

Moorepark News

Research, technology and innovation for the dairy industry

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Viewpoint

Infant Milk Formula – from technology to biology



Expanding milk production provides a unique opportunity to the Irish Dairy Industry to consolidate its position as a key player in value added international markets. However, success will depend on the capacity of the industry to be a leader in product and ingredient innovation. The Food Research Programme at Moorepark is strongly focused on supporting this agenda. Infant Milk Formula (IMF) is of particular relevance in this regard with over 12% of the IMF traded globally coming from Irish milk.

Research capability at Moorepark in IMF includes manufacturing technology but an ever increasing focus involves nutritional considerations of IMF. A key driver in IMF is development of milks that mimic as closely as possible human breast milk, the “gold standard” when it comes to infant nutrition.

The adult gut carries a very large and diverse population of microorganisms that are vital in maintaining our health status. The foods we eat programme this microbiota and this is particularly relevant in the case of infants. Teagasc Moorepark, along with our colleagues at UCC, are global leaders in gut microbiota research. We are currently investigating how food impacts the development of the infant gut microbiota, the role of IMF in such development and how the composition of IMF can be altered to make it closer to breast milk. Human breast milk contains a large and varied range of complex sugars (oligosaccharides). Research is demonstrating that oligosaccharides play a variety of roles including programming the gut microbiota and preventing infection. At Moorepark we are also investigating the oligosaccharide content of cow's milk, developing methods to enrich specific oligosaccharides during processing, as well as contributing to the international research effort in elucidating the role of oligosaccharides in infant nutrition. Fat is an important nutritional component of breast milk; however, human and cow milk differ in terms of fat composition. Part of the research strategy at Moorepark is aimed at manipulating the fat composition of cow's milk to make it more similar to human breast milk. These research strategies on nutritional aspects of IMF will provide opportunities for the Irish dairy industry to consolidate their position as global leaders in this area.

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Viewpoint: Farming systems post quotas



Like it or not we live in interesting times. Dairy farmers today operate in a production environment of unprecedented uncertainty but also unparalleled opportunity. For most of the last 30 years, milk output has been constrained by quotas, yet the Irish dairy sector remains one of the few indigenous sectors to have built a global footprint.

Buoyed by strong international demand, the abolition of milk quotas in 2015 will finally afford dairy farmers the opportunity to expand their businesses. Notwithstanding the positive energy for expansion at farm level, there are also challenges ahead. In recent years, the financial environment of dairy farming has shifted from relatively stable and predictable annual cash flows to higher milk prices but increasingly volatile farm incomes.

As an export oriented industry, the increasing integration of farming systems within interconnected global 'paddock to plate' food chains continues. We must ensure that our post quota systems meet the highest international standards of food safety and quality, while also being animal welfare friendly and environmentally sustainable. Irish dairying has an enviable reputation for sustainability; this must be enhanced post quotas.

At Moorepark, much of the production systems research undertaken in recent years has focused on the continued development of resilient grass based farming systems that facilitate profitable dairy expansion in an environmentally and socially sustainable manner. Resilient businesses are technically and financially efficient, generate surplus cash, consistently achieve financial expectations and are simple to operate. Based on the triple bottom line of profitability, socially and environmentally responsible milk production, our farming systems must continue to be heavily reliant on the production of milk from grazed grass. This will require compact calving, high EBI dairy cattle and an appropriate overall farm stocking rate that is consistent with the farms grass growth capability.

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Climate Change Policy – IPCC or LCA?

Life cycle assessment (LCA) and the Intergovernmental Panel on Climate Change (IPCC) are methods used to compute greenhouse gas (GHG) emissions. The IPCC method considers emissions from national sources and is used to evaluate compliance with emission targets.

The LCA approach quantifies all emissions associated with dairy production up to the point milk is sold from the farm including embodied emissions (e.g., fertiliser manufacture). Both methods were applied to evaluate the carbon footprint of grass-based and confinement systems operated in Moorepark.

The carbon footprint of the confinement system was 8% lower than the grazing system using the IPCC method. Using the LCA method, however, the carbon footprint of the confinement system was 16% greater compared with the grazing system. This difference arose because the IPCC method only considers the component of dairy systems emissions that occur within national boundaries. Therefore, to avoid adopting dairy systems that reduce Irish emissions but increase global emissions, the present policy method (IPCC) needs to be changed to the more appropriate LCA method.

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A model for energy consumption of dairy farms

The latest energy research at Moorepark is focussing on modelling the energy flows through the farm. A model was developed that simulates the energy consumption, costs and related CO₂ emissions of farm equipment on an hourly and monthly basis. The list of equipment includes milk cooling, water heating, milking machine, lighting, water pump and the winter housing facilities. The model was validated by comparing the simulated results against actual data collected from commercial dairy farms.

This model is suitable for application as an advice tool for farmers to improve their energy efficiency and reduce milk production costs. The usefulness of the model was demonstrated through an electricity tariff change (i.e. from day and night rate to flat rate), which showed that total electricity costs would increase by over 30% if farmers were to use a flat rate tariff instead of a day and night tariff. This model will be used to assess the impact of managerial and technology changes on electricity consumption, associated costs and CO₂ emissions on dairy farms.

Results to date indicate that pre-cooling milk with well water can reduce on-farm



electricity consumption by 28%, increase overall ten year profitability by 0.8% (€3,960) and reduce annual CO₂ emissions by 4.8 tonnes on a farm with 200 cows. Investing in a solar thermal water heater can reduce on-farm electricity consumption by over 18%, saving over 3 tonnes of CO₂ per annum on a 200 cow farm. The trade-off for this fossil energy saving, however, is a reduction in farm profitability of 1.8% (€9,200) in the ten year period after investment.

Ultimately, the model will lead to a set of recommendations to describe the optimal farm equipment configuration for existing dairy enterprises, new entrants and Greenfield sites to ensure low running costs and maximum profitability.

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Economic impact of exposure to Salmonella, Neospora caninum and Leptospira interrogans serovar hardjo in Irish dairy herds.



A study was conducted to quantify the impact of exposure to Salmonella, N. caninum, and L. hardjo on dairy farm profitability. The economic impact of vaccination for Salmonella and L. hardjo on dairy farm profitability was also estimated. Total annual profits in unvaccinated herds were reduced by €94 per cow as a result of exposure to Salmonella. Exposure to N. caninum and L. hardjo resulted in a reduction in annual farm profits of €12 and €14 per cow, respectively.

The reduction in total farm profits as a result of exposure to Salmonella in unvaccinated herds were between three

and four times greater than the combined reduction in farm profits associated with exposure to N. caninum and L. hardjo. This highlights the importance of implementing suitable control measures for Salmonella in Irish dairy herds.

Herds that vaccinated for Salmonella and L. hardjo generated €84 per cow and €9.70 per cow more profit compared to unvaccinated herds that tested positive for exposure to each respective pathogen.

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Disseminating cheese research



The European Union ends the system of maximum milk production per capita or “milk quotas” in 2015. Even though total milk production in Europe is unlikely to increase in the short term, a shift in production volumes within EU member states will occur. Arguably Ireland is best placed to gain from this due to commercial strengths, advantages of efficiency and quality of production. Estimates of a ~50% increase in milk production by 2020 are suggested, with cheese production volumes growing to 215,000 tonnes over this period. Key growth areas within cheese are in the production of non-Cheddar varieties, reduced/low fat and reduced salt cheeses and functional cheeses for the service industry.

In order to highlight the latest international research on cheese, exhibit products, equipment, facilitate discussion, be informed on market trends and show case Irish cheese research, Teagasc with UCC as part of the UCC/Teagasc Strategic Alliance in Food Research and in collaboration with INRA (The French National Institute for Agricultural Research) are hosting the 9th Cheese Symposium Cork on the 19th-21st November, 2014. The Symposium provides

a unique platform for national and international delegates from industry and academia to interact and discuss all aspects relating to cheese. This 9th Cheese Symposium is the latest in a series of very successful events that has continued to expand from its origins in 1988. The event is now an established international symposium recognised globally as an important event for the dissemination of cheese research that is applicable to both academics and industry.

This 9th Cheese Symposium incorporates topical thematic areas in cheese research such as; Health & Cheese, Cheese Quality, Structure Function, Safety, Sensory & Flavour Chemistry, Processability & New Technologies, and Cheese Markets and Trends. Key note presentations will be given by internationally renowned experts from both academia and industry. Details of the programme, registration, venue, can be found on www.teagasc.ie/events/2014cheese_symposium/ or cheesesymposium2014@teagasc.ie or by contacting Niamh O'Brien directly at Tel: +353 (0) 25 42313.

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DNA Sequencing Centre at Moorepark

The Teagasc DNA Sequencing Centre at Moorepark continues to go from strength to strength. The centre now contains 4 High-throughput DNA sequencers (Ion Proton, Ion PGM, Illumina MiSeq and Roche GS-FLX) and is now supported by a recently expanded Alimentary Pharmabiotic Centre (APC)-funded team.



To date, the Centre has primarily focused on Teagasc and APC-associated projects to assess the links between gut microorganisms and health/disease (and how to make beneficial changes to the composition of microbes in the gut through diet, probiotics etc) and to study the microbiology of foods. However, the team has also worked with other, non-APC, researchers from UCC as well as teams in CIT, WIT, NUIG, UCD and from industry on non-microbiology orientated projects and are eager to work with even more researchers/institutes/companies.

(NB. the Teagasc Ion Sequencers and the APC have been funded by Science Foundation Ireland).

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The Science of Starter Cultures

While the use of starter cultures for the production of fermented dairy products is an age-old process, state-of-the-art developments in genomics and metabolomics is providing the tools for a more ‘knowledge-based’ approach to selection of desirable cultures. By linking genomic traits to phenotypic outputs, it is now possible to mine the metabolic diversity of starter cultures and select strains with desirable and industrially significant properties that can impact both the production and final quality of the product.

An in-depth knowledge of properties such as flavour and texture development can allow starter blends to be ‘tailor made’ to suit industry needs. This approach also allows for the potential improvement of these and other characteristics in existing strains, strains that are at the core of the dairy industry. Applying this knowledge to starter culture research programmes is enabling scientists to develop superior starters and novel products for future market expansion.

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Emer Kennedy – Role Profile

Emer Kennedy is a Research Officer in the Grassland Science Research Department in Moorepark. Her research programme focuses on grassland management and nutrition as well as calf and heifer rearing.

Emer graduated from University College Dublin with a PhD in Agricultural Science in 2006. Her PhD research was conducted at Moorepark, and focused on early lactation grazing management strategies. Since completing her PhD, she has been employed at Moorepark, first as a Teagasc Post-Doctoral researcher, then as a Research Technologist, and currently as a Research Officer.

One of her current projects is focusing on investigating the effects of early lactation dairy cow nutrition on immediate and carryover dairy cow production. She also has a large programme of work on calf rearing, including investigations into colostrum management strategies to improve calf health and early calf nutrition. She has strong collaborative links with UCD, INRA (France), DairyNZ (New Zealand) and DEPI (Australia).



Emerging Cork Company of the Year is AnaBio Technologies Ltd

Sinead Doherty was a Walsh Fellow PhD student in Moorepark until 2011 (Dairy Levy funded). With the knowledge and expertise she gained during her PhD, she developed a technology for bioencapsulation (including one patent). She started her own company AnaBio Technology Ltd. (www.anabio.ie), and now commercialises technologies to stabilise ingredients for food, feed and pharmaceutical applications. Her company uses the laboratory and scale-up facility in the Teagasc Food Research Centre, Moorepark.



Dr Sinead Doherty's AnaBio Technologies Ltd has been named Cork Chamber of Commerce, in association with Vodafone, Emerging Company of the Year 2014.

International Cow Fertility Conference

Over 400 delegates attended the International Cow Fertility Conference in Westport, Co. Mayo organised by Teagasc, UCD and the British Society of Animal Science. Invited talks were presented by Moorepark research staff (Donagh Berry, Frank Buckley, Stephen Butler and Laurence Shalloo) and visiting scientists (Prof. Matt Lucy and Prof. Paul Fricke).



Visiting scientist from New Zealand



Dr. Kathryn Hempstalk from LIC in New Zealand is undertaking a four month sabbatical at Moorepark. Kathryn will undertake

research examining the application of machine learning techniques to milk MIR spectrometry data in collaboration with Donagh Berry.

Visiting scientist from Australia



Dr Christie Ho from DEPI in Melbourne, Australia is undertaking a three month sabbatical at Moorepark. Christie is a researcher in the area of farm systems

economics and will be working with Laurence Shalloo to understand how the Irish Pasture Profit Index is generated and examining how a similar index could be developed for Australia.

A group of Chinese journalists visited Moorepark



Chinese journalists visit Moorepark. A delegation of journalists met with Tom Beresford and Catherine Stanton who outline to them the key components of the Food Research Programme that is influencing new product development some of which are finding their way to the Chinese marketplace.

Professor Tim Guinee wins Teagasc Gold Medal



Tim receiving the medal from Teagasc chairman, Dr Noel Cawley

The award was presented to Professor Guinee in recognition of his achievements during his career in Teagasc since joining the organisation in 1990.

Upcoming Events



The 9th Cheese Symposium

12th & 13th November 2014
Clarion Hotel, Cork

The symposium will cover talks in the following areas:

- Health & Cheese
- Cheese Quality
- Structure & Function
- Safety
- Sensory & Flavour Chemistry
- Processability & New Technologies
- Cheese Markets & Trends

For more information: www.teagasc.ie/events/2014cheese_symposium/

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