Fork Strategy and Irelands Climate Action Plan. The</p>	<p>1. 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 2021R453</p> <p>Start Year: 2021</p> <p>Report not available.</p> <p>2. Efficacy & Safety of Nitrification and Urease Inhibitors</p> <p>Lead: Patrick Forrestal, Teagasc</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 2021R447</p> <p>Start Year: 2021</p> <p>Report not available.</p> <p>3. BioCrop: Biostimulants and Biopesticides for Crop Production (NOTE: Although this research aligns with the research area it does not appear to have a specific food safety focus)</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>evaluation should aim to generate an inventory of relevant Irish research and for each project, form a view as to possible food safety impacts of the research and whether food safety is being evaluated as part of the research.</p>	<p>Lead: Dr Angela Feechan, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 2019PROG705</p> <p>Start Year: 2019</p> <p>Report not available.</p>

Food science and technology

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
10. Future trends and food safety risks of new food production methods	<p>Advances in molecular biology and stem cell technology are facilitating new food production methods. The drive for a sustainable food system is also generating interest in new sources of protein and sustainable methods of food production. However, as with many new technologies, food safety aspects are rarely addressed during the development phase.</p> <p>Areas of interest to the FSAI are:</p> <ul style="list-style-type: none"> • Use of synthetic biology for food production • Production and uses of new insect protein • Synthetic meat. <p>A report that looks at the food safety implications and mitigations of each or all of these new food production systems, regulatory hurdles to their adoption and control as well as future research needs, would be a very useful resource for regulatory scientists.</p>	None notified.
11. Rapid traceability of fresh produce farm to retail	<p>Fresh produce has been associated with an increasing number of food safety incidents worldwide. However, the fresh produce supply chain is complex with fruit and vegetables supplied whole and in various ready-to-eat processed forms, all with short shelf lives. Contamination in field or during on-farm handling or further processing can affect large quantities of produce moving to multiple business customers.</p>	None notified.

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	<p>Should a food safety incident be identified in fresh produce 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.</p> <p>Consequently, research that will facilitate rapid identification and recall of unsafe fresh produce is needed in order to develop a traceability system that is accessible by all parties, including 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>12. Safe use of biosolids on agricultural land used for food production</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.</p> <p>Research in progress and published (see projects 1 and 2 listed) has/is addressing some of the safety aspects associated with spreading organic agricultural (OA) material, and organic municipal industrial (OMI) materials on land used for agriculture.</p>	<p>1. 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 2021R453</p>

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	<p>Further research is needed to expand on some of this work in respect of biosolids (solid treated waste from wastewater treatment plants). In particular, the FSAI would welcome research that provides data on the:</p> <ul style="list-style-type: none"> • Possible bioaccumulation of chemical hazards (heavy metals, persistent organic pollutants and microplastics) in different soils due to use of biosolids and the uptake of these chemicals in different pasture plants, tillage crops and fresh produce grown in these soils. (Note: project 2 listed looked at uptake of some chemical hazards in rye grass.) • Effectiveness of current treatment methods and development of new treatment methods for biosolids aimed at reducing and/or eliminating chemical and biological hazards prior to these materials being spread on agricultural land. • Detailed inventory of biosolids produced and used in Ireland including the amount used on agricultural land and what crops are grown subsequently on such land. 	<p>Start year: 2021</p> <p>Report not available.</p> <p>2. Health and Water Quality Impacts Arising from Land Spreading of Biosolids</p> <p>Lead: Mark Healy</p> <p>Funded by: Environmental Protection Agency</p> <p>Start year: 2014</p> <p>Report available : Here.</p>
<p>13. 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 several hazards in food concurrently. Methods need to be validated, cheaper, simpler and faster to allow for</p>	<p>None notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	product protection and use for hazard analysis and critical control point (HACCP) verification and monitoring in the manufacturing plant.	
<p>14. 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, consequently, there has been an increase in the development and availability of plant-based meat alternatives. These comprise plant proteins that are processed to mimic the properties of meat (e.g., texture, mouthfeel).</p> <p>Research is needed to:</p> <ul style="list-style-type: none"> • Establish the allergenicity, if any, of plant-based meat alternatives. • Determine the presence and risk of pathogenic microorganisms throughout the shelf life of plant-based meat alternatives. • Study the chemical hazards associated with the plant-based protein source plus any oils or carbohydrates used in the final food and quantify the risk in the final food as consumed. • Examine the presence, if any, of antinutrients in plant-based meat alternatives and their effect on nutrient intake from the final food. • Develop approaches to mitigate any risks to food safety that have been identified. 	<p>1. Duckweed as a Novel, Sustainable Source of Protein for Ireland (not clear from project summary if food safety is being considered)</p> <p>Lead: Marcel Jansen, University College Cork</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 2021R487</p> <p>Start year: 2021</p> <p>Report not available.</p> <p>2. Protein-I: Shared Island Sustainable Healthy Nutrition (not clear from project summary if food safety is being considered)</p> <p>Lead: Prof. Lorraine Brennan, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 2021R546</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	Note: There is some Irish research in this area but it is unclear if food safety is an aspect of the research.	Start year: 2021 Report not available.

Biological safety

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
<p>15. Reduction of antimicrobial resistance (AMR) as a foodborne hazard</p>	<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 human health, agricultural and environmental sectors.</p> <p>Research is required 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. Focus might usefully be applied to concepts such as:</p> <ul style="list-style-type: none"> • Establishing the extent of association, including potential time-lag between antimicrobial usage in animals, and prevalence of antimicrobial resistance bacteria in foods derived from those animals. • In the context of the sustainability debate and potential de-stocking strategies, assess intensification impact and extensification benefits of AMR prevalence in food producing animals, or organic production with enhanced withdrawal periods. • Separately assess direct food-borne and broader food-chain-related risks arising from AMR in food-producing populations. 	<p>3. COMplex Biofilms and AMR Transmission</p> <p>Lead: Prof. Séamus Fanning, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and Marine, TransNational JPI HARISSA 2TJH1\2</p> <p>Start year: 2021</p> <p>Report not available.</p> <p>4. Strengthening Implementation of National Action Plans by estimating the Full Economic burden of AMR across all ONE Health settings</p> <p>Lead: Prof. Finola Leonard, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and Marine, TransNational JPI HARISSA 2TJH1\3</p> <p>Start year: 2021</p> <p>Report not available.</p> <p>PigNutriStrat: Novel Nutritional and Management Strategies to Reduce Antimicrobial Reliance and Antimicrobial Resistance on Irish Pig Farms</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<ul style="list-style-type: none"> • Assess extent of usage and contribution to AMR of coccidiostat usage. • Assess inter-animal-crop AMR transfer through e.g., withdrawal-period milk and manure recycling, and recommend risk management strategies. • Assess consumer/market benefits of labelling scheme to enable purchase from farms/systems with lower antimicrobial reliance. <p>Researchers should note that there is extensive research in this area and the FSAI cannot be certain that aspects of its suggested research needs have been covered. A thorough check on the state of the art in this field would be prudent before submitting research applications.</p>	<p>Lead: John O’Doherty, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and the Marine, Food Institutional Research Measure 2019R518</p> <p>Start year: 2019</p> <p>Report not available.</p> <p>5. Biomarkers and Microbiome in Farms for Antimicrobial Resistance Management</p> <p>Lead: Edgar Garcia Manzanilla, Teagasc</p> <p>Funded by: Department of Agriculture, Food and the Marine, Transnational ERA-NET 2020EN510</p> <p>Start year: 2020</p> <p>Report not available.</p> <p>There was also a full list of projects either wholly dedicated to AMR or at least partly dedicated to AMR drawn up by the iNAP Animal Health Implementation Committee compiled in 2020:</p> <p>PathSurvPigs: Investigation of Respiratory Disease on Irish Pig Farms, Risk Factors, and the Relationship</p>

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		<p>with Performance, welfare and AMU. DAFM 14/S/832. 2015-2019</p> <p>Giltlife: Strategies to Optimise Gilt Lifetime Performance Teagasc. 2016- 2019</p> <p>PLFPigsCarc: Optimising Feedback of Computerised Meat Inspection Findings and Precision Livestock Farming Monitors on Farm to Improve Pig Health, Welfare and Carcass Quality. Teagasc. 2017-2020</p> <p>Tripartite 1: Application of Next Generation Sequencing for the Identification of DNA Based Biomarkers in Regulatory Regions of the Genome for Susceptibility to Bovine Respiratory Disease Complex. US-Ireland-Tri-partite grant. 2018-2020</p> <p>SWAB: Surveillance Welfare and Biosecurity of Farmed Animals. DAFM 17/S/230. 2018-2020</p> <p>SAFEFOOD AM: Use of Antimicrobials in Animal Health on the Island of Ireland: Knowledge, Attitudes and Behavior. Safefood. 2019-2021</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
		<p>AMURAP: Antimicrobial use and resistance in animal production. DAFM 15/S/676. 2016-2020</p> <p>MastiSTAPH: The Impact of Bovine-specific S. Aureus Genetic Variability on Mastitis Control and Milk Processing and The Effect Of Selective Dry Cow Antibiotic Therapy On Udder Health. MS Curie Action-IRC co-funded CAROLINE Fellowship. 2018-2020</p> <p>AREST: Antimicrobial Resistance and the Environment — Sources, Persistence, Transmission and Risk Management. EPA Ireland. 2018-2021</p> <p>SowWeanWel: The Implications of Chronic Stress in Gestating Sows for Sow Performance and Welfare and for the Resilience of her Piglets to Stress and Disease Teagasc. 2018-2021.</p> <p>WelfareDairy: Welfare of Dairy Cows in Pasture-based Systems. Teagasc. 2017-2022</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
		<p>OviData: Increasing Sheep Genetic Gain in Ireland Through Commercial Data Capture. Teagasc. 2018-2022</p> <p>Tripartite 2: Characterization of the Respiratory Microbiome and Virome associated with Bovine Respiratory Disease Complex. US-Ireland-Tri-partite grant. 2019-2022</p> <p>ZincO: Effects of Therapeutic ZnO on the Microbiome, Resistome and Immune System of Pigs and Strategies to Face ZnO Withdrawal. Teagasc. 2018-2022</p> <p>Novel Nutritional and Management Strategies to Reduce Antimicrobial Reliance and Antimicrobial Resistance on Irish Pig Farms. UCD. 2019-2022</p>
<p>16. ‘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 reported rate of shiga toxin-producing <i>E. coli</i> (STEC) illness in people 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, infection from environmental sources (for example private well water and on-farm exposure) is a major contributor. Food appears to play a lesser role</p>	<p>1. 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>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>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 production and human health dimension.</p> <p>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. Existing surveillance could be enhanced to identify risk factors for higher prevalence and therefore identify production practices to mitigate risk, e.g., pre-harvest dietary change or husbandry interventions, host genetic markers of super shedding likelihood.</p> <p>NOTE: This has been left in the FSAI research requirements due to the significant public health impact of STEC. Research into prevention of human infection via various food and environmental pathways needs to build on existing knowledge – not least that developed/being developed in projects 1 and 2 listed.</p>	<p>Start year: 2022</p> <p>Report not available.</p> <p>2. VTEC One for Health Surveillance of Verocytotoxigenic E. coli in Ireland: A One Health Approach</p> <p>Lead: Dr Geraldine Duffy</p> <p>Teagasc Ashtown</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 15F629</p> <p>Start year: 2015</p> <p>Report not available.</p>
<p>17. Maximising <i>Campylobacter</i> risk management within chicken slaughter</p>	<p><i>Campylobacter</i> remains the most common cause of bacterial gastroenteritis in people in Ireland, and <i>Campylobacter</i> is frequently detectable on raw chicken at Irish retail level. In 2011, the FSAI Scientific Committee made various recommendations to manage the <i>Campylobacter</i> risk from farm to fork. Since 2018, legislation requires slaughterhouses operators to apply a quantitative <i>Campylobacter</i> microbiological criterion in assessing their</p>	<p>1. Clean Broilers - Clean Broilers Through Enhanced Farm Biosecurity, Processing Prerequisites and HACCP Based Interventions.</p> <p>Lead: Dr Declan Bolton, Teagasc, Ashtown</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>process hygiene and to take corrective action regarding resolving non-compliance.</p> <p>Optimisation of slaughter practices towards minimisation of <i>Campylobacter</i> numbers on chicken meat has utility to contribute to overall risk management, within a broader holistic food chain. Investigations of practical effectiveness of <i>Campylobacter</i> interventions in an Irish context should facilitate progress towards incorporation into approved commercial establishments. The Clean Broilers project examined the impact of key processing stages and flock variables on the prevalence and levels of <i>Campylobacter</i> on broiler carcasses. Investigations of practical effectiveness of <i>Campylobacter</i> interventions in an Irish context should facilitate progress towards incorporation into commercial establishments. Candidate processes include the following:</p> <ul style="list-style-type: none"> • Quantify the effect on <i>Campylobacter</i> concentration of each step in the broiler slaughter process across several commercial plants representing the range of equipment, throughput and processes used in Ireland. • Investigate optimisation strategies for key process steps to reduce <i>Campylobacter</i> concentrations with particular focus on the pre-scald bleed, scald process, defeathering process, carcass washing process and primary chilling process. 	<p>Funding body: Department of Agriculture, Food and Marine, Food Institutional Research Measure 15F641</p> <p>Start year: 2015</p> <p>Report not available.</p> <p>2. <i>Campylobacter</i> Control on Irish Broiler Farms (Campy-control).</p> <p>Lead: Paul Whyte, University College Dublin</p> <p>Funding body: Department of Agriculture, Food and Marine, Food Institutional Research Measure 15F641</p> <p>Start year: 2012</p> <p>Report available: Here.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<ul style="list-style-type: none"> Develop and test practical measures to prevent or minimise cross contamination with <i>Campylobacter</i> between flocks during slaughter, considering that some flocks will be <i>Campylobacter</i> negative and others <i>Campylobacter</i> positive with varying levels of contamination. Focus being on measures that account for the quantitative risk (contamination level) presented by a flock rather than its qualitative risk (positive/negative). 	
<p>18. Campylobacter source attribution – case control study</p>	<p>In 2008, an EU wide baseline survey of broilers revealed a high <i>Campylobacter</i> prevalence in Ireland - 83.1% in caeca and 98.3% in broiler carcasses (EFSA, 2010a). Following measures taken by industry and regulatory stakeholders, a repeat of this study from September 2017 to August 2018, found a reduction in prevalence - 66% of caecal samples and 53% of neck skin samples (Lynch, et al., 2022).</p> <p>Looking at the data on Irish human cases from the Health Protection Surveillance Centre (HPSC), this decrease in contamination does not appear to have had an impact on human cases. However, without source attribution studies it is difficult to tell.</p> <p>While poultry is recognised as the main source of <i>Campylobacter</i> infection in humans (EFSA, 2010b; Cody et al. 2019), a systemic review by Cody et al. (2019) reported that ruminants (cattle or sheep) were consistently implicated in a substantial proportion of cases.</p>	<p>None Notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>An all-Ireland case-control study was conducted between December 2003 to December 2004 (Danis et al., 2009). The most important risk factors identified for contracting sporadic campylobacter infection were consumption of chicken ([adjusted matched2 (am) odds ratio (OR) of 6.8; 95% confidence interval (CI) 2.1-21.9]), consumption of lettuce (amOR 3.3; 95% CI 1.5-7.1) and eating in takeaways (amOR 3.1; 95% CI 1.4-6.6). Chicken consumption showed a dose-response relationship, whereby more frequent consumption of chicken increased the risk of infection by 20% per time of consumption.</p> <p>Given the national efforts to reduce <i>Campylobacter</i> in poultry, a new case control study would be beneficial.</p>	
<p>19. Safe reuse of water in Irish agriculture and food production</p>	<p>In the context of climate change, adverse weather events such as droughts, and a move towards a more sustainable approach for freshwater use through the circular economy under the Farm to Fork strategy and the European green deal, the safe reuse of water (e.g. treated urban wastewater) is set to become an increasingly important source of water for agriculture irrigation and food production in Ireland (and the rest of Europe/the World in general). Regulation 2020/741 on minimum requirements for water reuse for agricultural irrigation and food production entered into force in June 2020. The new rules will apply from 26 June 2023 and are expected to encourage and facilitate water reuse in the EU.</p>	<p>None Notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>Research Need & Rationale: In the context of water reuse, research is needed in Ireland to assess the current situation, need and the potential opportunities/food safety risks for water reuse for agricultural irrigation on fresh produce and other relevant crops and reuse of water during food production processes. Such information may improve the sustainability of the Irish food industry.</p> <p>Objective:</p> <ul style="list-style-type: none"> • To establish the chemical and biological hazards and risks if any, in an Irish context, of water reuse during irrigation of fresh produce, and other relevant crops. • To establish the chemical and biological hazards and risks if any, in an Irish context, of water reuse during food production processes with a focus on those that are high users of water. • To establish best practice for the reuse of water in Irish agriculture and food production and develop a risk assessment framework for use by the industry. 	

Allergens

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
<p>20. Development of data for allergen risk assessment</p>	<p>Currently, a food can be deemed unsafe if the undeclared significant presence of any of the 14 EU-regulated food allergens is established. 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. One element of the risk assessment requires the application of reliable data on the prevalence in Ireland of immune-mediated reaction to the EU 12 (EU 14 minus gluten and sulphite) allergens.</p> <p>Research is required 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 since 2010 that FSAI is aware of
21. 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 the 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 and Irish foods including foods of animal origin will increase in the future, as warmer but wetter weather prevails.</p> <p>There is a need for the development of validated, 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>1. Mycotox-I: Field to Fork Assessment and Mitigation of Mycotoxin Exposure Risk on the Island of Ireland</p> <p>Lead: Fiona Doohan, University College Dublin</p> <p>Funded by: Department of Agriculture, Food and the Marine, Food Institutional Research Measure.2021R460</p> <p>Start year: 2021</p> <p>Report not available.</p>
22. 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.

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
<p>23. The impact of the circular economy on food safety at farm level</p>	<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 with persistent organic pollutants. Inappropriate use of recycled materials (e.g. plastics recycled from electronics, etc.) could lead to contamination of farm animals or food, with contaminants (e.g., flame retardants, plasticisers). Conversely, as agriculture is essentially a nutrient-exporting venture, certain resources will become depleted at farm level unless replenishment strategies are incorporated.</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>FSAI considers that the following research areas would be beneficial in facilitating the circular economy at farm level:</p> <ul style="list-style-type: none"> • Develop an understanding of the extent and nature to which recycled materials (e.g., plastics, board/paper, rubber, insulation, wood) are used on farms with farm animals for food production. 	<p>None notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>Particularly, recycled materials that are not designed for use with food or compliant with food contact material laws.</p> <ul style="list-style-type: none"> Gain an understanding of the chemical and biological hazards that these materials may pose to food derived from animals e.g. milk and meat. <p>Establish guidelines on best practice and risk assessment to facilitate safe use of recycled materials on farms.</p>	
<p>24. Generation of occurrence data for perfluoroalkyl substances (PFAS) in food</p>	<p>Perfluoroalkyl substances (PFAS) are a group of man-made chemicals that are manufactured and used in a variety of industries around the world (e.g. textiles, household products, fire-fighting, automotive, food processing, construction and electronics).</p> <p>Exposure to these chemicals may lead to adverse health effects. People can be exposed to PFAS in different ways, including food. These substances are most often found in drinking water, fish, fruit, eggs, and egg products.</p> <p>In 2020, the European Food Safety Authority (EFSA) published a Scientific Opinion on the risk to human health related to PFAS in food. The EFSA considered the decreased response of the immune system to vaccination to be the most critical human health effect when determining a health-based guidance value. In their conclusions, the EFSA identified exceedances of the health-based guidance value by the population and therefore, a concern for human health is evident.</p>	<p>None notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>In response to these findings the European Commission put in place maximum levels for certain foodstuffs (Regulation 2022/2388) and called for further monitoring (Recommendation 2022/1431) for the years 2022 to 2025 to gather data on occurrence in foodstuffs for which data was lacking. They indicated that monitoring should include a wide variety of foodstuffs reflecting consumption habits, including fruits, vegetables, starchy roots and tubers, seaweed, cereals, nuts, oilseeds, food for infants and young children, food of animal origin, non-alcoholic drinks, wine and beer.</p> <p>Research into the occurrence of PFAS in these commodities is needed to inform future risk assessments and risk management measures. Mitigation measures need to be developed to inform best practice for avoidance of PFAS contamination of food above safe levels.</p>	
<p>25. 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</p>	<p>1. New Active Sustainable Packaging with Natural Antimicrobials for Shelf-Life extension of Fish Products (not clear from project summary if food safety is being considered)</p> <p>Lead: Malco Cruz-Romero, University College Cork</p> <p>Funded by: Department of Agriculture, Food and the Marine, Food Institutional Research Measure.2021R412</p> <p>Start year: 2021.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>emerging food contact materials that may also include recycled plastics and board.</p> <p>Research on recycled or compostable plastics, board, and intelligent/active packaging is needed 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 to safeguard consumer health and build competence for regulators to evaluate these materials.</p> <p>Note: There is some Irish research in this area but it is unclear if food safety is an aspect of the research.</p>	<p>2. PECTIPACK- Eco-friendly Compostable Pectin based Packaging Material Derived from Waste Sources of Fruit Pulp and Its Validation in Bread Packaging (not clear from project summary if food safety is being considered)</p> <p>Lead: Dr Joe Kerry, University College Cork</p> <p>Funded by: Department of Agriculture, Food and the Marine, Food Institutional Research Measure. 2019R248</p> <p>Start year: 2019</p> <p>Report not available.</p>
<p>26. Prevalence of natural toxins in Irish horticulture crops and food animals</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. Some of these compounds are highly toxic and exposure must be maintained at very low levels. In the context of the <i>EU Farm to Fork Strategy</i>, the desire to increase biodiversity and hence reduce pesticide usage may exacerbate the risks of natural plant toxins in Irish food in the future.</p>	<p>None notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>Irish food must comply with regulatory limits which may be a challenge. Hence there is a need to establish the seasonal prevalence of these hazards in Irish-grown crops, and Irish food animals grazing and feeding on pastures or crops, and to develop valid and practical mitigation strategies consistent with the targets of the <i>EU farm to Fork Strategy</i> (e.g., good agricultural practices, variety development).</p> <p>Specifically, research is needed to:</p> <ul style="list-style-type: none"> • Establish the seasonal presence of tropane alkaloids, pyrrolizidine alkaloids, opium alkaloids, ergot alkaloids, glycoalkaloids, erucic acid and cyanogenic glycosides in relevant Irish grown crops. • Establish the seasonal presence of tropane alkaloids, pyrrolizidine alkaloids, opium alkaloids, ergot alkaloids, glycoalkaloids, erucic acid and cyanogenic glycosides in food animals grazing on pastures containing toxic plants or feed containing natural plant toxins. • As appropriate, develop mitigation measures both at production and processing levels that ensure Irish food and feed compliance with EU maximum limits of these natural plant toxins. The need to reduce pesticide usage should be accounted for in this research. <p>Understand the possible bioaccumulation of these natural toxins in food-animals, their tissues and milk.</p>	

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
<p>27. Emerging novel toxins in the Irish marine environment – characterising algal species and their potential impacts, due to climate change, on human health</p>	<p>Climate change is altering the marine water environment in terms of temperature, salinity and nutrient availability. Toxic events due to the growth of toxic phytoplankton need to be anticipated and measures put in place to protect public health.</p> <p>Emerging risk work at EU level has shown the migration of toxigenic species of phytoplankton into areas outside their known range. Ciguatoxin has been detected in fish in the Canaries and phytoplankton carrying the toxin genes has been detected in the Eastern Mediterranean. Many countries have not studied their marine environment sufficiently to understand the risks, if any, new phytoplankton species may pose. Ireland has a thriving aquaculture industry and excellent bathing waters which we need to protect by identifying emerging risks.</p> <p>Specific research needs include:</p> <ul style="list-style-type: none"> • An understanding of the changes in the marine environment due to climate pressures that favour the growth of certain new toxic phytoplankton species over existing known toxic phytoplankton species. This includes the presence if any, of phytoplankton expressing new biotoxins e.g. tetrodotoxins and ciguatoxins. • Research into the existence of hitherto unknown species of toxic phytoplankton in Irish marine waters and the marine conditions which favour their growth. 	<p>1. ToxVib- Genomics to Investigate Risks of Toxin-Producing Vibrio in Irish Shellfish</p> <p>Lead: Dr Aoife Boyd, National University of Ireland Galway</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 2019R531</p> <p>Start year: 2019</p> <p>Report not available.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<ul style="list-style-type: none"><li data-bbox="501 357 1355 432">• Molecular data on new phytoplankton species and the presence and expression of toxin genes.<li data-bbox="501 448 1355 667">• Long-term data for new and emerging toxins, contaminants and pathogens should be collected and mitigation strategies should be put in place to protect consumers potentially exposed to such hazards through consumption of contaminated seafood, of both animal & plant origin.	

Public health nutrition

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
<p>28. The current status of fortified foods previously considered as dietetic foods (PARNUTs)</p>	<p>In 2016 Directive 2009/39/EC (PARNUTs) was repealed by Regulation (EU) No 609/2013 on food for specific groups. Four categories of foods previously regulated under the PARNUTS directive became controlled under general food law. These foods no longer require notification to the FSAI. The four categories of foods are:</p> <ul style="list-style-type: none"> • Meal replacements for weight loss • Sports foods • Toddler milks (milk-based drinks and similar products intended for young children) • Diabetic foods. <p>A desktop study is required to evaluate the range and nutritional composition of these foods that are on the Irish market now that their composition is no longer specifically controlled by legislation. Web-scraping and other web-based tools could be used to collect and collated information on:</p> <ul style="list-style-type: none"> • Range of foods under these categories • Nutritional composition • Ingredients • Nutrient fortification levels • Nutrition and health claims. 	<p>None notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>The report will inform whether further official controls procedures are required and inform the need for risk management actions.</p>	
<p>29. Review of fortified foods on the Irish market</p>	<p>As part of the EU Farm to Fork strategy the European Commission (EC) is planning to establish 'nutrient profiles', that is, maximum amounts for nutrients such as fat, sugar and/or salt in foods, above which the use of nutrition or health claims would be restricted or forbidden. For example, breakfast cereals exceeding a sugar limit could no longer advertise their fibre or vitamin content. Information on the fortified foods on the market can inform on the number and type of products which may be affected by the introduction of nutrient profiles.</p> <p>Research required includes a review which would provide information on:</p> <ul style="list-style-type: none"> • the prevalence of fortified foods available on the market • the prevalence of food fortification among different food categories • the specific nutrients with which products are commonly fortified <p>Information on the levels of nutrients present could be reviewed in line with nutrient ULs to assess the safety of such products.</p>	<p>None notified.</p>
<p>30. Develop a data set to help monitor priority foods for reformulation in the out of home sector</p>	<p>Food reformulation is an important tool for addressing obesity and non-communicable diseases e.g., cardiovascular disease. In Ireland the Department of Health has established a Food Reformulation Task Force to drive and monitor food reformulation by the food industry. The food service sector is difficult to monitor due to its diverse and extensive nature.</p>	<p>1. NANS II- National Adult Nutrition Survey</p> <p>Lead: Dr Janette Walton, Cork Institute of Technology (Technical University Munster)</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>Research is needed to investigate the contribution of food consumed out-of-home to the nutritional intakes of Irish adults and therefore establish priority food categories / meals for reformulation that contribute most to calorie, saturated fat, sugar and salt intakes in the out-of-home sector and set a benchmark for monitoring.</p> <p>Analysis of the recently conducted National Adult Nutrition Survey II is a source of information.</p>	<p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 2019R445</p> <p>Start year: 2019</p> <p>Report when available: Here or Here.</p>
<p>31. The safety and suitability of dairy alternatives</p>	<p>Ireland’s healthy eating guidelines recommend three servings of dairy per day for all individuals with the exception of those aged 9-18 years where five servings are recommended. A serving of dairy includes a 200ml glass of milk, 125g pot of yogurt or 30g cheese which is based on calcium requirements for the population.</p> <p>However, in recent times, there has been an explosion of dairy alternatives on the Irish market. Research has demonstrated that shaken and unshaken plant-based drinks have divergent protein and calcium content highlighting the importance of consumer understanding of food product labels to avoid nutritional deficiencies.</p> <p>In line with the Farm to Fork Strategy and developing healthy sustainable dietary guidelines, it is important to understand the safety, sustainability and suitability of such products for various population groups.</p>	<p>None Notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>Research should also include a review of the ingredients used in terms of chemical and microbiological risks, nutritional profile and sustainability index, presence of non-mandatory labelling information including nutrition and health claims, and green claims.</p>	
<p>32. Reduction of fat, sugar, and salt in consumer foods</p>	<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, contributes to addressing 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., saturated fat, sugar, and salt) across all consumer foods categories.</p> <p>Reformulation should simultaneously address all relevant 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.</p> <p>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), to ensure an energy reduction in the product as well as a reduction in sugar content. Such replacement options need to be rigorously researched, to ensure safety for all population cohorts, including children</p>	<p>See food consumption studies listed earlier in this report.</p> <p>1. FORC- Food Reformulation for Consumers: Understanding barriers to consumer acceptance of reformulated food products</p> <p>Lead: Prof Patrick Wall , University College Dublin.</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 13F460</p> <p>Start year: 2013</p> <p>Report available: Here.</p> <p>2. PROSSLOW- Development of Consumer Accepted Low Salt and Low Fat Irish Traditional Processed Meats</p> <p>Lead: Dr Maurice O'Sullivan, University College Cork.</p> <p>Funded by: Department of Agriculture, Food and Marine, Food Institutional Research Measure 11F026</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<p>and those with fibre-sensitive conditions such as irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD). Research should also investigate the potential impact of reformulation efforts for those on restricted diets. For example, individuals with inborn errors of metabolism e.g., phenylketonuria (PKU) who can't metabolise aspartame. 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>	<p>Start year: 2011</p> <p>Report available: Here.</p> <p>Note: There may also have been research funded by DAFM in this area prior to 2010 on ready meals and bread.</p>
<p>33. Market review of the prevalence of claims on 'sustainable foods' or plant-based alternatives</p>	<p>In recent years, there has been an increase in the production and consumption of 'sustainable foods' and plant-based alternatives, this may not have been captured in previous studies. This research project would inform on whether nutrition and health claim regulation should have a particular focus for this category of food products.</p> <p>An increasing number of labels relating to the sustainability of food products including those which estimate the effect of a product on one or more environmental factors, such as carbon footprint as a marker of greenhouse gas emissions or climate change i.e. 'green labels'. This research could provide an insight into the types of labels being used on these 'sustainable' and plant-based alternative products. There are currently no mandatory regulations governing these types of labels.</p>	<p>None notified.</p>
<p>34. Risk assessment for high dose</p>	<p>The European Food Safety Authority (EFSA) has been tasked by the European Commission to review past opinions on the tolerable upper intake</p>	<p>None notified.</p>

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
<p>vitamins and mineral supplements</p>	<p>levels (ULs) for vitamin A, folic acid/folate, vitamin D, vitamin E, vitamin B6, iron, manganese and β-carotene and to take into account recent scientific developments and evidence. Recently, EFSA have released their “<i>Draft scientific opinion on the Tolerable Upper Intake Level (UL) 1 for vitamin B6</i>” where they propose to reduce the UL for vitamin B6 from 25 mg/day to 12.5mg/day. Based on data from case reports and recent nutriviigilance data, a causal relationship between high vitamin B6 intakes and peripheral neuropathy is well established and is the critical effect on which the UL is based. While hypotheses for the potential mechanisms of toxicity have been recently put forward, the casual mechanisms are still unknown. Considering the popularity of vitamin B6 and availability to the general public, more work is warranted to better understand the safety profile of high dose vitamin B6 supplements.</p> <p>In addition, in the conclusions of their draft opinion, EFSA put forward a number of research recommendations:</p> <ul style="list-style-type: none"> • Additional research is needed regarding potential differences in the toxicity profile of the different vitamers of vitamin B6. • Additional research on toxicokinetics and toxicodynamics could help to refine the derivation of a uncertainty factor. • Further investigation of the mechanisms of vitamin B6 toxicity is needed and the identification of genetic traits that may influence individual susceptibility. 	

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
	<ul style="list-style-type: none">• Additional research is required to investigate the impact of other factors, such as age and sex and epigenetics, on vitamin B6 neurotoxicity.• Further investigations or analysis of the existing datasets would be needed to clarify the role of high vitamin B6 intake on bone health.	

Social science

Research area	Research need	Relevant Irish research projects in progress or completed since 2010 that FSAI is aware of
<p>35. Food safety culture</p>	<p>Self-regulation is the norm in many industries, e.g., financial, electronics, pharmacological sectors, where potential consumer harm is managed by the company's own compliance reviews. The paradigm of the regulator and the regulated in food safety compliance sometimes tends towards a very different culture of food safety arising from compulsion as opposed to choice.</p> <p>EU food safety legislation on official controls now require an assessment of food safety culture in food businesses. This requires food businesses to consider what their food safety culture is and how to embed it into their business so that it can be verified by regulators. Research into the marked-difference in safety assurance cultures across different industrial sectors, may yield insight to culture-forming initiatives transferrable from non-food sectors to food production.</p> <p>Research needs include:</p> <ul style="list-style-type: none"> • Research safety assurance cultures in other industries e.g., pharmaceutical, to gain insight into initiatives that could be adopted/adapted by the food industry to strengthen food safety culture. • Investigate behavioural and leadership drivers within food production which support an explicit culture of food safety as a 	<p>None notified.</p>

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	<p>priority. Conversely identify potential impediments which might increase the risk of food safety culture being sub-optimal.</p> <ul style="list-style-type: none"> • Identify practical interventions which can be applied to drive an ethos of food safety culture in food businesses. • For the purposes of official controls of adequate compliance with legal obligations, identify tangible indices of adequate food safety culture and early-warning indicators of poor food safety culture that could be used to verify compliance. 	
<p>36. Food safety enforcement</p>	<p>Official controls on food are in place to protect public health and public interests. Food law is complex and there are various penalties for non-compliance up to and including prosecution and conviction. This latter penalty is often considered a last resort and reserved for the most severe or persistent breaches of food law. Competent authorities recognise that most food businesses want to comply with legal requirements but sometimes fail through lack of technical knowhow or ignorance of the law. Nevertheless, sometimes legal enforcement procedures are necessary and need to be carried out in a way that is dissuasive of further non-compliance both by the specific food business and by the food sector, as a whole.</p> <p>Research is needed to understand the behavioural effectiveness of different approaches to food safety enforcement. For example:</p>	<p>None notified.</p>

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	<ul style="list-style-type: none"> • Does leniency, noting a non-compliance and allocating generous time-period for closeout send a message of acceptability of non-compliance? • Are Compliance Notices more or less effective at dissuading non-compliance by that operator? Have they any effect wider than the operator? • Assuming published enforcements (Enforcement Orders under the FSAI-Act or S.I. 79 of 2020) are more dissuasive than non-public notices e.g., compliance notices under SI 22 or 79 of 2020 , can the magnitude of that benefit be quantified, both for the individual operator and also in deterring non-compliance by broader group of operators? Can appropriate scenarios for application for different tools be considered to ensure maximal effect and proportionality? • Fixed Penalty notices have a benefit of immediacy but may lack proportionality. What is the comparative dissuasiveness, and appropriate scenarios for such enforcement tools, over others? • Should prosecutions be taken more frequently? Does it have a dissuasive effect on the wider food industry? • What are the public’s attitudes to the different enforcement options in the context of fairness and proportionality? 	

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<p>37. Food operation expansion risk assessment</p>	<p>An anecdotal contributor to food safety issues is any rapid expansion of food production volume or complexity. Increased commercial output can stretch physical structures and assurance systems designed for much more moderate operations. Raw material diversity, new processes, new equipment, when imposed on pre-existing structures and systems have potential to detract from food safety risk management effectiveness.</p> <p>Research is needed to identify drivers related to business expansion that result in increasing food safety risks. This work could include:</p> <ul style="list-style-type: none"> • Economic drivers • Physical drivers • Behavioural drivers. <p>Ideally a set of early indicators would be beneficial to identify when food safety is becoming compromised so proactive action can be taken to protect public health.</p>	<p>None notified.</p>



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