

The Lactose and Galactose Content of Cheese Suitable for Galactosaemia: New Analysis

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Received: 09 September 2015 / Revised: 19 October 2015 / Accepted: 29 October 2015 / Published online: 19 December 2015
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Abstract Introduction: The UK Medical Advisory Panel of the Galactosaemia Support Group report the lactose and galactose content of 5 brands of mature Cheddar cheese, Comte and Emmi Emmental fondue mix from 32 cheese samples. The Medical Advisory Panel define suitable cheese in galactosaemia to have a lactose and galactose content consistently below 10 mg/100 g.

Methods: A total of 32 samples (5 types of mature Cheddar cheese, Comte and “Emmi Swiss Fondue”, an emmental fondue mix) were analysed by high-performance anion exchange chromatography with pulsed amperometric detection (HPAEC-PAD) technology used to perform lactose and galactose analysis.

Results: Cheddar cheese types: Valley Spire West Country, Parkham, Lye Cross Vintage, Lye Cross Mature, Tesco West Country Farmhouse Extra Mature and Sainsbury’s TTD West Country Farmhouse Extra Mature had a lactose and galactose content consistently below 10 mg/100 g (range <0.05 to 12.65 mg). All Comte samples had a lactose content below the lower limit of detection (<0.05 mg) with galactose content from <0.05 to 1.86 mg/100 g; all samples of Emmi Swiss Fondue had lactose below the lower limit of detection (<0.05 mg) and galactose between 2.19 and 3.04 mg/100 g.

Conclusions: All of these cheese types were suitable for inclusion in a low galactose diet for galactosaemia. It is possible that the galactose content of cheese may change over time depending on its processing, fermentation time and packaging techniques.

Introduction

In the last 15 years, the UK Galactosaemia Support Group (GSG) Medical Advisory Panel have reported eight separate lactose and galactose analyses on 134 samples of 15 cheese types (Portnoi and MacDonald 2009, 2013). They identified that seven types were suitable in a low galactosaemia diet: West Country Farmhouse Cheddar, Emmental, Italian Parmesan, Grana Padano, Gruyere and Jarlsberg. The UK GSG Medical Advisory Panel recommends cheese should have a lactose and galactose consistently below 10 mg/100 g for its inclusion in a low galactose diet. In this short paper, we report the lactose and galactose content of five brands of mature Cheddar cheese, Comte and Emmi Emmental fondue mix from 32 cheese samples. We do not report any cheese analyses that had a lactose/galactose content consistently above 10 mg/100 g.

Methods

Five samples of each cheese (exception Valley Spire West Country Cheddar Parkham) listed in Table 1 (five types of mature Cheddar cheese, Comte and “Emmi Swiss Fondue”) were purchased from retail outlets or supplied by cheese makers from 2013 to 2014. They were prepared and

Communicated by: Alberto B Burlina, MD

Competing interests: None declared

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Table 1 The lactose and galactose content of cheese

Cheese	Information about manufacturer	Number of analyses	Lactose content (mg/100 g of cheese samples)	Galactose content (mg/100 g of cheese samples)
Valley Spire West Country Cheddar Parkham	Parkham farm: formerly part of the West Country Farmhouse Cheesemakers Group	2014: $n = 2$	<0.05 mg/100 g: $n = 2$ <i>Historical analysis of 10 other samples of West Country Farmhouse Cheese makers Cheddar were < lower limit of detection</i>	<0.05 mg/100 g: $n = 2$
Lye Cross Vintage Cheddar	Lye Cross Vintage Cheddar Maturation: aged >15 months	2013: $n = 1$	<0.05 mg/100 g: $n = 4$	<0.05 mg/100 g: $n = 4$
		2014: $n = 4$	1.3 mg/100 g: $n = 1$	12.65 mg/100 g: $n = 1$
Lye Cross Mature Cheddar	Lye Cross Mature Cheddar Maturation: aged >9 months	2013: $n = 1$	<0.05 mg/100 g: $n = 5$	2.20 mg/100 g: $n = 1$
		2014: $n = 4$		2.44 mg/100 g: $n = 1$ 2.43 mg/100 g: $n = 1$ <0.05 mg/100 g: $n = 2$
Tesco West country Farmhouse Extra Mature Cheddar	Tesco West Country Farmhouse Extra Mature Cheddar	2013: $n = 2$	<0.05 mg/100 g: $n = 5$	2.48 mg /100 g: $n = 1$
		2014: $n = 3$		2.55 mg/100 g: $n = 1$ 2.55 mg/100 g: $n = 1$ 2.79 mg/100 g: $n = 1$ 2.87 mg/100 g: $n = 1$
	Made on Ford Farm on Ashley Chase Estate	2013: $n = 1$	6.82 mg/100 g: $n = 1$	5.51 mg/100 g: $n = 1$
		2014: $n = 4$	<0.05 mg/100 g: $n = 4$	10.15 mg/100 g: $n = 1$ 11.78 mg/100 g: $n = 1$ <0.05 mg/100 g: $n = 2$
Comte	Mild French mountain cheese using rennet to coagulate Maturation: aged >12 months	2013: $n = 5$	<0.05 mg/100 g: $n = 5$	<0.05 mg/100 g: $n = 2$ 0.43 mg/100 g: $n = 1$ 1.86 mg/100 g: $n = 1$ 1.48 mg/100 g: $n = 1$
Emmi Swiss Fondue	Packet mix of Emmental cheese, wine and potato starch to make Swiss cheese fondue	2013: $n = 1$	<0.05 mg/100 g: $n = 5$	2.32 mg/100 g: $n = 1$
		2014: $n = 4$		2.19 mg/100 g: $n = 1$ 2.21 mg/100 g: $n = 1$ 2.22 mg/100 g: $n = 1$ 2.31 mg/100 g: $n = 1$

analysed by Leatherhead Food Research. High-performance anion exchange chromatography with pulsed amperometric detection (HPAEC-PAD) technology was used to perform lactose and galactose analysis. The HPAEC-PAD had a limit of detection for lactose and galactose of <0.05 mg/100 g. Valley Spire West Country Cheddar Parkham was only analysed twice as this cheese was formerly part of the West Country Farmhouse Cheese makers group. Their Cheddar cheese had a consistently low lactose and

galactose content from previous analysis (Portnoi and MacDonald 2009, 2013).

Results (Table 1)

Cheddar Cheeses All Cheddar cheeses (Valley Spire West Country, Parkham, Lye Cross Vintage, Lye Cross Mature, Tesco West Country Farmhouse Extra Mature, Sainsbury's

TTD West Country Farmhouse Extra Mature) had a median lactose and galactose content consistently below 10 mg/100 g (range <0.05 to 12.65 mg).

Comte All Comte samples had a lactose content below the lower limit of detection (<0.05 mg) and galactose content ranging from <0.05 to 1.86 mg/100 g.

Emmi Swiss Fondue All samples had a lactose content below the lower limit of detection (<0.05 mg) and a galactose content ranging from 2.19 to 3.04 mg/100 g.

Discussion

All of the cheeses reported (five specific brands of mature Cheddar cheese, Comte and Emmi Swiss Fondue) are suitable for inclusion in a galactosaemia diet. The testing of additional cheese types to examine their suitability for patients with galactosaemia is beneficial. This patient group is at risk of osteoporosis, and intake of calcium and vitamin D from a low galactose diet may be suboptimal. In the UK, the introduction of low lactose/galactose cheese has gained wide acceptance by patients (Ford et al. 2012).

In this paper, we excluded two brands of mature Cheddar cheese as the lactose/galactose content was consistently over 10 mg/100 g. Not all mature Cheddar cheese is processed in the same way. In the traditional manufacture of Cheddar cheese, it dries in large barrel shapes called truckles. The lactose content decreases as cheese dries over many months, which may be protected by a cloth only. The cheese may also be dried in blocks or covered in a rind, with extra lactose lost at this stage as the cheese dries naturally. However, in less traditional large-scale manufacture, the cheese may be packed in a plastic wrapper soon after production, with maturation occurring within the package. Consequently lactose is not lost within increasing maturity within the package.

In conclusion, this lactose and galactose analysis has expanded the range of the cheese types allowed in a low galactose diet. Using systematic and reproducible analysis, with a technique with a very low level of lactose and galactose detection, has enabled the inclusion of an expanded range of cheeses. It is important that professionals are fully aware of the suitable cheese types and

understand the differences in cheese production so they can accurately advise and support their families with galactosaemia. The suitability of cheese may change over time depending on their processing and packaging techniques. More traditional manufacturing processes will continue to provide the lowest levels of lactose and galactose.

Acknowledgements The UK Galactosaemia Support Group very kindly sponsored the analysis of these foods.

Conflicts of Interest

Pat Portnoi has no conflicts of interest.

Anita MacDonald is a member of the Sapropterin Advisory Board and Chair of the European Nutrition Expert Committee, both groups supported by Merck Serono. She is also on Advisory Boards for Nutricia and Arla. She receives research funds from Vitaflo Ltd., Nutricia and Merck Serono.

Compliance with Ethics Guidelines

This study did not involve humans. It was a food analysis study only, so informed consent was unnecessary.

Details of the Contributions of Individual Authors

Pat Portnoi helped with study design, organised food analysis and interpretation of the data.

Anita MacDonald helped with study design, interpretation of the data and writing of the paper.

References

- Ford S, Bevington S, Bevington M, Ford K, Portnoi P, Rapps H, Rapps G, Sagal S, MacDonald A (2012) Attitude and use of low lactose/galactose cheese by caregivers and patients with Galactosaemia. *JIMD* 35(Suppl 1):S155, Abstract
- Portnoi PA, MacDonald A (2009) Determination of the lactose and galactose content of cheese for use in the galactosaemia diet. *J Hum Nutr Diet* 22:400–408
- Portnoi PA, MacDonald A (2013) Lactose and galactose content of cheese. In: Preedy VC, Watson RR, Patel VB (eds) *Handbook of cheese in health*. Wageningen Academic, Wageningen, pp 495–516