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Milking Cows Less Often Might Benefit Farmers (And Possibly Cheese)

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At a Glance

Most dairy farms milk cows twice-a-day, but interest in once-a-day milking systems is increasing. This article discusses the background and benefits that are leading some farms to consider a change to a reduced milking frequency. Also, until recently, only limited work had been done to explore how dairy products are impacted by milking frequency. Some recent investigations completed at UCC and Teagasc on cheese now provide some reassuring evidence. Going further still, this research also suggests that reducing milking frequency might offer some unique opportunities for cheese production in the future.

Keywords: OAD, TAD, Once-a-day milking, Twice-a-day milking, Cheese manufacturing, Cheese nutrition.

Introduction and Background

All milk is not equal

Milk quality varies depending on how it is produced. How a dairy farmer chooses to farm can lead to changes in milk chemistry, and this can influence taste, aroma, and colour, in addition to the food's nutritional value. Milk is a primary product that can also be processed into dairy foods, such as yoghurt, butter, and cheese. Consequently, when milking practices are changed, quality differences might also result within the products of milk, in addition to the milk itself.

Giving consideration to how often cows get milked

Dairy farms in Ireland typically milk cows twice-a-day, and this is also true for other geographical regions. However, in some locations, intensive dairy systems are used, and animals are managed indoors and do not graze outside. In intensive systems, cows tend to be milked more

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often, as much as four times in a day. In Ireland, pasture grazing is favoured, and one or two milkings a day are typical. Twice-a-day milking is generally associated with higher milk volume and milk solids yield compared to once-a-day milking, and the practice has been favoured to maximize financial earnings. However, interest in reduced milking frequency strategies is now increasing because of some specific benefits.

Time savings that bring benefits

Wellness, work-life balance, and the mental health of farmers are topics that have been gaining increased attention. Milking cows less frequently can reduce milking income, but reduced milking times of as much as 35% have been reported with once-a-day milking. Consequently, the less frequent milking of cows is associated with improved farmer wellbeing, increased job satisfaction, improved time for farm planning and safety, and enabling farmers to have more time for community involvement. Time savings can also be used for alternative business activity, and this business diversification can lead to more flexible and adaptable farm businesses. It is also even possible that this additional business activity could generate greater profits than the second milking. The time savings that result from once-a-day milking can also provide more favourable working conditions for farm employees through more conventional working hours. Additionally, the management of labour costs is currently highly topical, and less time spent milking cows can mean a lower overall wage bill. This is particularly important to farms at a time when the pressure to increase employee wages is substantial.

What might once-a-day milking mean for milk?

Common to all dairy farms is the milk itself. It is essential to consider how once-a-day milking might impact milk quality. The term "milk composition" is used to describe the chemistry of milk and the relative proportion of fat, protein, milk sugar (lactose), and other micronutrients, such as vitamins and minerals. The composition can also be considered in greater detail by thinking about the types of fats and proteins that are present, known as the "fat and protein profile". Milking frequency is already known to impact milk composition, with the most notable effects observed in fat and protein contents. Once-a-day milk has consistently been shown to have higher levels of both fat and protein compared to milk obtained through twice-a-day milking.

What might once-a-day milking mean for milk products?

Changes in milk composition can also impact dairy product quality. For example, some investigations have suggested that a reduced milking frequency results in lower levels of free fatty acids, a factor favourable to butter and cream producers. Other research has suggested that changes occur within specific proteins that can benefit cheese-making and the gel-forming properties of milk. When making cheese, milk is transformed into gel through the use of enzymes (rennet), acid, heat, or a combination of all three. The gel-forming ability of milk is important for cheese manufacturing. How long it takes the milk to become a gel and how firm

that gel becomes is useful information for cheese producers. After gel formation, the gel is subjected to cutting, leading to the separation of curds and whey. The curds go into the cheese, and the quality of the curds impacts the cheese quality. Some scientific research has suggested that milk gel-forming properties are negatively impacted by once-a-day milking. However, other research has reported differently, that these factors are not impacted. This is just one example of where scientific evidence in relation to cheese manufacturing and milking frequency is still both limited and contradictory.

A need for further research

Once-a-day milking is primed for future growth in Ireland. New Zealand has already experienced an increased use of once-a-day milking, and this country shares a number of common aspects with the Irish dairy industry, including extensive use of pasture-based grazing. With limited and inconsistent evidence, more detailed work is needed to deepen our understanding of the impact of milking frequency on milk products. An improved scientific understanding of this area could provide additional confidence for farmers and the dairy industry at a time when interest in reduced milking frequency strategies is increasing.

Where this particular research was targeted

Cheese is an important dairy product, and approximately one third of Irish milk is used for cheese production. Changes in cheese attributes resulting from milking frequency might have serious impacts for the dairy industry. As a concentrated version of milk nutrition, any changes could also bring about health consequences. Cheddar cheese is regularly consumed by the Irish population. It is also the subject of substantial research interest as a scientific model food. It is within this context that research at UCC and Teagasc investigated the effects of milking frequency upon the composition, cheese-yield, and quality characteristics of Irish grass-fed Cheddar cheese.

The method of this recent UCC and Teagasc study

Milk was obtained from two separate groups of cows, one group being milked once-a-day and the other twice-a-day. Cheddar cheese was then made at a pilot production plant in Teagasc Moorepark. Scientific investigations were carried out on this cheese as it matured over a six-month period. The work was also carried out in duplicate to help eliminate experimental error.

Some interesting results

Composition

The composition of all cheese produced within these investigations was consistent with previously reported results for Cheddar cheese. No significant compositional differences were observed between the experimental treatments, meaning that the fat, protein, and lactose contents were not significantly impacted. This result provides reassurance that once-a-day milking

does not have a negative impact on the cheese produced from this milk.

Manufacturing impacts

The cheese yield was significantly higher from once-a-day milk compared to twice-a-day milk. In simpler terms, more cheese was obtained from the same volume of milk, a positive outcome in terms of enhancing cheese-making efficiency. Regarding processing properties, milk gels formed quicker for once-a-day milk, and this could offer benefits from a manufacturing perspective.

Consumer experience: The sensory attributes of texture and colour

Consumer sensory experiences of food can be replicated in the laboratory. One example is through texture profile experiments that attempt to mimic how food feels in the mouth as it is eaten. This analysis demonstrated that the texture profile attributes of hardness, cohesiveness, springiness, and resilience were not statistically different between the cheese types. This suggests that consumers should not detect differences in the mouthfeel of cheese made with once-a-day milk. Colour is also an important quality characteristic of food. The yellow colour of Irish dairy products has been positively associated with grass-fed milk and the benefits of pasture systems from a nutritional and environmental perspective. The cheese made with once-a-day milk was more yellow in colour. As more highly coloured cheese is typically preferred by consumers, this difference could be regarded as an improved sensory characteristic.

Nutrition and Health

Once-a-day milking might offer nutritional benefits to cheese consumers. Yellow colour in cheese is associated with -carotene, a plant pigment and important provitamin that the body converts to Vitamin A. The -carotene content in once-a-day cheese samples were found to be significantly higher than in twice-a-day cheese. On average, once-a-day cheese contained 31% more -carotene. Vitamin A (including -carotene) is recognised for numerous health benefits; these include supporting iron metabolism, maintaining normal skin and mucous membranes, maintaining normal vision, and maintaining the normal function of the immune system.

Conclusions: Reassuring evidence and future opportunities

Some reassuring evidence for farmers and others

Cheddar cheese does not seem to be meaningfully impacted in a negative way by a reduced milking frequency. This is evidence that should reassure farmers and others who have an interest in reduced milking frequency strategies.

Possible future opportunities for cheese manufacturing

The research provided some novel insights into once-a-day milking and cheese, observations that could enable some interesting future opportunities for cheese manufacturing.

- Once-a-day milk resulted in significantly improved cheese yield, and milk gels formed quicker. If more cheese can be obtained from a given volume of milk, in less time, this suggests increased economic value for that milk within cheese manufacturing.
- The reduced milking frequency resulted in cheese that was significantly more yellow. Yellow colour is generally seen as preferable to consumers, so once-a-day milking might be considered favourably by manufacturers to meet this consumer preference.
- With more -carotene in cheese made from once-a-day milk, positive health implications should be considered. Making a health claim is complex, beyond the scope of this work, but the result highlights an interesting area for future investigation.

Final thoughts

Once-a-day milking can provide some specific benefits to dairy farms, and each farming business must assess how those benefits balance against the financial cost of milking less often. This recent work completed at UCC and Teagasc provides evidence that can help to inform those decisions. It is also interesting that no negative impacts were observed here in Cheddar cheese manufactured from once-a-day milk. The research area offers potential for more investigation, and such work could include a further exploration of some of the exciting opportunities suggested here for cheese producers.

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Declaration of Interests

Nothing to declare.

Author Bio

Richard's research focuses on cheese as an economically important dairy product. He investigates the food's nutrition and technical properties in response to changes in primary production factors. Key topical themes under investigation include animal breed and genetics, farm management strategies, animal diet, biodiversity, and sustainability. He is based in UCC's School of Food and Nutritional Sciences and Teagasc Moorepark. Richard enjoys taking part in education and public engagement activities, such as speaking at public events, completing laboratory demonstrations for undergraduates, supporting transition year projects, conducting school visits, participating in Science Week, and writing for the Teagasc TResearch magazine.