Submission regarding A1136 – Protein Glutaminase as a Processing Aid (Enzyme)

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Authorised for release on behalf of Plant & Food Research Ltd by Dr Jocelyn Eason, General Manager, Food Innovation Portfolio and Dr Richard Newcomb, Chief Scientist.

The purpose of Application A1136 is to permit the use of protein-glutaminase from *Chryseobacterium proteolyticum* (EC 3.5.1.44) as a processing aid to improve protein functionality in baking, noodle, dairy, meat, fish and yeast products.

In the early 2000's, research at The NZ Institute for Crop & Food Research was being conducted regarding the use of the microbial enzyme transglutaminase (EC 2.3.2.13) as a protein crosslinking aid in bakery products. It should be noted that although the primary action of transglutaminase is protein crosslinking, the enzyme has a secondary binding site that performs a deamidation function **essentially identical to that performed by glutaminase**. In a paper published on that research (Gerrard, J. A., Sutton, K. H. 2005: Addition of transglutaminase to cereal products may generate the epitope responsible for coeliac disease. Trends in Food Science and Technology, 16 (11): 510-512), we raised the possibility that the addition of transglutaminase to cereal products may result in the formation of elevated levels of coeliac disease epitopes (small peptides) in the bakery products *via* this deamidation mechanism. These epitopes could potentially act as triggers for fully developed coeliac disease in pre-disposed individuals so, in our paper, we urged caution in the use of transglutaminase in bakery products. This information was also communicated to FSANZ officials at the time, to make them aware of our findings.

Several other research groups have followed up on our publication (see: Lerner A, Matthias T. Possible association between celiac disease and bacterial transglutaminase in food processing: a hypothesis. Nutrition Reviews. 2015;73(8):544-552 and Andreas Heil, Jürgen Ohsam, Bernard van Genugten, Oscar Diez, Keiichi Yokoyama, Yoshiyuki Kumazawa, Ralf Pasternack, and Martin Hils. Microbial Transglutaminase Used in Bread Preparation at Standard Bakery Concentrations Does Not Increase Immunodetectable Amounts of Deamidated Gliadin. Journal of Agricultural and Food Chemistry 2017 65 (32), 6982-6990) and it would be fair to say that there is still no general consensus as to whether transglutaminase is safe for use as a processing aid in bakery products with respect to its ability to affect the levels of gluten epitopes found in the resulting food products.

Given that the level of glutamine deamidation activity is likely to be much higher in glutaminase than in transglutaminase, **we consider it likely that higher levels of the epitopes responsible for coeliac disease may be generated during use of glutaminase** than during use of transglutaminase in the production of bakery goods. We would, therefore, not recommend approval for the use of glutaminase for bakery products until further research can be performed to ensure that a clear consensus on the risks around its use in bakery products can be formed.

Regards

Kevin Sutton

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