Milk Protein Used to Make Edible, Water-Resistant Film

Jim Core, ARS

WYNDMOOR (Montgomery Co.) — An Agricultural Research Service (ARS) scientist has received a patent for her method to turn a milk protein into water-resistant films that could be used to coat or package foods.

The method removes the protein casein from milk by using carbon dioxide under high pressure. Casein, which solidifies when milk is acidified, is the chief ingredient in cheese. It is also used as a food supplement and as an ingredient in nonfood products including adhesives, finishing materials for paper and textiles, and paints.

Until now, it's been difficult to obtain films, fibers, and molded materials with acceptable mechanical properties from casein. That's because moisture can dissolve casein.

The new extraction method takes advantage of casein's natural structure to form water-resisting films or coatings, according to Peggy Tomasula, the method's inventor. Tomasula is a chemical engineer at the ARS Eastern Regional Research Center (ERRC) in Wyndmoor, Pa.

Films act as stand-alone sheets, while coatings are thinner and adhere directly to the product. Both can act as a barrier to outside substances while protecting a product from damage or contamination. The new material remains intact when exposed to water, unlike water-soluble, protein-based films patented in the past.

The film can lock in moisture, according to Tomasula. Edible coatings might be used to coat dairy food products such as cheese, or could be used as part of a laminate in packaging for cottage cheese or yogurt. Flavorings, vitamins or minerals could be added to the coating to enhance the flavor and reinforce nutrition. The method could also be used to develop biodegradable packaging materials from casein. Casein may also be combined with plasticizers to soften and improve the flexibility of casein-containing, nonfood materials.

In pilot plant studies, ERRC researchers are further evaluating the method's potential. The patent is available for licensing, and ARS is seeking commercial partners. ARS is the USDA's chief scientific research agency.