



Brexit: The case for cheese research

The Irish cheese industry has been gearing up for big changes in preparation for Brexit. **TEAGASC** is supporting the industry with a world-class cheese research programme.

“We buy 78,000 tonnes of your cheese every year”, said Boris Johnson, former British Foreign Secretary, in response to RTÉ’s Caitríona Perry, on his understanding of the need for a backstop in the context of Brexit. The backstop is a position of last resort, to maintain an open border on the island of Ireland in the event that the UK leaves the EU without securing an all-encompassing deal. That the UK actually imports about 115,000 tonnes of Irish cheese annually may also suggest a wider underestimation of the impact of Brexit by some. Irish cheese production has grown by over 250% since 1995 and exports were 225,000 tonnes in 2018, valued at €815m (CSO). Cheddar – a cheese consumed largely by English-speaking nations – accounts for over 65% of Irish cheese exports. The imposition of tariffs post Brexit at €1,671/tonne on a product valued at approximately €3,000/tonne reflects the gravity of the situation faced by the Irish cheese industry.

Industry response

The response from the Irish cheese industry in recent years has been to increase exports to other EU countries, the Middle East, North Africa, and Japan. The industry is also substantially investing in process facilities, including: siting by Tine of a new Jarsberg (continental-type) cheese plant at Dairygold Mogeely, Co Cork; a €78m diversification project including development of mozzarella cheese production by Carbery; and, a joint venture between Glanbia and Leprino for a 45,000-tonne mozzarella cheese plant in Portlaoise, Co. Laois, and with Royal A-ware for a €140m continental cheese plant to process 450 million litres of milk annually at Belview in Co. Kilkenny. Ibec chief economist, Gerard Brady, recently said that “(Cheese) diversification is not a panacea. It is difficult, expensive work”. Notwithstanding the progress made in diversifying markets, and in non-Cheddar cheese type production, considerable technical challenges are posed in producing diverse, market-led products of consistently high quality within the context of an Irish seasonal milk production system.

A complex subject matter

Cheese differs from many other dairy products in that it is a highly complex and dynamic biological system produced from a raw material of continuously changing composition. While products such as powders are relatively stable, cheese contains a live and continuously evolving microflora and enzyme complement that remain active throughout ripening, chilled distribution, and ultimately to the point of consumption. Furthermore, cheese ripening and quality is the product of a complex interplay between the physico-chemistry of the cheese matrix (**Figure 1**) and the metabolic activity of pockets of bacteria dispersed throughout cheese blocks.

Teagasc and cheese research

Teagasc is well placed to provide a scientific platform to support the Irish cheese industry. Since 1988, Ireland has ranked seventh globally in publishing cheese science papers, although this drops to eighth when focusing on the most recent five-year term, where China has overtaken Ireland. When comparing similar timelines, Teagasc has increased its ranking as a cheese research provider from third to second globally (Web of Science, Thomson Reuters). Similarly, Teagasc has also been centrally involved in commercial innovation, such as through a public-private partnership with Ornua.

Recent cheese research at the Teagasc Food Research Centre, Moorepark, includes:

Predictive modelling of in-vat curd moisture content

Focused on reducing the effect of seasonal variation in milk for cheese making and increasing plant throughput, this research showed a marked interactive effect between coagulation temperature and protein-standardisation of milk on coagulation properties (**Figure 1**). Models have been derived that predict the interactive influence of these parameters on curd moisture loss kinetics during in-vat stirring of curds (Panthi *et al.*, 2019).

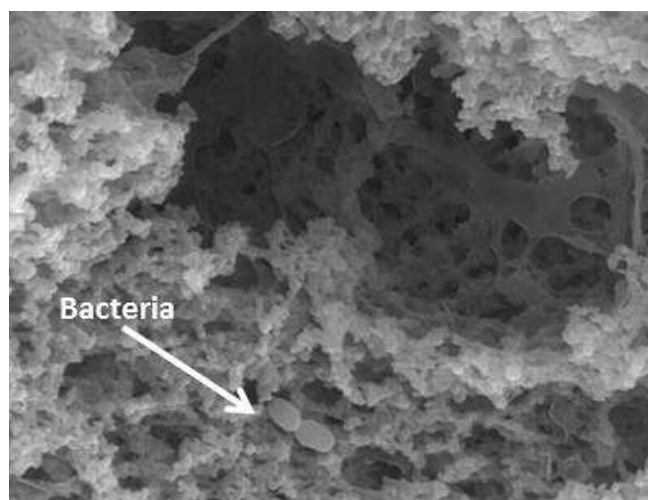
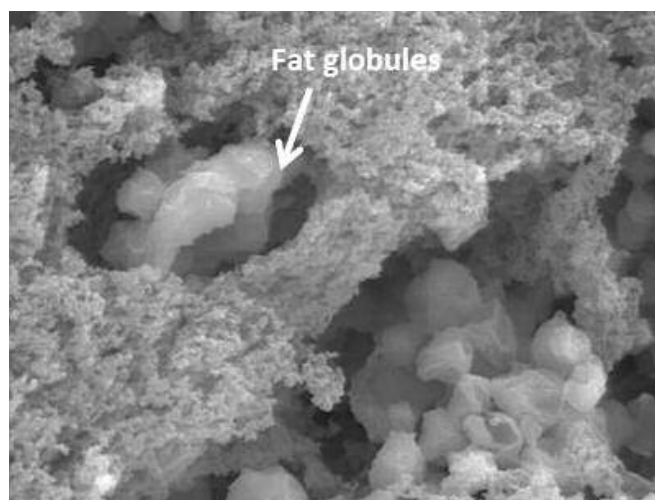


FIGURE 1: Predictive modelling of in-vat curd moisture content: fat globules (left) and bacteria (right) entrapped within the cheese protein matrix.

Cheese structure-function

Knowledge of fracture properties of cheese is important for understanding breakdown properties of cheese during mastication, in designing bespoke cheese texture suitable for slicing, etc. (Lamichhane *et al.*, 2018).

Results have shown that modulation of hydrolysis of α_{S1} -casein is an effective means for maintaining the strength of the cheese matrix during ripening, but maintaining higher levels of intact β -casein or insoluble calcium content results in reduced shortness or brittleness of cheese texture.

Cheese for China

Although desiring its nutritional properties, most Chinese consumers have limited experience of cheese, and its sensory properties may not appeal to them. Research underway will: profile Chinese consumer preference for cheese sensory traits; exploit colloidal and casein-polymer sciences to incorporate non-dairy ingredients familiar to Asian consumers into cheese formulations to achieve desired sensory (flavour and mouthfeel) properties; and, develop a platform technology for cheese innovation for emerging Chinese markets post Brexit.

Cheese from grass-fed milk

This research is focused on examining the influence of herd diet and particularly pasture fed (grass fed or grass and clover fed) compared to total mixed ration (TMR) on cheeses produced from milk derived therefrom. Grass-fed derived Maasdam cheeses (a continental-type cheese containing 'eyes') had significantly higher scores for colour, smooth texture, ivory colour and shiny appearance compared to TMR. A further metabolomics study showed herd diet to influence cheese metabolites from the lipid phase.

Other current research

Other research being carried out includes: cheese manufacture from micellar casein concentrates; sustainability of Cheddar cheese manufacture; casein-polymer interactions to support development of ambient stable dairy products; and, process and technological factors influencing cheese matrix digestion and consumer health.

Future requirements

Future research needs to focus in depth on areas such as: enhanced sustainability of cheese manufacture and reduction in greenhouse gas emissions; application of sensor technology and development of algorithms to improve in-process control to make bespoke cheeses from milks of variable composition; and, developing flexible factories of the future to produce a broad range of cheese types.

Overall, given the changing portfolio of cheese types, the need for sustainable manufacture processes, and the accelerating rate of change in the sector, maintaining a targeted cheese research platform is vital to provide a national competitive and innovative edge for Irish cheese products.

References and further reading

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