



DAIRY CONFERENCE

GROWTH THROUGH INNOVATION



AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

Milk product innovation- an international perspective

The Irish Agriculture and Food Development Authority

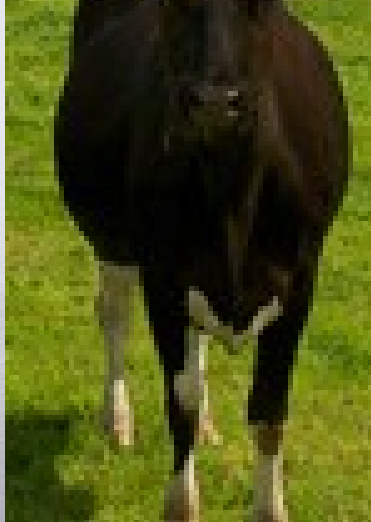
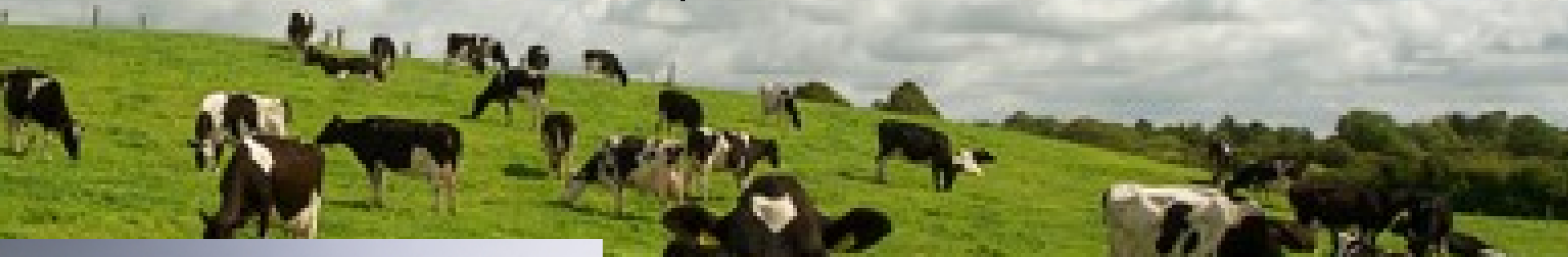
Dairy Innovation

an International Perspective

Why the need for innovation now?

What you need for Dairy Innovation?

Where do we put our efforts?



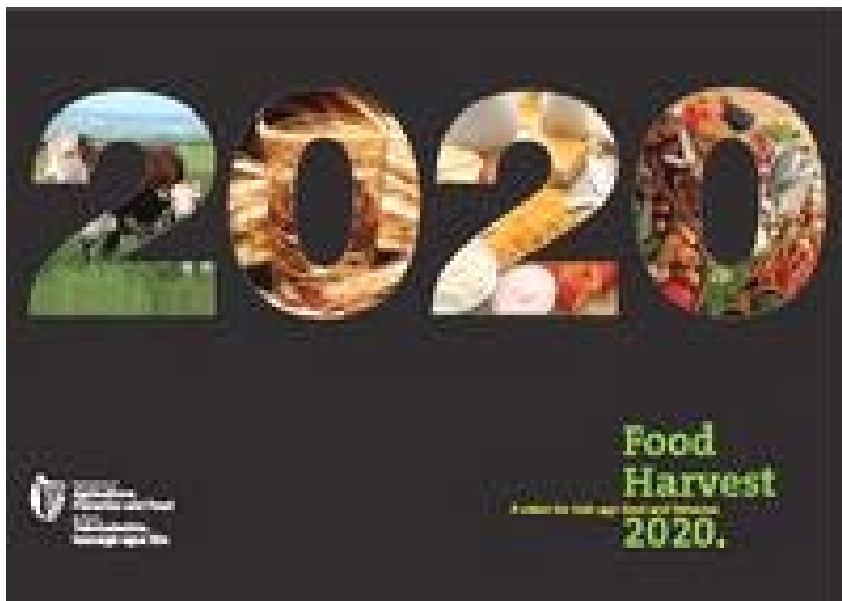
Irish Agri-Food Industry

Most important indigenous industry.

11% of Ireland's exports and 8.6% of total employment. (DAFM 2013)

In 2013, exports increased by an estimated 9% to approximately €9.9 bn (Bord Bia 2013).

The UK 42% in 2013 accounting for of all exports.
32% Continental EU markets 26% international markets.



Predictions for 2020

Milk output to increase by 50%

Beef exports to increase by 20%

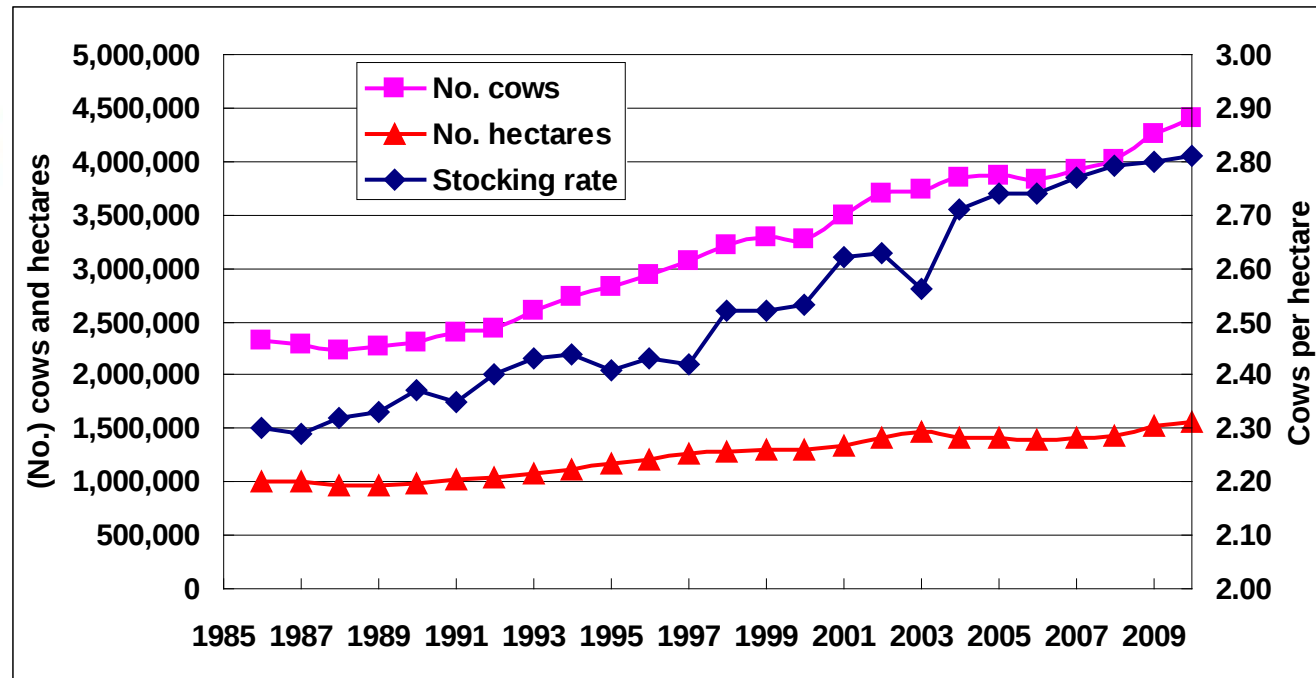
Pork exports to increase by 50%

Ireland versus New Zealand (1985-2010)

In 1985 Ireland and New Zealand produced 5.5 Billion Litres

In 2013 Ireland produced 5.8 Billion Litres

Now New Zealand produces 19 Billion Litres



Why now?



Advantages

Climate
Production cost
Carbon footprint
Sustainability

Pasture-based
“Natural”

Safe
Higher in
polyunsaturates/CLA
Healthier

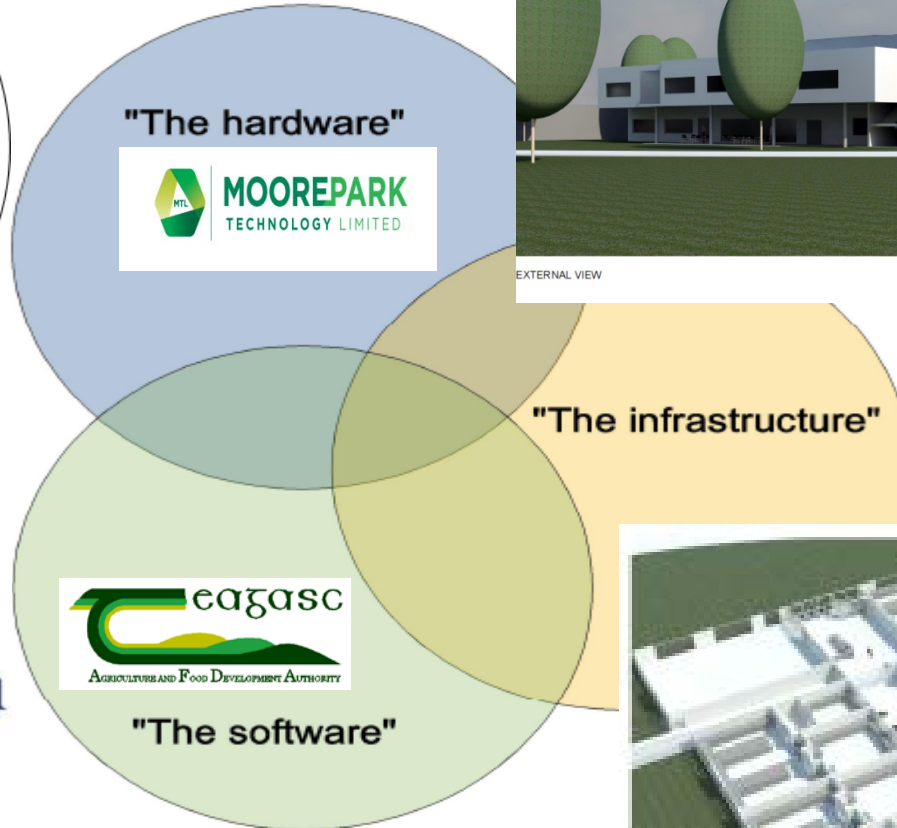


Research

Grass breeding/
Grasslands

Genomic selection/
Animal nutrition

Food Innovation/
Food Safety



EXTERNAL VIEW



Food Innovation Hub



VISION

Teagasc Food Programme Mission

“To support science-based innovation in the Irish food sector so as to underpin profitability, competitiveness and sustainability”

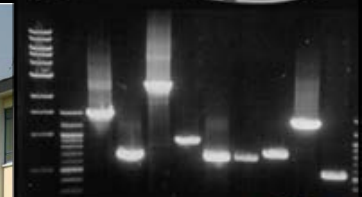
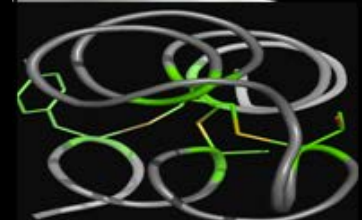
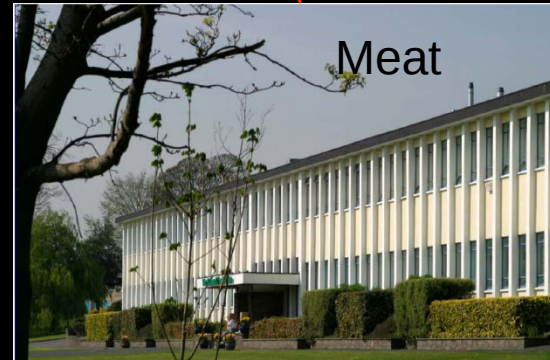
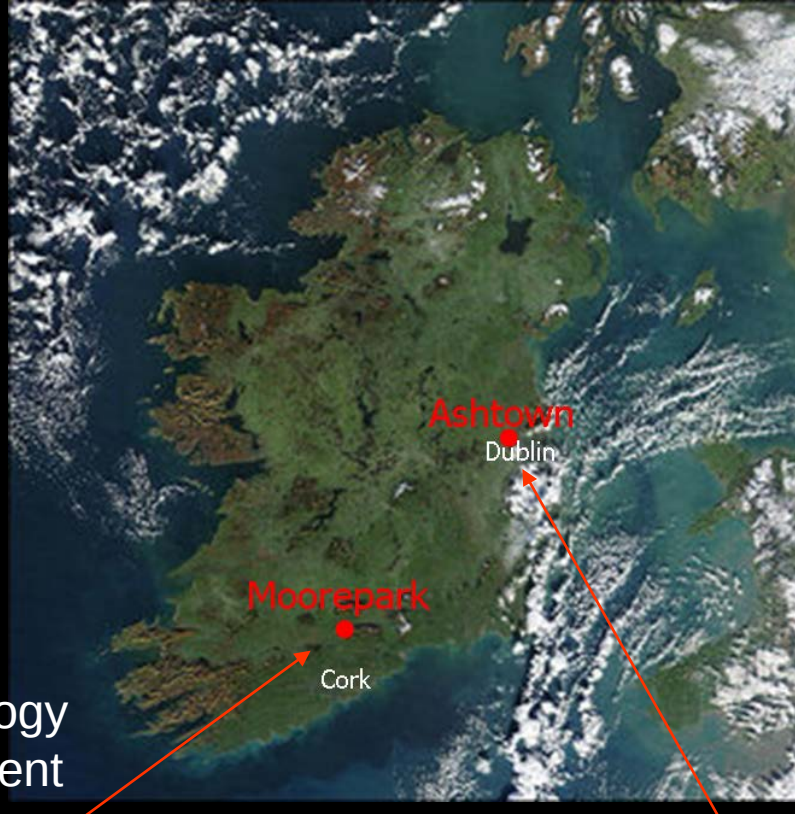


Food Research Programme

- 200 Research Staff & Students at 2 locations
- Budget – 15 M Euro

Departments

Food Biosciences
Food Chemistry & Technology
Food Industry & Development
Food Safety



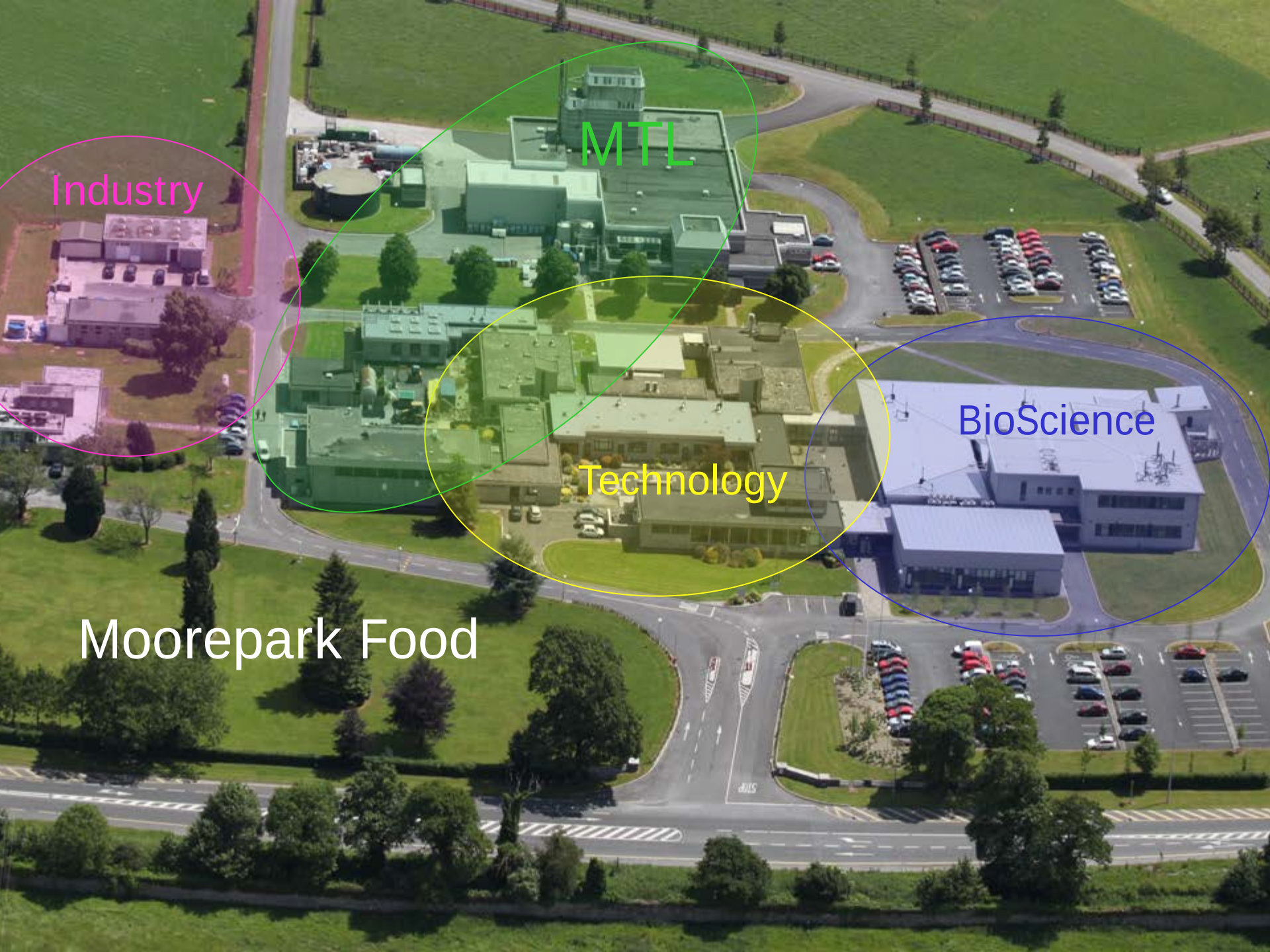


Technologies
for the
Food Industry

MEAT@GATEWAYS

Ashtown, May 21st





Industry

MTL

Technology

BioScience

Moorepark Food



BIO-FUNCTIONAL
FOOD ENGINEERING



Wet Process Unit



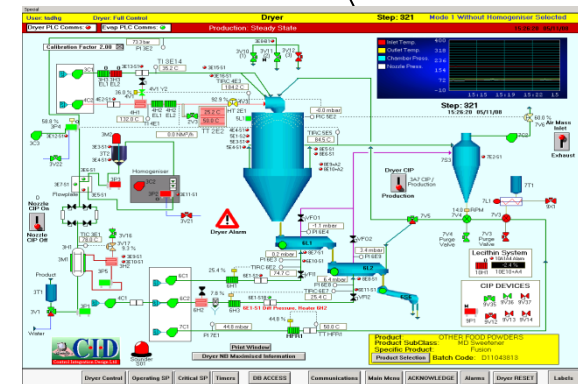
Separation



Food Applications Unit



Fat Technology Unit

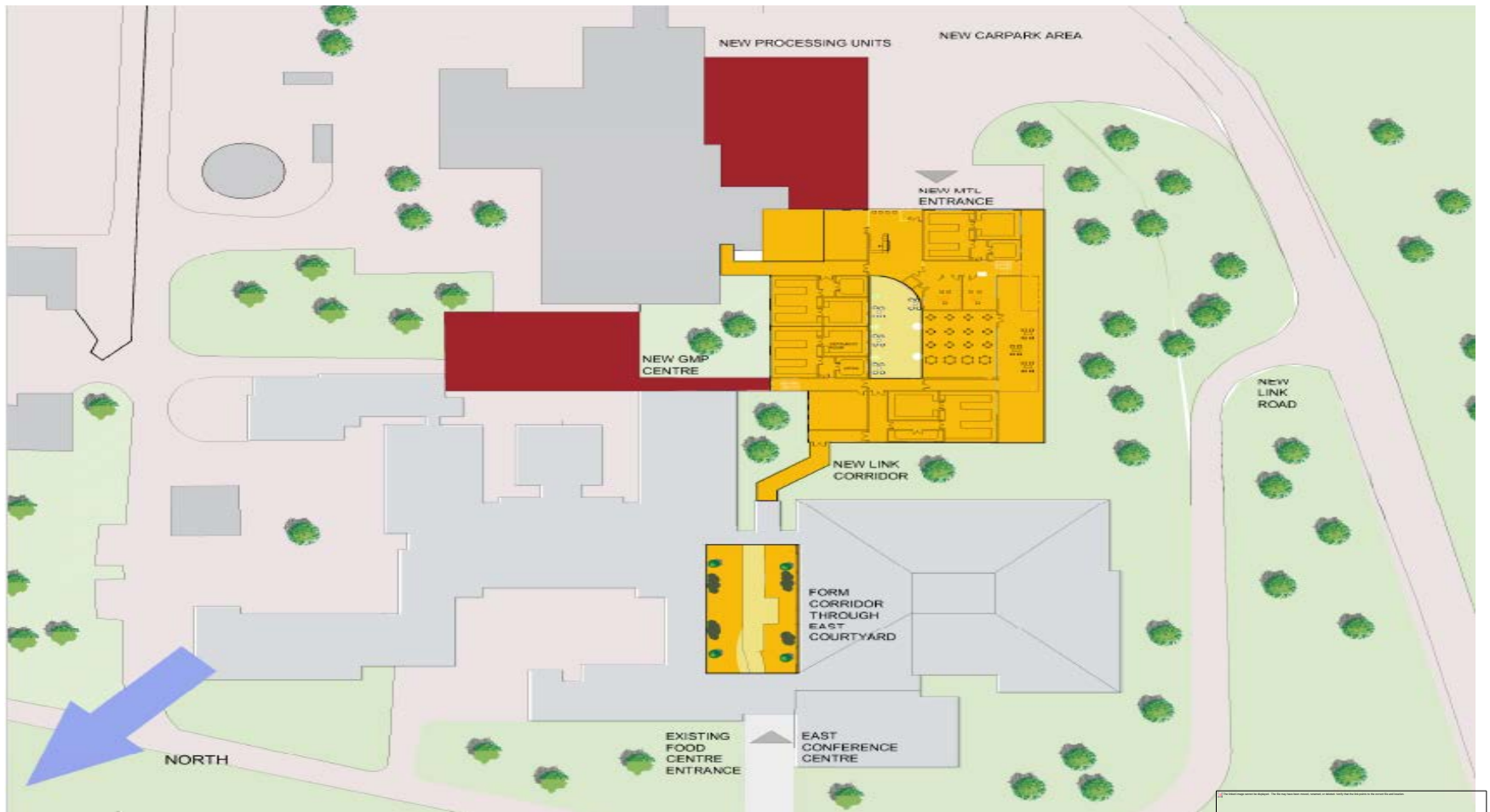


Evaporation and Drying



Cheese-making

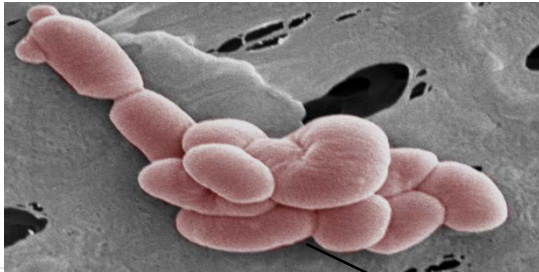
Site Plan





Smart Ingredient Example:

Yoghurt Powder with half a billion probiotics/g



Development of a spray dried probiotic yoghurt containing *Lactobacillus paracasei* NFBC 338

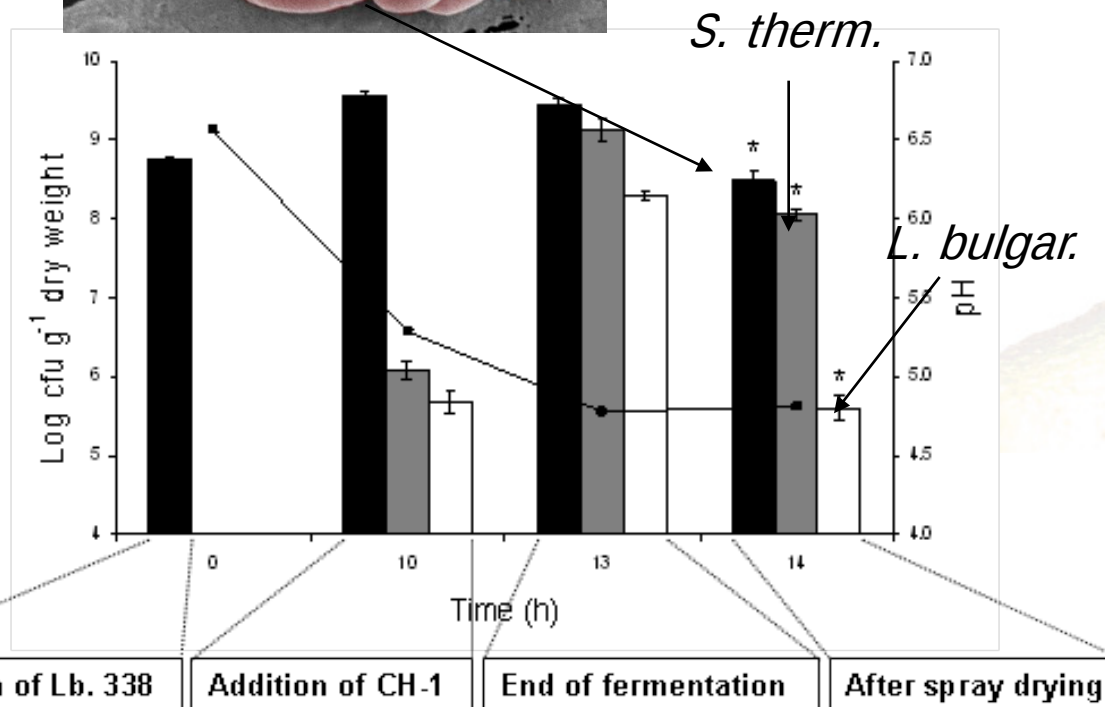
N. Kearney^a, X.C. Meng^b, C. Stanton^{a,d}, J. Kelly^a, G.F. Fitzgerald^{c,d}, R.P. Ross^{a,d,*}

^aTeagasc, Moorepark Food Research Centre, Fermoy, County Cork, Ireland

^bKey Laboratory of Dairy Science (Ministry of Education) and Food Science & Technology College, Northeast Agricultural University, Harbin, China

^cMicrobiology Department, University College Cork, Ireland

^dAllimentary Pharmabiotic Centre, University College Cork, Ireland



Where do we put our efforts?

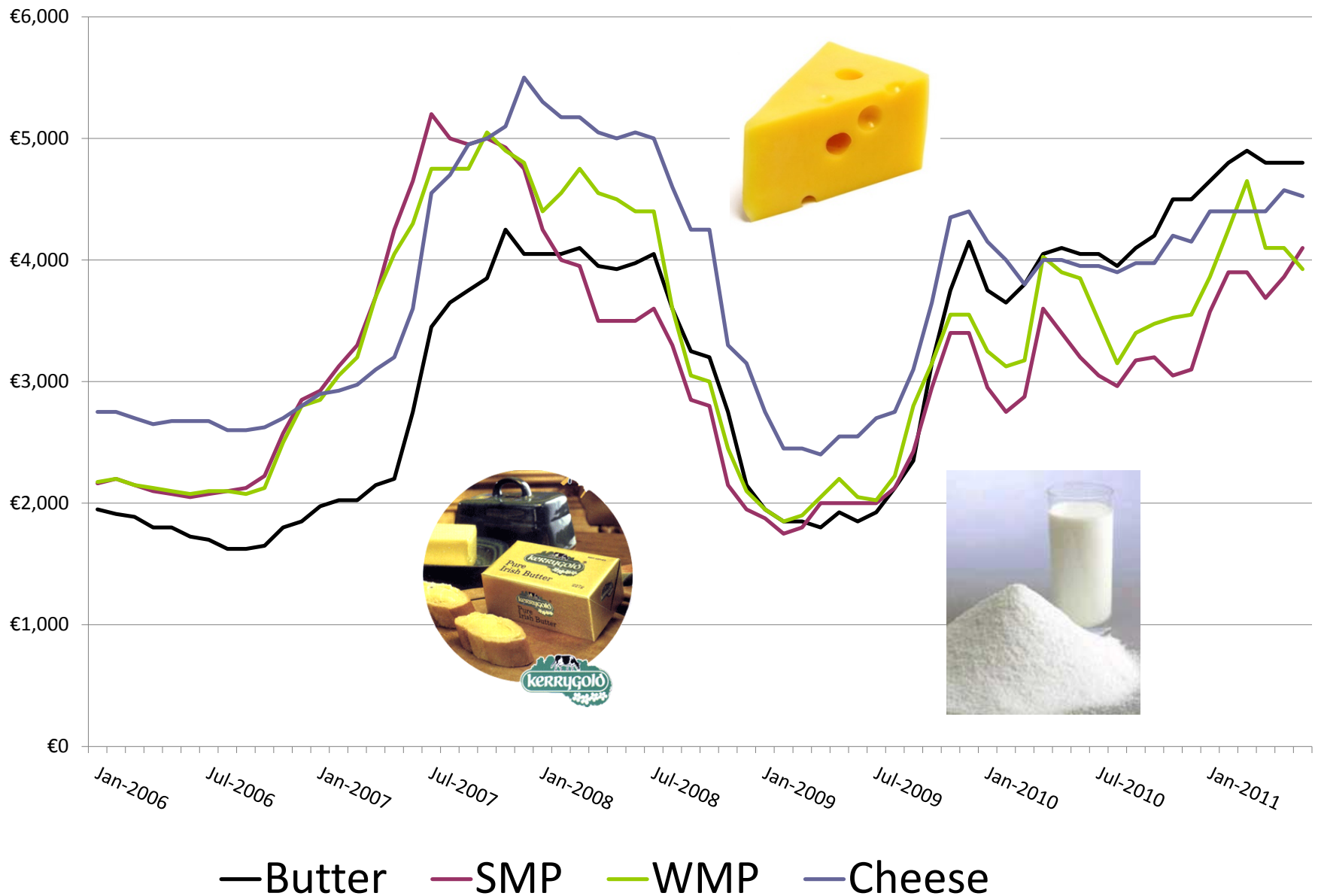


Value-add

Commodity



Volatility in Commodity Prices



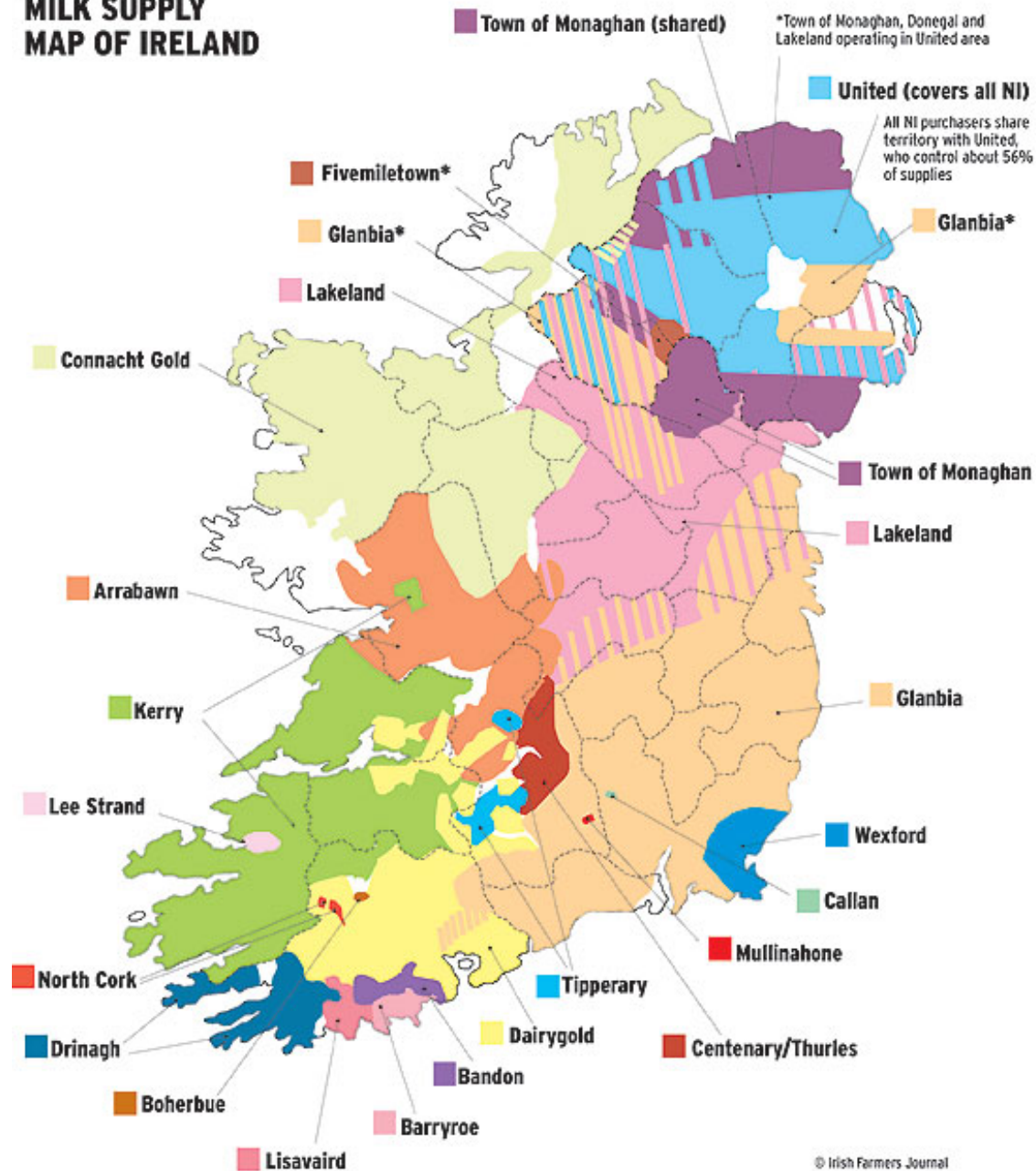
Message:

Processing of milk into **value-added** products will be a rate-limiting step in milk price in the next 10 years.



The Real Map of Ireland

MANUFACTURING MILK SUPPLY MAP OF IRELAND



Delivering R&D Solutions: Dairy

1. In Cheese

- Develop new varieties
- Develop Improved ingredient cheeses
- Improve efficiency and quality
- Scale-up and yield



2. In Dairy Ingredients

- Develop “smart” ingredients
- Improve Infant formula
- Improve safety
- Scale-up spray drying technology



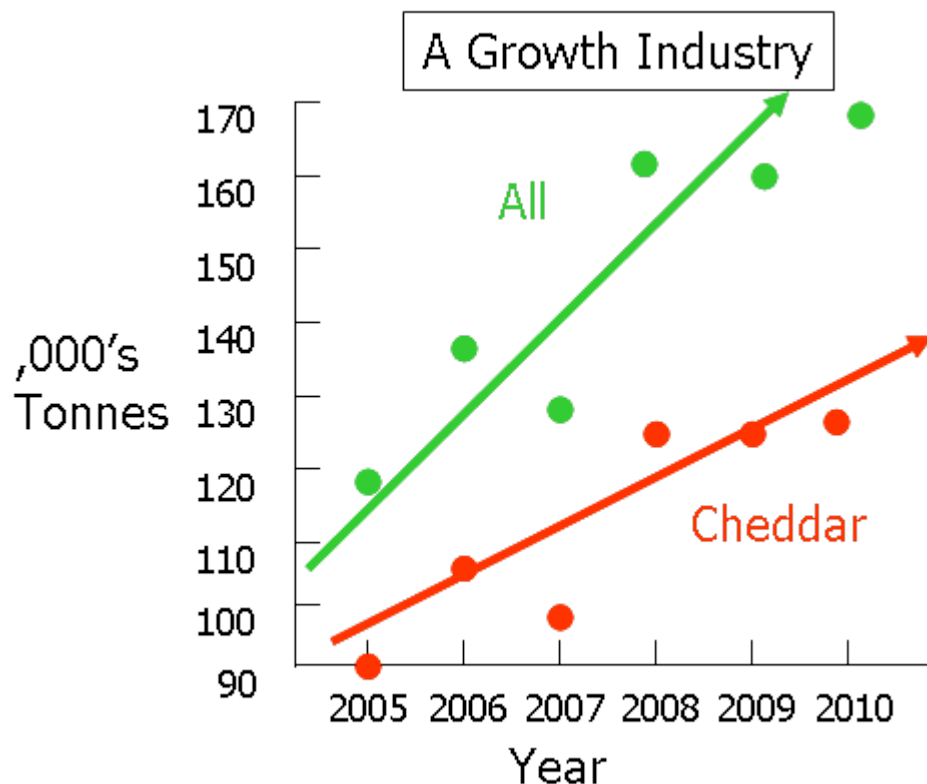
3. In Food and Health

- Improve dairy nutrition
- Develop new Functional Foods: gut health
- Innovate Novel Product Development



The importance of Cheese to Ireland

- Total cheese production is worth more than €500m in 2010
- Cheese accounted for 30% of whole milk utilisation in 2010



Cheese Programme

Cheese Diversification

e.g. Swiss-type, Mediterranean-type, Hybrid cheeses

Cheese Functionality

Technology Factors

Physico-chemical Leavers

Ingredient Cheeses

Cheese Flavour

Mapping and biochemistry

Sensory

Cheese Microbiology

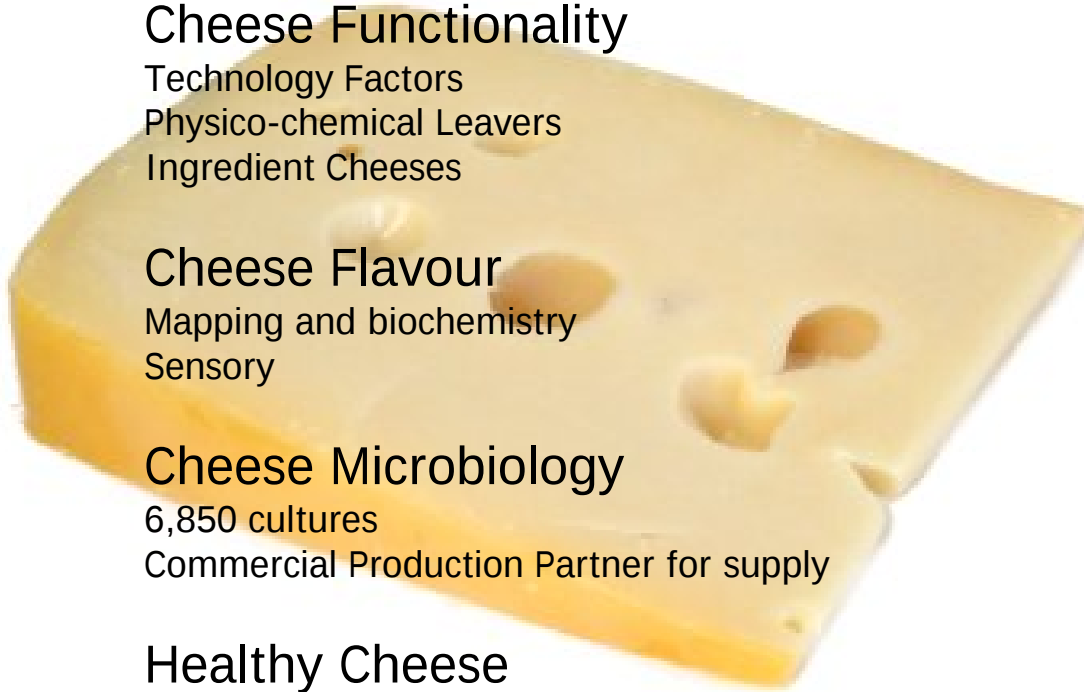
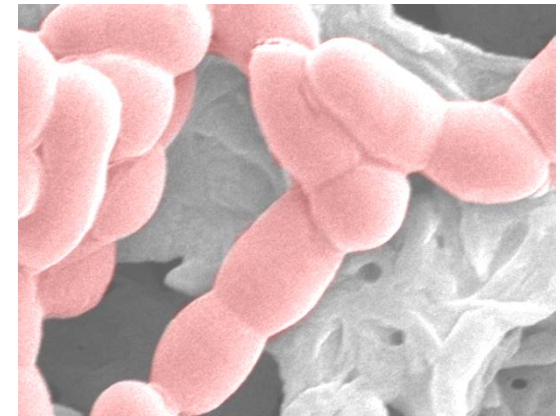
6,850 cultures

Commercial Production Partner for supply

Healthy Cheese

Reduced Fat/ Salt

Healthy additions – probiotics prebiotics etc.



The IDB Dairy Innovation Centre

- > Joint venture between IDB and Teagasc Moorepark
- > Commercial development programme
- > Objective to develop a portfolio of products to meet customer and consumer needs in our key markets
- > Collaboration between the two organisations commenced in September 2010 on a joint cheese development programme.
- > Results: 300 variants/ 11 leads/ 3 going commercial 2013





Launch: October 2013
Partnership with Al Wazeen Trading LLC

Tim Guinnee



Ivo Piske

Delivering R&D Solutions: Dairy

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Expertise and facilities relevant to infant milk formula

Milk and Ingredient Quality

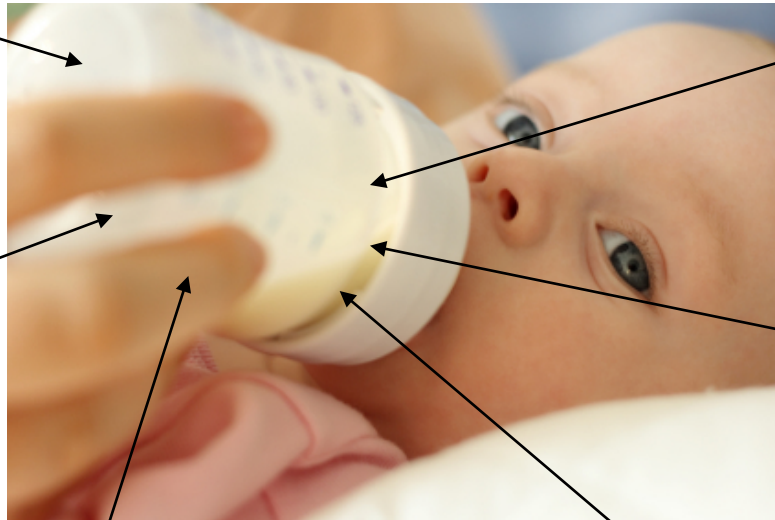
Process technology

Encapsulation

Customised training courses

Ingredient innovation

Pilot Plant and drying



Why global giant Danone backs Irish expansion

PAT O'KEEFE
NEWS EDITOR

Competitively-priced milk, the track record of their existing plants here, Moorepark research centre and Enterprise Ireland support. These were the key factors behind the decision of multi-national food giant Danone to invest €50m in their Macroom, Co Cork infant formula plant.

The expansion from 30,000 to 100,000 tonnes of output per annum will transform Macroom into the largest single production site in Danone's global network of 21 plants (Figure 1).

In fact, the new 10 tonne spray dryer currently under construction will be the largest at any infant formula plant in the world.

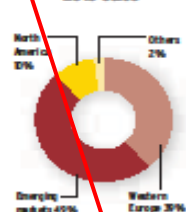
Dairygold co-op will be the main supplier to Danone's Macroom plant and will become the third largest supplier to Danone globally (after FrieslandCampina).

In an exclusive interview with the *Irish Farmers Journal*, Vincent Maurice, vice president of operations in Danone's baby nutrition division, signalled that this may be just the first stage of the global giant's expansion in Ireland. "This factory is certainly not the end point. We are growing at 10% per year, so the needs of tomorrow are

Figure 1
Danone's global IMF factories: A network of drying, blending and packing capabilities



Figure 2
2010 sales



much higher than today. We need to permanently increase the capacity."

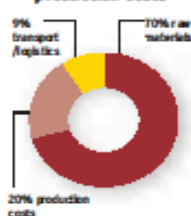
He revealed that Ireland saw off competition for the

Figure 3
Infant nutrition sites



investment from the Netherlands, France, Germany and Poland. Given that raw materials account for 70% of the cost of infant formula manu-

Figure 4
Infant formula production costs



facture, access to a plentiful supply of "competitively priced" milk was crucial.

However, Vincent Maurice warned that high energy prices nearly cost Ireland

plants around the world.

The product from Ireland will primarily be sold in Europe after being packed in factories in the Netherlands, Germany, Poland and

Also, Dairygold will represent 30% of our diversified whey requirements in Europe. However, if sales growth of 10% per annum is maintained, dependence on



No room for quality lapses

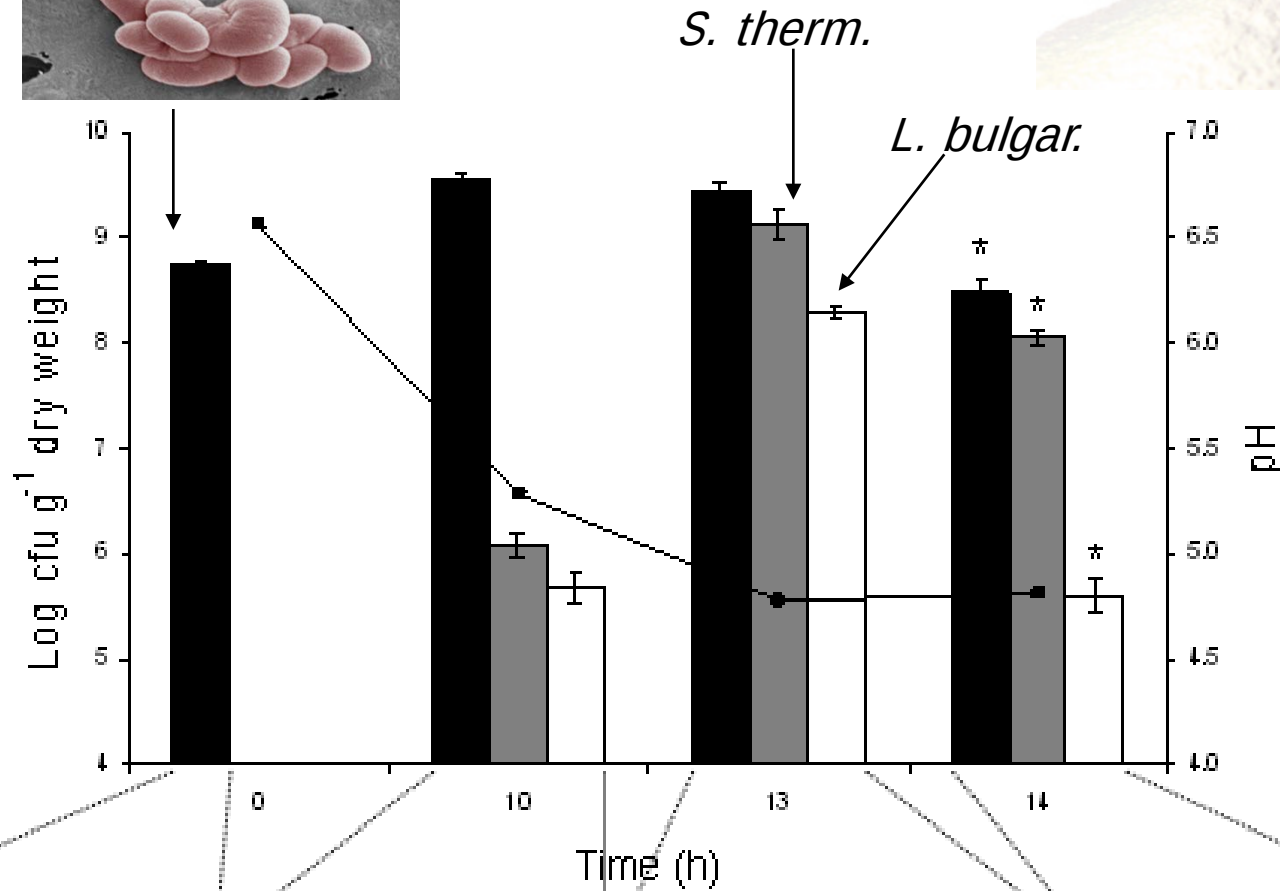
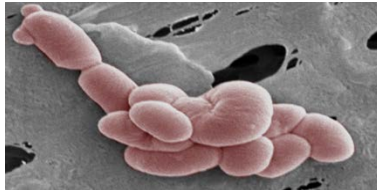
The infant formula industry is one where companies cannot fall on quality. "A mistake in

believe that Irish suppliers are in this spirit, even though there is big room for improvement."

ABOVE: Construction of Danone's Macroom plant, currently on 100,000 tonnes per hour installed at the

Competitively priced milk, the track record of their existing plants here, Moorepark research centre and Enterprise Ireland support. These were the key factors behind the decision of multi-national food giant DANONE to invest €50m in their Macroom, Co Cork infant formula plant.

Probiotic Yoghurt Powder



Addition of Lb. 338

Addition of CH-1

End of fermentation

After spray drying

Delivering R&D Solutions: Dairy

1. In Cheese

- Develop new varieties
- Develop Improved ingredient cheeses
- Improve efficiency and quality
- Scale-up and yield



2. In Dairy Ingredients

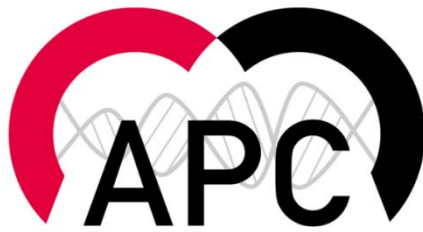
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3. In Food and Health

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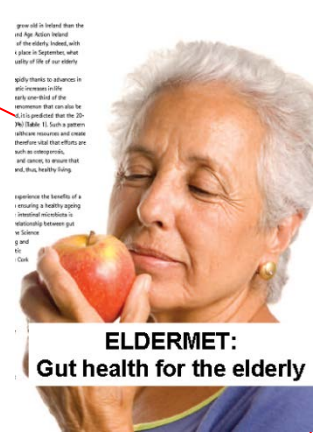
Alimentary Pharmabiotic Centre
Interfacing Food and Medicine



VISION



THE DEPARTMENT OF
AGRICULTURE & FOOD
AN ROINN TALMHAÍOCHTA AGUS BIA



ELDERMET:
Gut health for the elderly



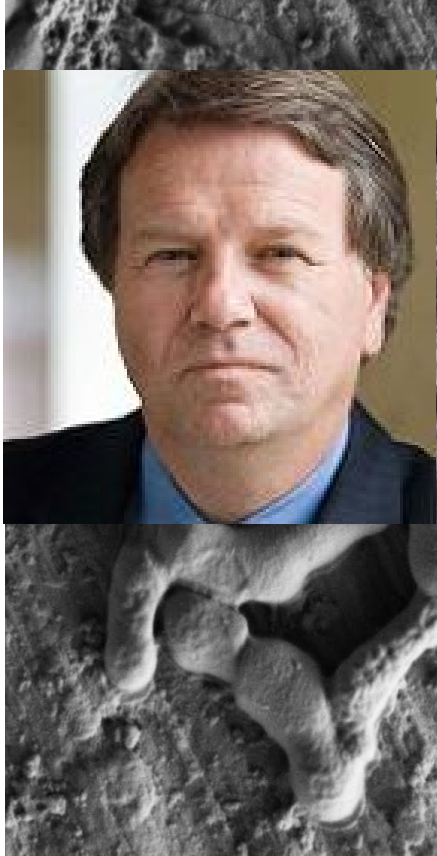
Food for Health Research Programmes



THE DEPARTMENT OF
AGRICULTURE & FOOD
AN ROINN TALMHAÍOCHTA AGUS BIA



Irish Phytochemical Food Network

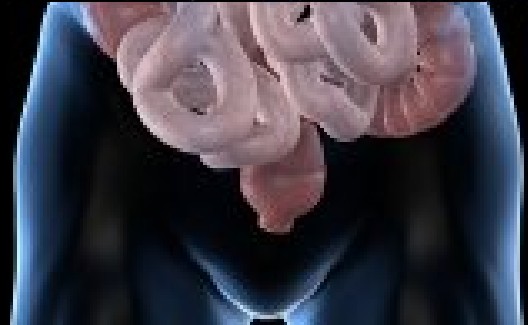
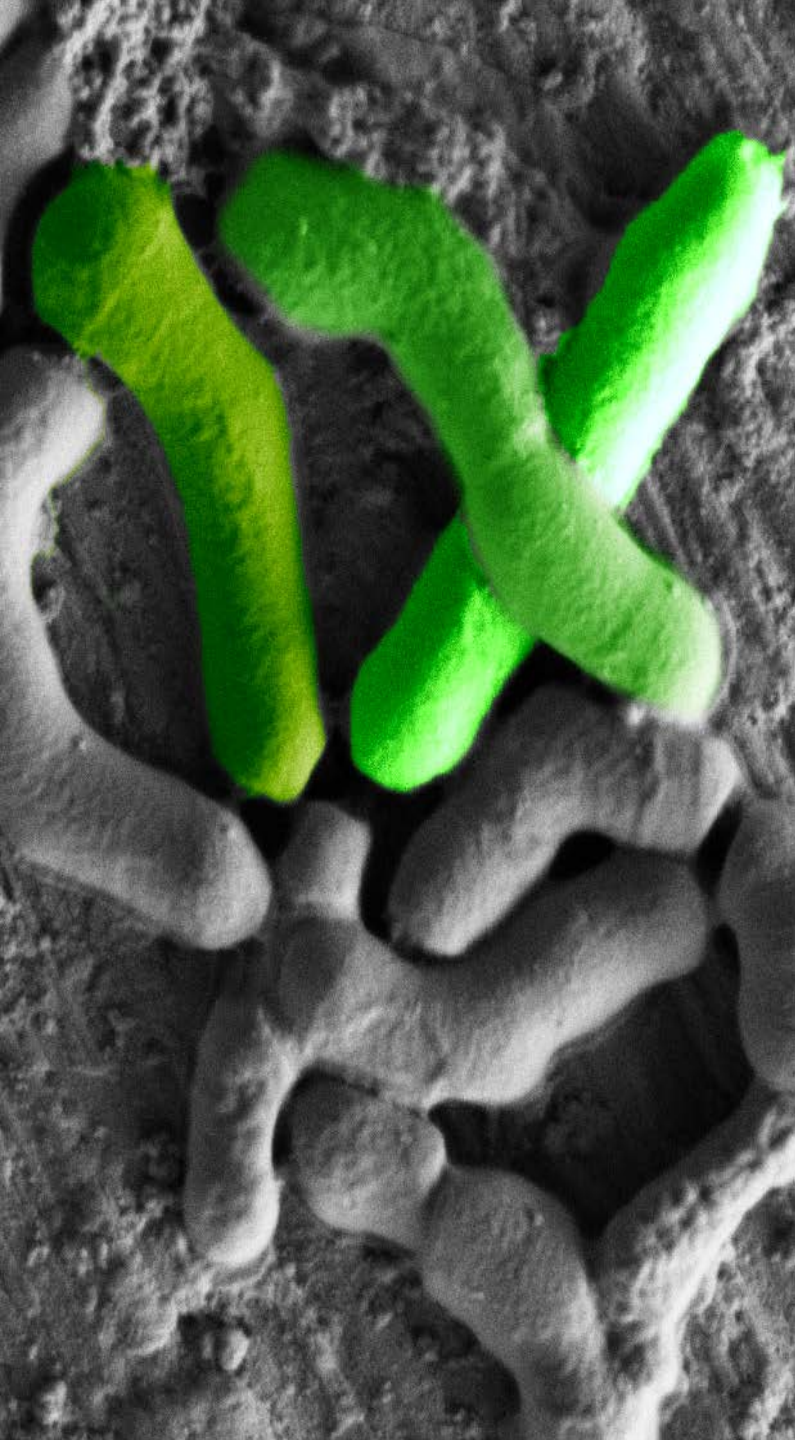


Exploring the role of the gut microbiota in human health and how it is programmed by food

Understanding the mechanism of action of probiotics.



The Irish Agriculture and Food Development Authority



The
Economist

AUGUST 18TH-24TH 2012

Economist.com

The Catholic church's unholy mess
Paul Ryan: the man with the plan
Generation Xhausted
China, victim of the Olympics?
On the origin of specie

Microbes maketh man



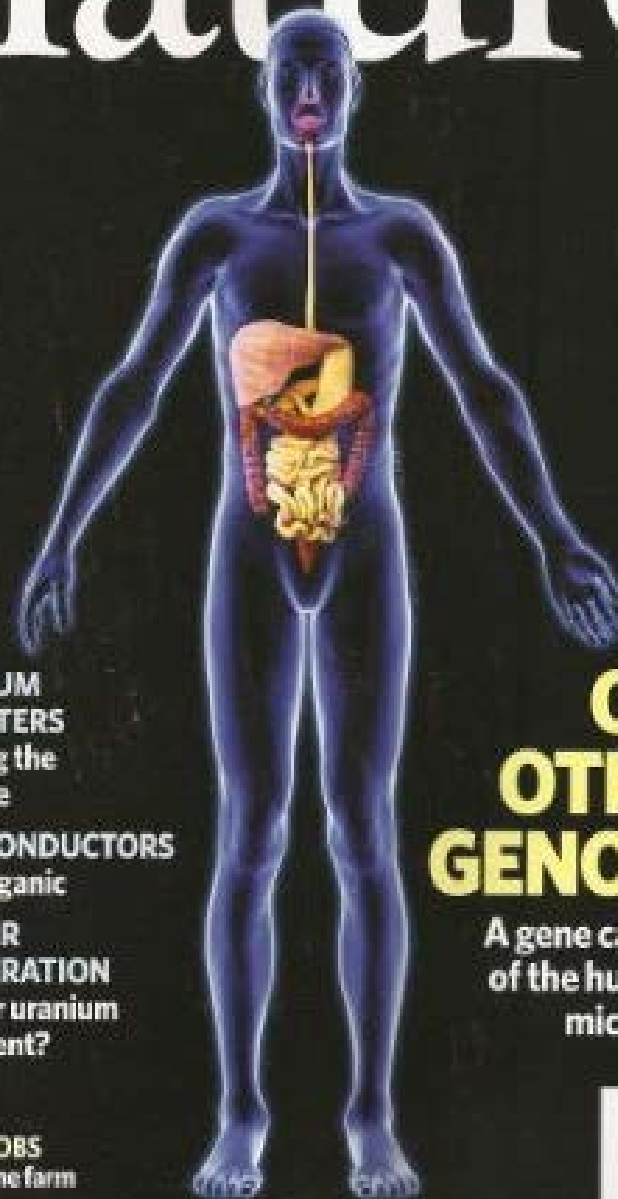
AUGUST 18TH - 24TH 2012

Worldwide cover

4 March 2010 | www.nature.com/nature | \$10

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

nature



QUANTUM
COMPUTERS
Choosing the
hardware

SUPERCONDUCTORS
Going organic

NUCLEAR
PROLIFERATION
Ban laser uranium
enrichment?

NATUREJOBS
Down on the farm

OUR OTHER GENOME

A gene catalogue
of the human gut
microbiome



A-V4
B-V4
C-V4
D-V4

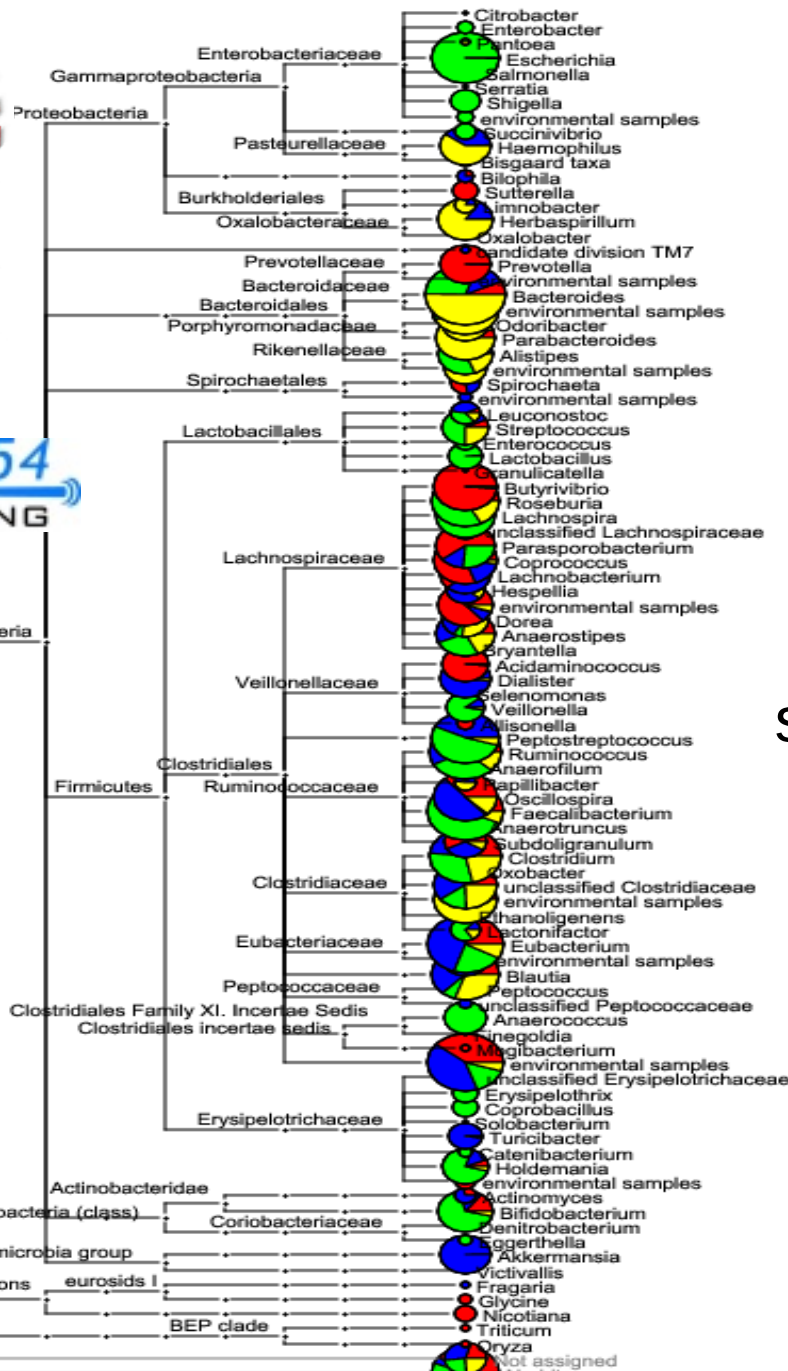
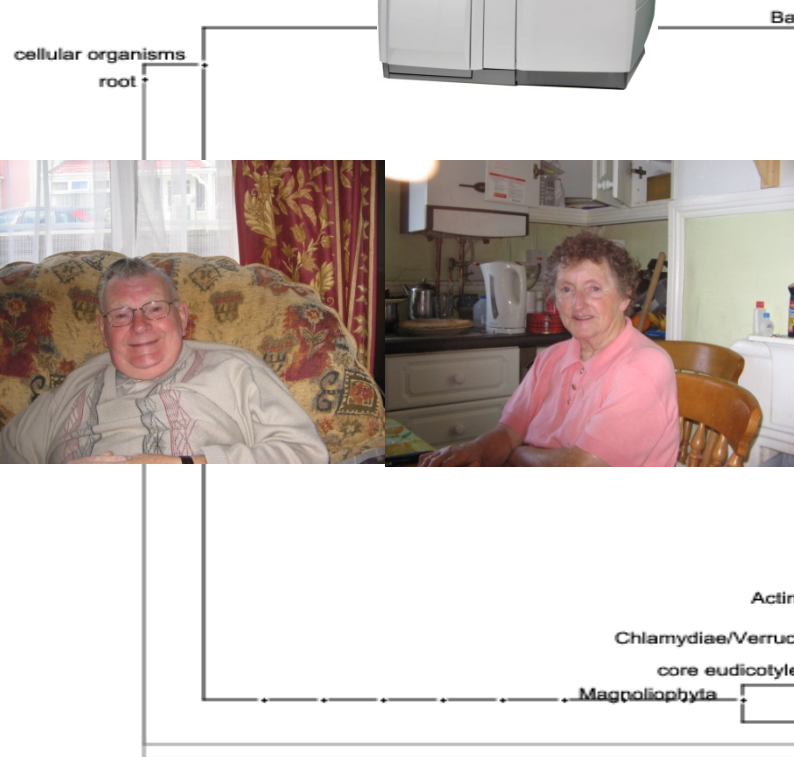
239 samples



Ion DNA Seq Platforms
(PGM & Proton)
Illumina MiSeq



454
SEQUENCING



~400
species



Gut microbiota composition correlates with diet and health in the elderly

Marcus J. Claesson^{1,2*}, Ian B. Jeffery^{1,2*}, Susana Conde³, Susan E. Power¹, Eibhlís M. O'Connor^{1,2}, Siobhán Cusack¹, Hugh M. B. Harris¹, Mairead Coakley⁴, Bhuvaneswari Lakshminarayanan⁴, Orla O'Sullivan⁴, Gerald F. Fitzgerald^{1,2}, Jennifer Deane¹, Michael O'Connor^{5,6}, Norma Harnedy^{5,6}, Kieran O'Connor^{6,7,8}, Denis O'Mahony^{5,6,8}, Douwe van Sinderen^{1,2}, Martina Wallace⁹, Lorraine Brennan⁹, Catherine Stanton^{2,4}, Julian R. Marchesi¹⁰, Anthony P. Fitzgerald^{3,11}, Fergus Shanahan^{2,12}, Colin Hill^{1,2}, R. Paul Ross^{2,4} & Paul W. O'Toole^{1,2}

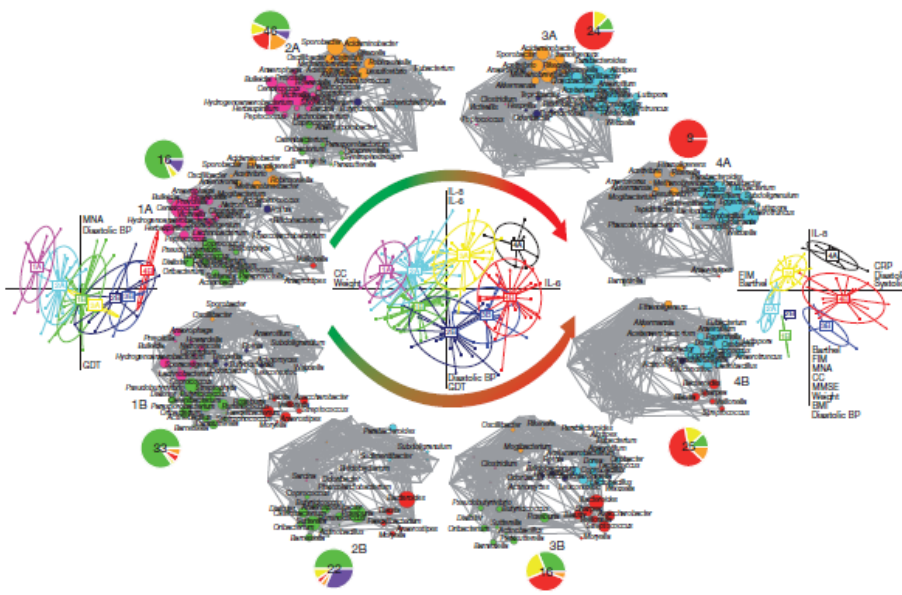


Figure 4 | Transition in microbiota composition across residence location is mirrored by changes in health indices. The PCA plots show 8 groups of relative to background. The pie charts show residence location proportions (colour coded as in Fig. 1c) and number of subjects per subject group. Curves





To assess the relationship between diet, exercise, gut microbiota, metabolic & inflammatory markers in elite athletes relative to controls

Subject Recruited

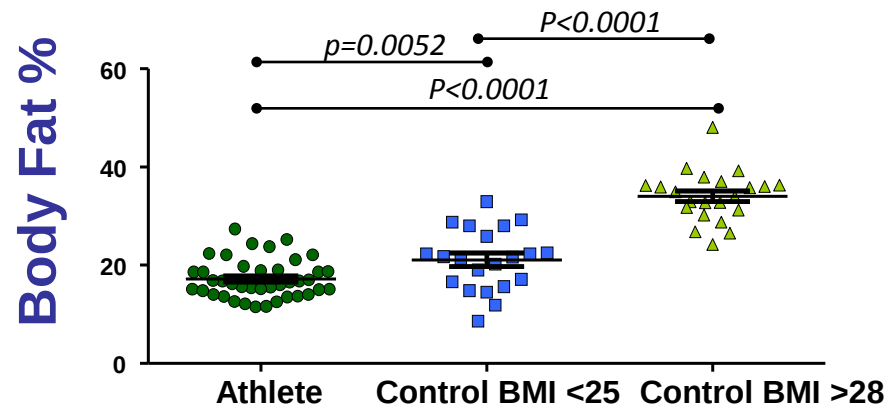
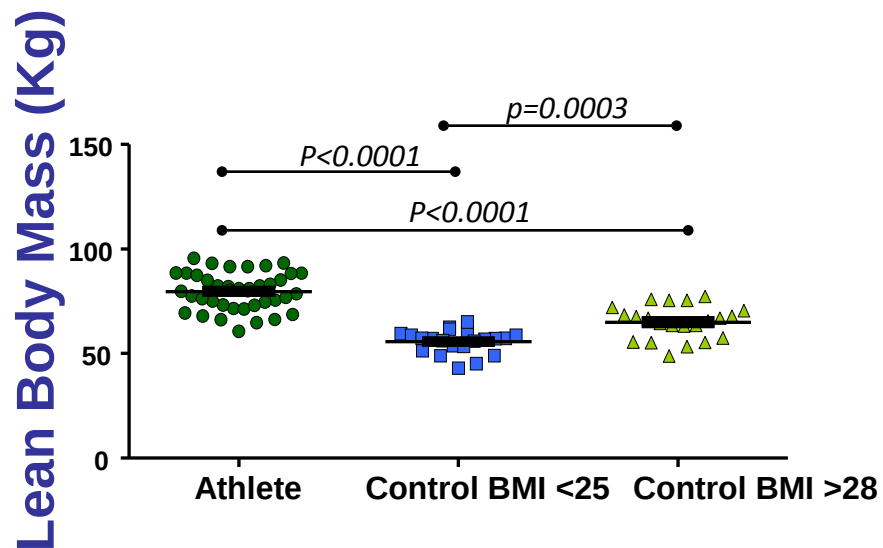
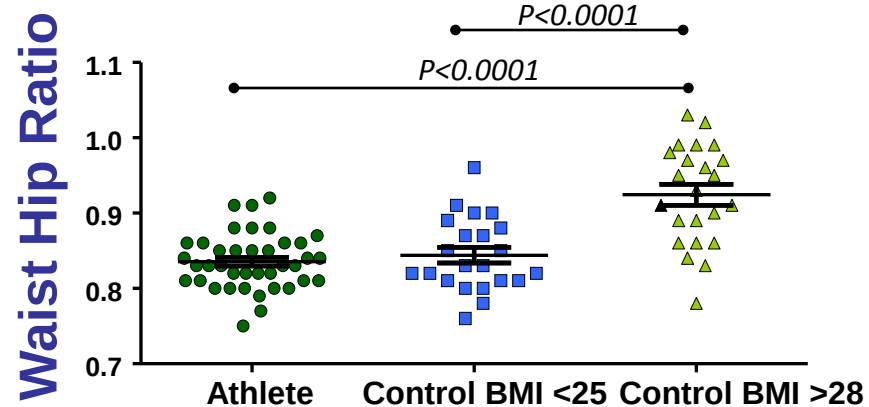
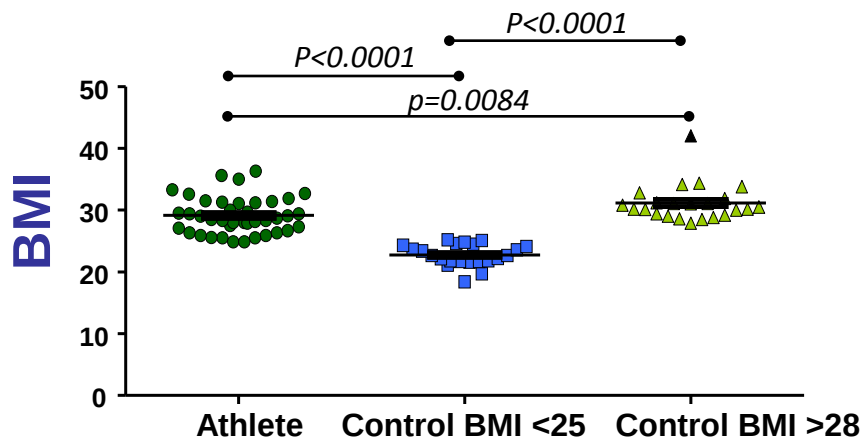
- Male
- Age: 18-37
- **Elite Athletes n=40**
- **Control BMI <25 n=23**
- **Control BMI >28 n=23**

Data collected

- Fasting blood sample (metabolic & inflammatory markers)
- Clinical bloods (CHOL, TG, fasting glucose etc.)
- Diet (FFQ)
- Body composition (DXA and W:H measurement)
- Faeces (microbial sequencing)



Physical Characteristics



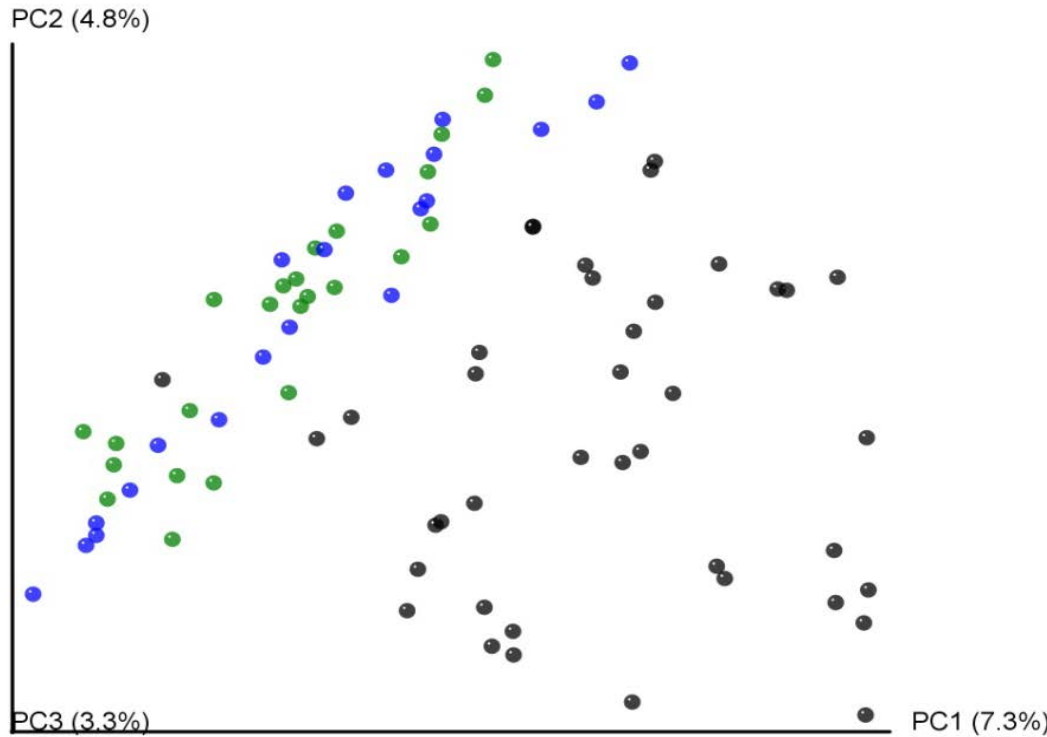
Microbiota - β diversity

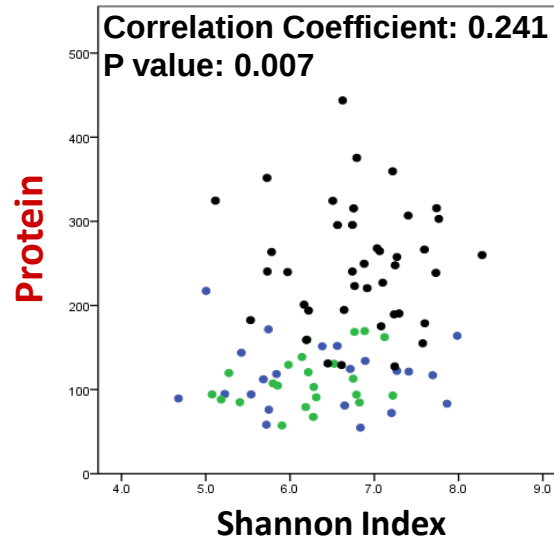
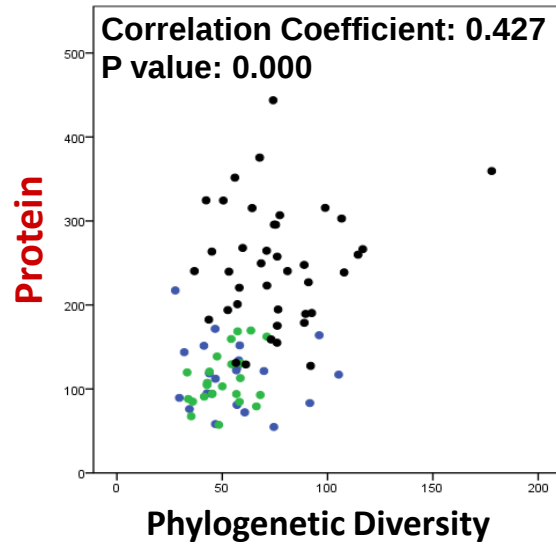
Unweighted Unifrac

Green = High BMI Controls

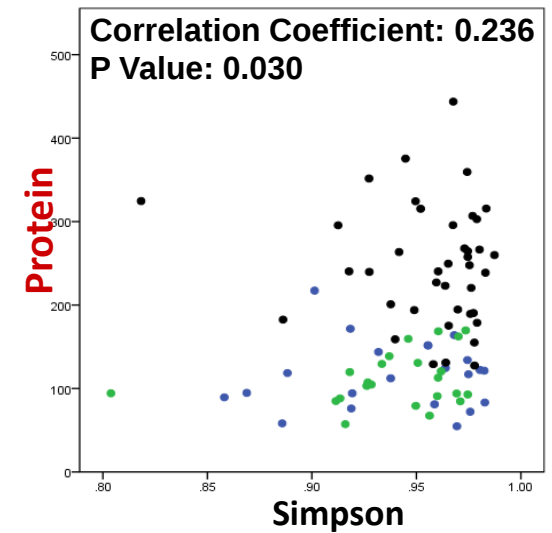
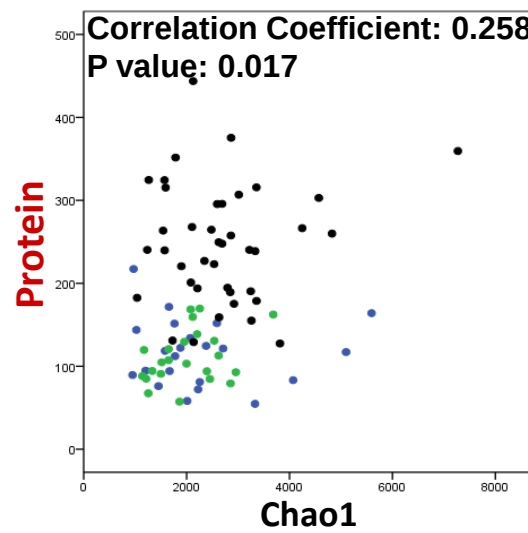
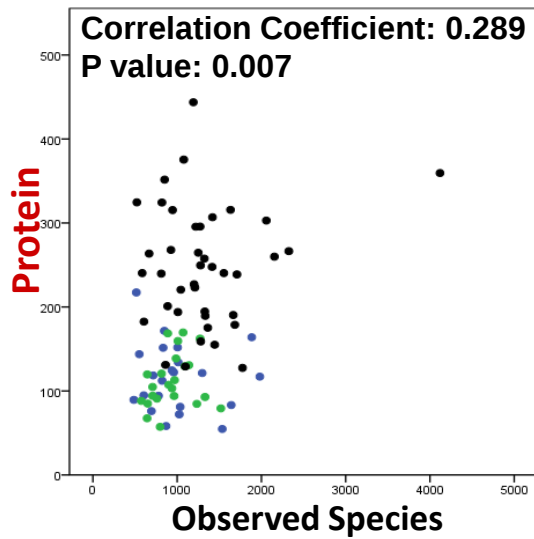
Blue = Low BMI Controls

Black = Athletes





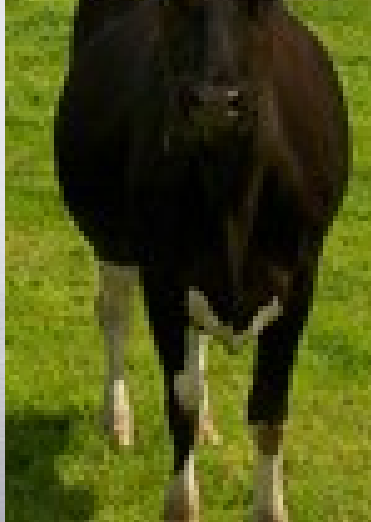
- Low BMI Controls
- High BMI Controls
- Athletes



Dairy Innovation

an International Perspective

Why the need for innovation now? **To add value to the expanded milk pool**
What you need for Dairy Innovation? **Market intelligence, Knowledge and pilot plant**
Where do we put our efforts? **Value add and processing scale and efficiency**





Next >

James Campbell
AgriSearch