DAFM 2011 Research CALL – Supplementary Projects funded under the FIRM Programme

DAFM Reference	Project Title	Lead(Collaborating)Institution	Award
11F009	The use of marine derived antibacterial agents to combat the prevalence of Salmonella in pork products.	UCD (Teagasc)	€490,393
Project Coordinator: Prof Alan Dobson			
Project Abstract			
Infections caused by food borne pathogens, such as Salmonella spp. are a major public health problem worldwide and the consumption of pork products containing salmonellae continues to be a major source of food poisoning. There is a clear need to identify novel products to control the threat both to human health and the pig industry in Ireland. Marine sponge-derived Pseudovibrio species were previously identified (in FIRM project FS067) as a novel source of anti-Salmonella activities but the isolation and charactorisation of these anti-Salmonella activities has proved difficult using standard approaches. This new project will build upon these results, using an approach combining genomics, molecular microbiology and natural product chemistry, to fully charactorise anti-Salmonella compounds from these Pseudovibrio isolates. Draft genome sequences of three selected bioactive Pseudovibrio species will be determined. These genomes will be analysed for the presence of genes involved in tyhe biosynthesis of known families of antibiotics. Newly identified antibiotic biosynthesis gene clusters will then be over-expressed leading to increased production of antibiotics and enabling their purification and full characterisation. In a parallel approach a media/fermentation optimisation strategy will be employed to increase antibiotic production levels in the native hosts. Anti-Salmonella activities will be purified using a bioassay-guided strategy with novel compounds being rapidly identified using mass spectrometry approach. Novel compounds will be fully characterised by NMR. This novel approach will result in the identification of 3-15 compounds with anti-Salmonella activity and an improved means to produce then for commercialisation and field applications.			

DAFM Reference	Project Title	Lead(Collaborating)Institution	Award
11F031	High Pressure Processing to Control Pathogens in Ready-to-eat-Traditional cooked meat products with reduced-sodium, lower preservatives and no artificial colours or flavours.	UCC (Teagasc)	€308,173
Project Coordinator: Dr Malco Cruz-Romero			
Project Abstract			
Sodium in meat products has a variety of functions: microbiological safety, preservation, taste, flavour, texture, structural integrity, nutrition, and colour (Kuhn, 2010). The reduction of sodium in meat products presents significant challenges to developed meat products maintaining quality attributes in an acceptable and affordable manner (Clemens, 2012). E.g. too little sodium in meat products can result in unstable emulsions with poor texture. High pressure processing (HPP), is an alternative method for food preservation (Barbosa-Cánovas & Bermúdez-Aguirre, 2011), fulfilling consumer requirements for minimally processed and additive-free products and inactivates pathogenic and spoilage micro-organisms including Salmonella, Escherichia coli, and Listeria at room temperatures, maintains sensory and nutritional properties and contributes to the development of meat products with lower salt content. Hurdle technology presents vast opportunities for processing and preserving food of excellent quality (Rodriguez-Calleja et al., 2012). The objectives of this project are to reformulate traditional meat products (ham and frankfurters) with significantly reduced sodium and preservatives, investigate the use of HPP and organic acids as hurdles to control pathogens and increase shelf-life in these products. The impregnation of flavour by HPP on lower cost meat small joints of beef and pork leading to added-value-products will also be investigated. Through shelf life extension, a reduction in retailer supply chain wastage of these products is foreseen, improving sustainability in the manufacture of these products. Pilot scale processing will be used to determine consumer acceptability, storage shelf-life, handling and packaging requirements. Overall			

production costs per unit will be determined by a commercial HPP.			
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11F033	Packaging and Chilling Technologies to Enhance Meat Quality and Safety	Teagasc (UCC, UCD)	€621,577
Project Coordinator: Dr Declan J. Bolton			
Project Abstract			
Hot/warm boning offers significant cost saving opportunities for the Irish beef industry. While the improvements in meat quality and yield have been scientifically proven, information on the microbiological aspects of this technology is lacking. In theory the elevated storage temperatures encountered during hot/warm boning could support the growth of spoilage and pathogenic bacteria resulting in reduced shelf-life and increased risk to the consumer. Blown pack spoilage (BPS), already a significant issue for the Irish beef industry, is of particular concern as hot/warm boning could further exacerbate an already serious issue. This project will study the microbiology of hot/warm boned meat using internationally accepted methodologies. Active and smart packaging solutions to reduce and/or prevent BPS will be developed and validated. Rapid cooling with slurry will be investigated as a technology to improve both the physiochemical and microbiological quality and safety of hot/warm boned beef including an assessment of the suitability of this technology for use with meat intended for further processing. For the first time, the genome of a BPS Clostridial species (C. estertheticum, the most common and most rapid cause of BPS in Ireland and elsewhere) will be mapped using state-of-the-art sequencing and bioinformatic methods. Finally a multiplex real time PCR assay will be developed to detect C. estertheticum, C. gasigenes and C. ruminantium, providing the Irish beef industry with a technology that is more rapid, detects a broader range of BPS causing species and, most significantly, is at least 100-fold more sensitive (and therefore suitable for sanitation and decontamination validation checks) than that currently available. Overall, this project will increase the competitiveness, profit margins and overall value of the Irish beef industry through the provision of significant cost savings achieved through reduced processing and spoilage costs.			

DAFM Reference	**Project Title**	**Lead(Collaborating)Institution**	**Award**
11F061	Dehydration / Rehydration dynamics for development of 'SMART' Dairy ingredients	Teagasc (UCC, UL)	€800,983
Project Coordinator: Dr Mark Fenelon			
Project Abstract			
A growing world population and increasing middle class is driving demand for high quality powdered nutritional products, particularly in the world's emerging markets. This, coupled with the abolition of quotas in 2015, provides the dairy sector with an opportunity to expand by a predicted 50% (Food harvest 2020) by the year 2020. Consequently, there is an urgent requirement for targeted dairy chemistry / technology based research as the only technically feasible way to deliver Irish milk to emerging markets outside Europe in powdered (dehydrated) format. The aim of the current project is to develop core scientific competency in protein chemistry and dehydration / rehydration dynamics for engineering of 'SMART' protein base powdered ingredients for export with built in cost modelling. The scope of the science will include thermal and ionic manipulation of milk proteins in liquid state to influence new hydration dynamics during subsequent drying and reconstitution. In some instances, these hydration properties will form the basis of a finished food. In order to utilise large volumes of milk, without expensive waste streams, the target functionality of these 'SMART' ingredients is primarily physical, ultimately rehydration mechanics. The new ingredients will be built from a base milk protein concentrate, MPC platform, with advanced design function to increase value, while utilising volume, at two value levels: level 1: targeted ingredients with specific rehydration properties to allow reconstitution into large volume dairy based foods e.g. sports beverages and / or Level 2: nutritional base for beverages including infant formula, dietary products, elderly health beverages, therapeutic and medical products including supplements.			

DAFM Reference	Project Title	Lead(Collaborating)Institution	Award
11F064	Extraction and validation of antioxidant and anti-inflammatory ingredients from Brewers' Spent Grain	UL (UCC)	€495,920

Project Coordinator: Prof R.J. (Dick) FitzGerald

Project Abstract

While large quantities of brewers' spent grain (BSG) are produced annually (~ 160,000 tons in Ireland) the residual protein and polyphenolic components therein remain an untapped source of functional food ingredients. This project aims to extract protein/peptide and polyphenolic rich extracts from BSG to assess their potential to act as antioxidant (AO) and anti-inflammatory (AI) agents. These bioactivities are implicated in minimising/preventing the consequences of many diseases. Our recent findings demonstrate that significant in vitro AO and AI activity exits in BSG protein hydrolysates and polyphenolic extracts. We propose to expand on these findings to optimise the generation of AO and AI peptides from BSG along with optimising the extraction of polyphenolics. Evidence in the literature demonstrates that phenolics occur in a bound format in barley. Furthermore, it appears that the bioactivity of bound versus free phenolics may be significantly different. We are therefore proposing to use mild enzymatic extraction approaches to release carbohydrate-bound but soluble phenolics from BSG. In addition, we plan to apply alternative direct enzymatic approaches to release bioactive peptides directly from BSG. The comparative in vitro AO activity of the peptide and bound versus free phenolic ingredients will be assessed. Human cell culture approaches will be employed to assess extract effects on biomarkers of oxidative stress and low grade inflammation. The most promising ingredients will be formulated for oral ingestion. A human intervention study will be carried out to access the effects of a combined ingredient blend (phenolics and peptides) on markers of AO and AI activity.

DAFM Reference	Project Title	Lead(Collaborating)Institution	Award
11SF310	Gender, Age and Diet Effects on Lamb Meat Flavour and Sensory Quality	UCD (Teagasc, AFBI)	€952,454

Project Coordinator: Prof Frank Monahan

Project Abstract

There is concern in the Irish lamb meat industry about the marketability of lamb from uncastrated (ram) lambs, arising from a perception among suppliers, buyers and consumers that the sensory quality of such lamb is inferior to castrate lambs. The project sets out to establish if there is any scientific evidence to support this perception. Thus, the project will investigate the influence of different Irish lamb production systems on the sensory quality and acceptability of lamb meat, focussing specifically on the effect of castration of male lambs, their age at slaughter and diet, and interactions between these factors, on lamb meat quality, particularly flavour quality. To meet the project objectives controlled lamb feeding trials will be conducted over four years in the Republic of Ireland and in Northern Ireland where lambs will be assigned to treatments designed to determine the effect of gender, age at slaughter and pre-slaughter diet (and interactions between these factors) on lamb meat quality measured sensorially and instrumentally. The new information generated will be invaluable to primary producers in devise mitigating strategies to address issues of flavour (taint) if they exist and will underpin the efforts of the lamb meat industry and Bord Bia to increase the sale of lamb at premium prices on national and international markets.