



Dairy for life

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**Re: Fonterra Application A1068: Hydrogen Peroxide as a Processing Aid to Control pH in Fermented Dairy Ingredients**

Dear Sir:

You recently requested any relevant academic papers, technical reports, and/or patents available in the public domain describing the function of hydrogen peroxide as used in Fonterra application A1068.

We believe that the application contains all relevant public domain citations. Unfortunately, the proposed use differs somewhat from other hydrogen peroxide food applications, so available reports do not precisely describe the proposed Fonterra use in great detail. A brief explanation of a hydrogen peroxide application allowed in the Canadian food regulations seemingly provides the best public domain response to your query.

Canadian regulations allow the use of hydrogen peroxide to treat  
.."liquid whey destined for the manufacture of dried whey products to decolourize and ***maintain ph.***" (Department of Justice Canada, 2011b)

Fresh whey contains residual lactic acid starter microorganisms derived from the fermented milk used in producing the cheese. The pH of fresh liquid whey initially is equivalent to the pH of the parent cheese curd at draining; typically about  $6.35 \pm 0.05$  for sweet whey. However, the residual starter organisms inherently continue to produce acid, transforming whey into a "fermented or fermenting dairy ingredient". This fresh whey must be immediately treated to limit subsequent starter activity and acid production. Otherwise, the subsequent decrease in whey pH will significantly alter the flavour and functionality<sup>1</sup> of the finished dry whey, rendering the finished dry whey products unsuitable as ingredients in other foods. Additionally, major variations in the pH of the whey feed stock creates major processing problems, rendering the manufacture of the various dried whey products impossible.

Using refrigeration and heat treatments to inhibit additional acid production in whey and maintain whey pH frequently is unsuitable. Refrigeration incurs additional energy costs for cooling and then re-heating the whey, while allowing continued acid production to occur while cooling and heating. Heat treatments

<sup>1</sup> Functionality describes the ingredient performance in the product, or the ability to create an emulsion, a foam, a gel etc., thereby contributing to the body and texture of the finished product.

- Completely kill the starter organisms,
- denature the whey proteins to reduce product functionality,
- induce Maillard browning which
  - alters product colour and flavour,
  - reduces the nutritional value of the proteins by destroying lysine, and
  - promotes caking of packed product in bags, and
- creates cooked flavours.

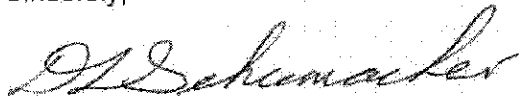
The addition of hydrogen peroxide to the fresh whey avoids all of these issues. Any residual hydrogen peroxide then is completely destroyed by the addition of catalase to produce only water and oxygen.

The advantages of using hydrogen peroxide in processing whey become more significant in processing fermented dairy ingredients containing casein. Indeed, applying heat treatments to fermented dairy ingredients containing promotes casein coagulation and whey protein denaturation. Although the manufacture of Ricotta and related cheese varieties exploit the acid heat effect, such a process inherently destroys any protein functionality and is completely unacceptable in the manufacture of most fermented dairy ingredients such as a prepared yoghurt base for the manufacture of frozen yoghurt etc.

The Canadian food regulations allowing the maintenance of whey pH by hydrogen peroxide addition capture the essence of the Fonterra proposal relating to the use of hydrogen peroxide in fermented dairy products and ingredients.

Hopefully, this explanation describes the function and necessity for using hydrogen peroxide as described in the Fonterra application A1068. Please feel free to contact me if you require additional information.

Sincerely,



Dianne Schumacher  
Global Regulatory Manager