



The balancing act in making process cheese

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The topic of sodium reduction in dairy products continues to garner attention within the dairy industry, whether it is focused on the possible health benefits of a low-sodium product or the safety risks that can come with lower salt levels.

The goal of the Center for Dairy Research is to investigate ways to consistently create safe and delicious low-sodium cheese products. In particular, CDR and its UW-Madison partners, with the help of Dairy Research Institute funding, are focusing on three areas:

- Shelf stability and quality of reduced sodium cheese
- Permeate as a salt replacer for the food industry
- New method for directly testing sodium levels in cheese

Shelf stability, safety

Understanding the shelf stability of reduced-sodium processed cheese is critical to producing a consistent, high-quality and safe product. Given the delicate balance between salt content and the safety of cheese products, CDR is working with UW-Madison and Food Research Institute Senior Scientist Kathy Glass and other UW food science faculty to study both the safety and quality of reduced-sodium cheeses. In particular, they are looking at the impact of natural preservatives, or starter bacterial adjuncts, as well as what factors successfully inhibit *Clostridium Botulinum* in reduced-sodium pasteurized processed cheese products.

It is important to note that when sodium salts are reduced in a cheese product, the pH and moisture content should be adjusted as well. These adjustments can cause significant changes in the safety, texture, flavor and overall consumer acceptability of a cheese. In particular, the shelf stability of processed cheese products is directly affected by a change in the level of sodium salts.

Given this relationship between salt and safety, one outcome of the research collaboration between Glass, CDR and the industry will be to develop a model for safety assessment that can be used by cheese manufacturers to formulate reduced-sodium process cheese products that have a safe balance between the sodium levels, pH, moisture and fat content.

By developing this predictive model, companies will have greater flexibility in product development, especially for nonrefrigerated products. This study will also investigate the impact of factors such as salt (sodium) replacers like potassium, preservatives like sorbic acid and the effect of emulsifiers on the stability and quality of reduced-sodium cheese.

The popularity of permeate

One means of salt replacement that is now gaining increased use, particularly in the baking industry, is the use of permeate. Permeate, a by-product of milk or the whey membrane filtration process, contains lactose, protein and ash, as well as milk minerals, such as sodium, calcium, potassium and magnesium. The broad range of different minerals in permeate helps to provide saltiness, which reduces the amount of traditional salt (sodium chloride) needed in food formulations.

CDR began researching the use of permeate in foods several years ago and has since successfully tested its use in multiple food products. Permeate assists in moisture retention, which allows for a softer baked product and contributes to a longer shelf life. Additionally, permeate can be used in soups, meat products and dry mixes. It can be labeled as dairy solids, and large quantities of this ingredient are now available due to the popularity of membrane filtration within the dairy industry. (For more on permeate, see staff member KJ Burrington's article on permeate applications at innovatewithdairy.com.)

Rapid sodium testing

In addition to our work on sodium replacers and safety, CDR has also been working to evaluate alternative methods for the rapid determination of sodium in cheese. The current, routine method of sodium detection in the dairy industry is the chloride analyzer. While this method works for sodium chloride, the chloride analyzer method may not work well when dealing with the addition of non-sodium sources of chloride, such as potassium chloride.

CDR is investigating X-ray Fluorescence Spectrometry (XRF) as an alternative method for rapid and direct sodium testing in cheese. This method uses an XRF technology developed by Oxford Instruments, which can test for sodium in a cheese sample in less than four minutes. So far, this method appears to work well in cheese.

Conclusions

Sodium will continue to be an essential ingredient in cheese but improved analytical methods and new safety models will be necessary to ensure the safety and quality of reduced sodium dairy products.

Overall, reducing sodium in cheese products will require better control of sodium levels (salting) during the make procedures and rapid, robust testing methods. Direct sodium testing within cheese plants could potentially be helpful in reducing salt variability as results will be immediately available to operators and can be acted upon for improved control.

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