Ali ALEHOSSEINI

Technology Centre:	**Dairy Processing Technology Centre (DPTC) & Teagasc Food Research Centre**
Academic Mentor:	**Dr. Diarmuid Sheehan**
Company Partner:	**Dairygold Food Ingredients Limited**
Company Mentor:	**Dr. Anna Moynihan**

Ali has a significant number of years' experience in food science and research as well as experience in industrial scale food production, food industry consulting, and in commercial laboratories. He has a PhD in Food Material and Process Design Engineering—conducted at the Research Institute of Food Science and Technology, Iran—focused on the design of new food structures, delivery systems, and encapsulation of a wide range of bioactive compounds & probiotic bacteria in hydrocolloid/protein networks (e.g., whey proteins, soy protein isolate, zein, and polysaccharides) using electro-hydrodynamic atomization (electrospraying & electrospinning), spray & freeze drying, as well as using cross-linkers (e.g., Transglutaminases enzyme) and oil-induced biphasic hydrogel particle formation techniques. Under the supervision of Dr. Amparo López Rubio, Ali also conducted research at Instituto de Agroquímica y Tecnología de Alimentos (IATA-CSIC), Spain as a visiting research fellow—from 2017 to 2018. He has also worked as postdoctoral fellow in the field of manipulation of dairy matrices to eliminate color transfer to whey during cheese making under the supervision of Dr. Diarmuid Sheehan (Teagasc) and Prof. Alan Kelly (University College Cork) (2019-2020).

Dr Diarmuid Sheehan

Dr Sheehan is a Senior Research Officer based at the Teagasc Food Research Centre Moorepark. Amongst other activities, he is RFA 1 lead and a Principal Investigator (PI) for the Dairy Processing Technology Centre and a PI for the Food Health Ireland programme. He has licensed IP protected technologies to industrial partners and was previously a programme manager for a public private partnership focused on converting research expertise into the development of products for market launch. Diarmuid has published over 75 peer reviewed publications and book chapters, is an Associate Editor for the international Journal of Dairy Technology and chairs the Standing Committee for Dairy Science and Technology of the International Dairy Federation.

Dr Anna Moynihan

Dr Moynihan, an experienced R&D professional, specialist in cheese technology, graduated from UCC in 2008 with a BSc (Hons) in Food Science and Technology. She completed her PhD in 2012 on the topic "Studies on the texture, functionality, rheology and sensory properties of Cheddar and Mozzarella cheeses" under supervision of Professor Paul McSweeney. She was awarded the prestigious US Fulbright Scholarship in 2010 to conduct a part of her PhD research in Prof John Lucey' lab at University of Wisconsin-Madison, USA and published two research papers in peer reviewed journals. Since year 2012, Dr Moynihan has been leading commercially driven cross functional cheese innovation projects in Dairygold.

Dairy Processing Technology Centre (DPTC)

The Dairy Processing Technology Centre is an industry-academic collaborative research center, hosted by the University of Limerick, with a research agenda driven by the long-term growth opportunities for the dairy sector. The Centre will help to fuel growth in the Irish dairy sector by performing research focused on cost-efficient processing, facilitating a step-change in environmental sustainability and creating, validating and commercializing a pipeline of science and technology-based manufacturing platforms for dairy ingredients.

Dairygold Food Ingredients

Dairygold Food Ingredients has a strong research collaboration with the Teagasc Food Research Centre Moorepark, both directly and through other innovation platforms. Dairygold has one of the largest Cheddar production plants nationally and is committed to improved dairy market returns for its stakeholders by producing and exporting milk products in a cost effective and sustainable manner.

Ali's project

"Modelling solute transport dynamics in reduced solvent matrices for optimizing sustainability of industrial scale cheese manufacture"

Ireland produces ~285,000 tonnes of cheese annually (~ > 95 % exported, worth ~ € 1 bn) but this is also responsible for emission of greenhouse gas (GHG). For each kg of cheese produced, significant amounts of energy (4.9-8.9 MJ) are consumed and produce 7.2 kg of GHG through electricity usage, heat generation, and transportation costs. Furthermore, 15-30 % of the salt added during cheese-making, is lost to waste which incurs disposal costs.

Ireland exports 223,000 tonnes of Cheddar p.a. (worth ~ € 749m) with the UK being an important market. However, given the exposure of this market to the impact of Brexit, there has been a serious focus to diversify cheese sales in the fast growing (8% annually) Asia-Pacific markets such as for low moisture cheese.

The current project will present a scientific-industrial platform to (1) enable production of cheeses with lower moisture contents, thus reducing global transportation costs by €85 per 1 tonne of cheese, (2) reduce salt use by up to 25%, recovering up to 1.8 % more whey solids from waste, reducing disposal costs for salty whey by up to 15%, and preventing up to 42.6 tonnes of salt per 10000 tonnes of cheese from going to waste. The project will focus on model protein gel systems and sophisticated analytical techniques such as laser induced breakdown spectroscopy (LIBS) and confocal Raman microscopy, but will prove its results at industrial scale. Overall, the project will use science to deliver climate friendly, economically viable and sustainable cheese manufacturing solutions for a key export industry.