



Canadian Celiac Association
L'Association canadienne de la maladie coeliaque

Celiac News

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Blue Cheese in the gluten-free diet – A research update

by Alex Anca, MHS., RD and Advisor to the CCA Professional Advisory Board

Blue cheese has always been a hot topic in the gluten-free diet. A charming legend tells of a young shepherd watching his sheep in the Roquefort-sur-Soulzon area of France. He was resting near a cave, enjoying lunch of bread and ewe's milk cheese when a beautiful girl caught his eye. He quickly stowed his meal in the cave and chased after his heart. A few months later, he stumbled upon the abandoned bread and cheese. Despite the mould and strong aroma, his hunger drove him to bite into the cheese, discovering the delightful flavour of what would one day become Roquefort, the unique blue cheese made from the region's specific mould, *Penicillium roqueforti*.

This story has brought blue cheese to the forefront of the debate amongst those who suffer from celiac disease – is it safe for consumption or not?

Back in 1992, the second edition of the Canadian Celiac Association's Pocket Dictionary classified Blue Cheese as "ALLOWED" in the gluten-free diet. The status was based on Dr. J. A. Campbell's research in late 1991. It revealed that even though *P. roqueforti* mould may be grown on gluten-containing media, the harvesting and the amount of spores used to make blue cheese (1 g of fungus added to 10,000 L of milk!) may lead to a final gluten concentration well below the 20 parts per million threshold.



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Mission Statement

The Canadian Celiac Association is a national organization dedicated to providing services and support to persons with celiac disease and dermatitis herpetiformis through programs of awareness, advocacy, education and research.

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Blue Cheese (continued)

Because questions continued to arise about blue cheese's suitability in the gluten-free diet, we decided to conduct a more in-depth investigation in an attempt to clarify and further understand the science behind blue cheese.

Blue cheese is a classification of cow's milk or goat's milk cheeses with green/bluish mould. Varieties of internally mould-ripened, hard-pressed cheeses include Stilton, Blue Shropshire, Blue Cheshire, Blue Wensleydale, Buton Blue, Blue Vinney, Danish Blue, Roquefort and Gorgonzola¹. By international agreement, Roquefort cheese must be made from sheep milk, in the Roquefort Valley of France, and ripened in naturally air-conditioned, high-humidity caves near the town of Roquefort. Similarly, manufactured cheese produced from cow's milk in the United States and other countries is called blue cheese².

Blue cheese is usually made from a blend of heat-treated (raw) or pasteurized skim milk and homogenized cream. Spore suspensions of *Penicillium roqueforti* are added to the vat at the same time as the starter cultures. The cheese contains no other ingredients except the spores and natural milk components.

Spores of *P. roqueforti* may be harvested from mould grown on mixed substrates: some may be gluten-free, while others may contain malt extract. For the latter type of media, the fermentation process usually breaks down gluten. Moreover, in order to multiply, *P. roqueforti* fungus uses the protein portion of the media (i.e., gluten) to grow. Following fermentation, the spores are collected and the medium is discarded. Cultures (or spores) are then diluted, based on manufacturer's specifications to 1:500,000 to 1:1,000,000 (where 1 unit is 1 g of *P. Roqueforti* culture). This is equivalent to 1 g of mould in 500 to 1,000 L of milk.

In order to assess and quantify whether blue cheese contains any residual amounts of gluten, we sent three samples of blue cheese that use mould grown in gluten-containing media in addition to two samples of mould culture grown on wheat-based dextrose.

The analysis was conducted by Dr. Terry Koerner's laboratory in the Food Research Division at Health Canada. Three different commercial ELISA test kits were used:

1. R-Biopharm sandwich ELISA test, with a Limit of Detection of 1.5 parts per million and a Limit of Quantification of 2.5 parts per million.
2. Tepnel sandwich ELISA test, with a Limit of Detection of 1 part per million and a Limit of Quantification of 3 parts per million.
3. R-Biopharm Competitive ELISA test which is used to detect gluten protein fragments, such as those produced from protein hydrolysis.

The results of the tests were as follows:

A. St. Benoit Blue Cheese: No detectable gluten (all three kits). The manufacturer, L'Abbeille St. Benoit du Lac, uses *P. Roqueforti* mould grown on media containing malt extract.

B. Roquefort Blue Cheese: No detectable gluten (all three kits). The manufacturer, Roquefort Société, uses *P. Roqueforti* mould grown in a medium containing rye and wheat flours.

C. Alexis de Portneuf Blue Cheese: No detectable gluten (all three kits). The manufacturer uses *P. Roqueforti* mould grown on gluten-containing media.

D. Two samples of *P. Roqueforti* moulds: No detectable gluten (all three kits). The mould and culture manufacturer uses wheat-based dextrose in the fermentation medium. However, this ingredient is considered safe as the manufacturing process, separation and purification techniques render it gluten-free regardless of the source.

These results are considered accurate and reliable since each product was tested three times using the most sensitive gluten detection tests available on the market. In addition, you may consider that some manufacturers of blue cheese, such as Rosenberg[®], provide information on their websites about the use of gluten-free mould cultures.

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President's Message (continued)

forums in order to bring back to you as much information as possible on current research and other developments in the celiac world. It will also be an ideal opportunity for us to make connections with celiac associations from around the world and share information.

Closer to home but just as exciting is our annual conference in May. Those of you who have attended past conferences know that there is nothing like it. The food is always spectacular and plentiful. The exhibitors enjoy meeting and talking with their customers. Renowned scientists come from around the world and actually talk to us. It is an intense and rewarding experience for all of us who take an active role in managing our own or a loved one's health to learn together in an atmosphere of mutual support and camaraderie. I hope to be able to say hello in person to as many of you as possible at Celebrating our Celiac Community in Waterloo, Ontario, starting on May 29th. See you there!



Janet Dalziel
CCA President

Blue Cheese (continued)

Based on the most sensitive tests currently available on the market and our understanding of the minute amounts of mould spores used in the making of the cheese, we may conclude that blue cheese is safe for consumption as part of the gluten-free diet. In the future, we may attempt to test more samples of blue cheese in order to validate the results described above.

I hope that the research outlined above will put to rest the controversy surrounding blue cheese and that patients with celiac disease will enjoy the unique taste and sensory experience it has to offer.

We're looking for your help!

Are you interested in contributing towards increased understanding and control of celiac disease?

You might have recently read about a new, natural food product being developed for celiacs ('Discovery offers hope for celiac sufferers' – National Post & Edmonton Journal, January 7, 2009.) My team is conducting a web-based survey asking about your current dietary lifestyle habits, and your preferences for this product – a natural food supplement expected to enable you to manage gluten-related symptoms more effectively.

The survey takes about 30 minutes to complete. You'll receive a \$5 Amazon voucher for participation, and you'll be put on an email list that informs you about the progress of this study. For more background and to complete the survey log on at

www.celiac.ales.ualberta.ca.

Thanks for your support!
Bodo Steiner, Principal Investigator
University of Alberta.

Alexandra Anca is the principal researcher for the Canadian Celiac Association's Pocket Dictionary of Ingredients - Acceptability of Foods & Food Ingredients for the Gluten-Free Diet.

Footnotes:

1. Caballero B., Trugo C.L, Finglas P.M., Encyclopaedia of food sciences and nutrition. Academic Press, Elsevier Science Ltd., ©2003
2. Marth E., Steel J., Applied Dairy Microbiology, p. 358-360, Marcel Dekker Inc., C 2001