Efficient & Economical Method of Removing Lipids from Whey to Improve Whey Protein Concentrate (WPC)

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a cost-effective method of removing lipids from whey that improves manufacturing efficiency, results in purer and more usable whey protein concentrate and creates an additional value-added product.

Overview

Whey, a liquid by-product of the cheese industry, has enormous potential as a source of food protein as well as pharmacological, immunological, antibacterial and bioactive agents. A significant portion of whey is converted into whey protein concentrate (WPC), a homogeneous, protein-rich powder. WPC is manufactured by extensive ultrafiltration and diafiltration of crude whey to reduce the non-protein components, especially lactose. It has become a popular food ingredient because it contains highly nutritive and digestible proteins, is soluble over a wide pH range and has good gelling and water binding characteristics.

However, because the high lipid content of WPC causes problems during the manufacture, storage and utilization of WPC, its use as a protein ingredient is limited. Lipid fragments foul the ultrafiltration membranes, increasing the time and energy used during production. They impair the functional properties, including the solubility, turbidity and foaming and emulsifying properties, of commercial WPC products and increase their variability. More significantly, WPC products typically develop a stale, “off” flavor and become discolored during storage as a result of their high lipid content.

Several methods have been developed to remove lipids from whey. But most of these methods cause complete denaturation and insolubilization of whey proteins, hindering their functional properties. Improved methods for removing lipids and lipid membranes are needed to limit the formation of off-flavors and discoloration and to reduce filter fouling, thereby reducing production costs.

The Invention

A UW-Madison researcher has developed a method of using zinc salts as chelating agents to remove lipids in WPC preparations. This efficient and economical method can be easily integrated into existing manufacturing processes, reduces ultrafiltration membrane fouling, produces nearly fat-free WPC without interfering with its functional protein content and results in an additional value-added product.

After calcium ions are removed by diafiltration, very low amounts of a zinc salt, such as ZnCl or ZnAc, are added to the whey solution. Next the pH is adjusted to about 4.2, and the solution is incubated for 30 minutes before being centrifuged. This simple process removes up to 90 percent of the lipid and lipid membranes in the solution.

The lipids and lipid membranes removed from the whey provide a related value-added product. They contain many bioactive and therapeutically interesting molecules, including chitosan, sphingolipids and omega fatty acids. These molecules could be further

processed or sold in additional markets.

Applications

- Production of highly pure WPC
- Isolation of therapeutic biomolecules from milk

Key Benefits

- Provides a means of producing highly pure WPC without significantly increasing production time or cost
- Creates a WPC product that is nearly fat-free and retains the beneficial nutritive and functional properties of commercially available WPC
- Allows WPC to retain flavor quality and color over long storage periods
- Enables a significant increase in the use of WPC in food and beverage products
- Improves the WPC manufacturing process by eliminating lipids and their fouling of filtration membranes, thereby reducing energy use and the number of cleaning cycles required during WPC production
- Creates a value-added product that contains many bioactive molecules, such as chitosan, sphingolipids and omega fatty acids, which could be further processed or sold into additional markets
- Can be easily integrated into common WPC manufacturing processes using existing whey processing equipment
- Uses efficient and economical zinc salts that are relatively inexpensive, widely approved by the U.S. Food & Drug Administration as GRAS (generally regarded as safe) substances, and generally can be recovered and recycled back into the process.

Stage of Development

The inventor has optimized incubation times and temperature, and has tested a number of different salts.

Tech Fields

- Animals, Agriculture & Food : Food ingredients & additives
- Animals, Agriculture & Food : Food processing

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842