

Gluten in Oat-based Beverages and Oatmeal

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Introduction

Pure oat has been used in gluten-free diets for several years in the Nordic countries. Oat increases the fibre content in the gluten-free diet and most gluten-intolerant children and adults tolerate pure oats (Holm *et al* 2006, Storsrud *et al* 2003). According to Commission regulation (EC) No 41/2009 oats that are suitable for gluten intolerant individuals shall fulfil the following criteria: "The oats contained in foodstuffs for people intolerant to gluten must have been specially produced, prepared and/or processed in a way to avoid contamination by wheat, rye, barley, or their crossbred varieties and the gluten content of such oat must not exceed 20 mg/kg".

Around the time of diagnosis of celiac disease secondary lactase deficiency is common (Rodrigo 2006) and conventional milk products must be avoided. Oat-based beverages might replace milk products in a lactose-reduced diet.

Objective

Analyze the gluten content in oat-based beverages and oatmeal products on the Swedish market and study whether oatmeal products are contaminated with wheat, rye and/or barley.

Methods

Seventeen oat-based beverages and sauces (Fig. 1a) and 14 oatmeal products (Fig. 1b) were analyzed for gluten content with the R5 Mendez ELISA. Two different production dates were analyzed for most products. Three of the beverages contained malt flour in concentrations ranging from 0.03% to 0.15%. One oatmeal product was labelled pure oat as it was produced and processed to avoid contamination of wheat, rye and barley. In order to discriminate between the cereals found in the oatmeal products, TaqMan® real-time PCR, specific for wheat, rye and barley respectively, was employed.



Figure 1a. Oat-based beverages and sauces.



Figure 1b. Oatmeal products

Conclusions

Oatmeal products are often contaminated with wheat, rye and/or barley. Most oatmeal products are thus not suitable for coeliacs unless the oat has been specially cultivated, processed and packed to avoid contamination. However, oat-based sauces as well as oat-based beverages can be regarded as safe in a gluten-free diet unless malt flour is added to the beverage. Still, beverages which are consumed in large quantities might contribute to the overall daily gluten intake.

Results

The gluten content was below the limit of quantification (LOQ) (5 mg gluten/kg) in one oat-based beverage and one sauce (Fig. 2a and 2b). The other oat-based beverages and sauces contained in average 14 mg gluten/kg (6 to 24 mg gluten/kg) except for the beverages which contained malt flour. A gluten content of 110 mg gluten/kg was found in the oat-based beverage with the highest malt flour concentration (Fig. 2c).

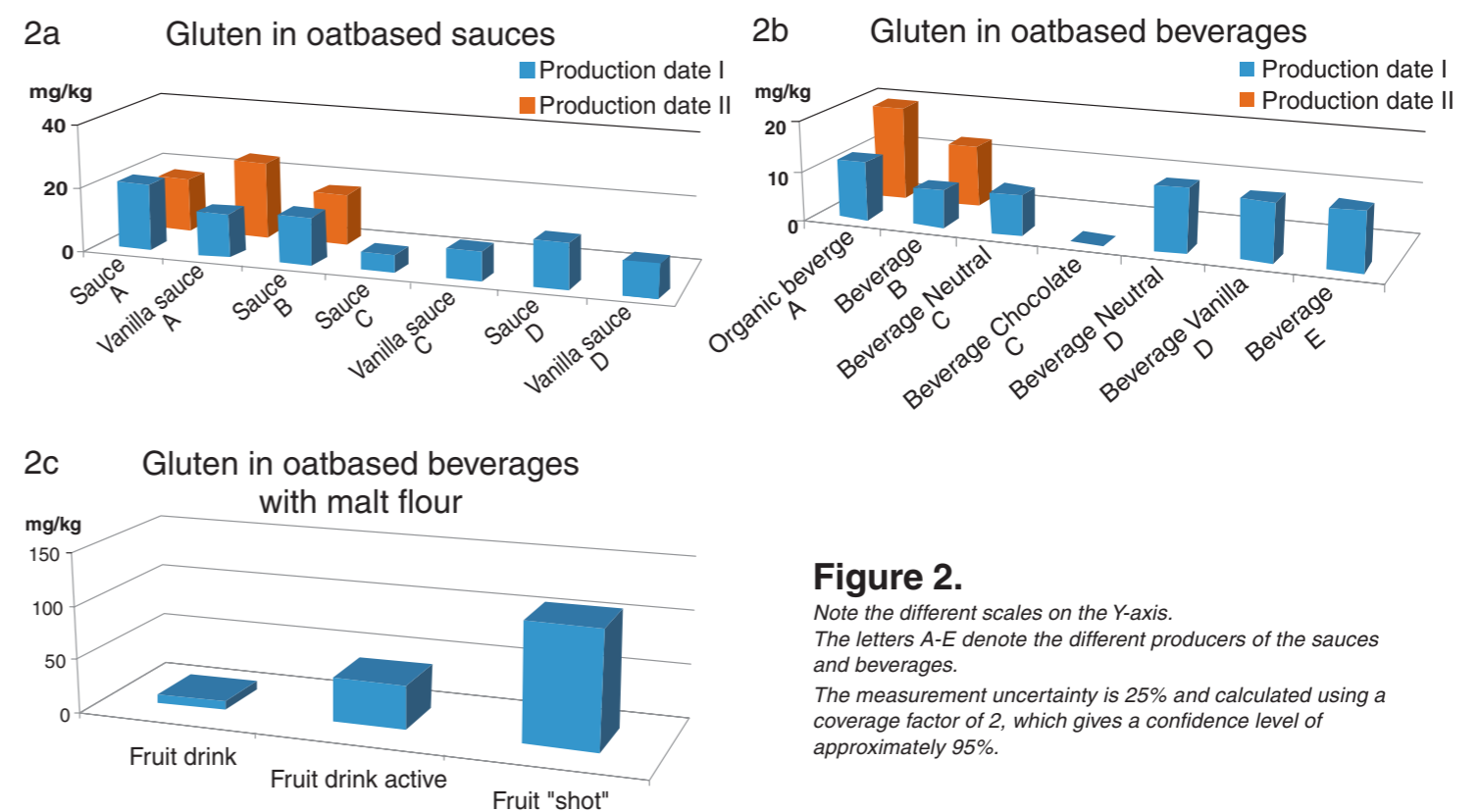


Figure 2.

Note the different scales on the Y-axis. The letters A-E denote the different producers of the sauces and beverages. The measurement uncertainty is 25% and calculated using a coverage factor of 2, which gives a confidence level of approximately 95%.

The gluten content was below LOQ in four of the 14 oatmeal products analyzed, including the "pure" oatmeal (Table 1). There was a large variation in gluten content between the different production dates of the oatmeal products (Table 1). This was in contrast to the oat-based beverages and sauces where the variation between production dates was small. Wheat, rye and/or barley DNA was detected in most oatmeal products and all three cereals were responsible for gluten contamination. No wheat, rye or barley DNA was detected in the pure oatmeal or in the oat gruel that had been autoclaved.

Table 1. Gluten and DNA from wheat, rye and barley analyzed in oatmeal products produced at two different dates (I and II).

Product	Producer	I		II	
		ppm gluten*	Detected DNA	ppm gluten*	Detected DNA
Oatmeal	a	17	barley	44	wheat, barley, rye
Oatmeal, organic	a	127	wheat, barley, rye	1403	wheat, barley, rye
Oatmeal	b	1922	wheat, barley	n.t.	
Oatmeal	c	46	wheat, barley	470	wheat
Oatmeal	d	11	wheat, barley	1105	wheat,barley, rye
Oatmeal, organic	d	n.d.	n.d.	n.d.	wheat, rye
Oatmeal	e	368	barley	42	barley, wheat
Oatmeal with extra fiber	e	260	rye,barley, wheat	129	wheat, barley, rye
Oatmeal "pure"	f	n.d.	n.d.	n.t.	
Oatmeal	g	8	wheat	13	barely
Oatmeal "quick"	h	n.d.	n.d.	n.t.	
Oatmeal	h	n.d.	rye	n.t.	
Oatmeal and quinoa, organic	i	8	wheat, rye	n.d.	wheat, barley, rye
Oatgruel (autoclaved oat)	e	65	n.d.	47	n.d.

n.d. = not detected, n.t. = not tested. * = The measurement uncertainty is 25% and calculated using a coverage factor of 2, which gives a confidence level of approximately 95%.

References

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