

Are All Milk Protein Concentrates Alike?

With robust demand for dairy protein anticipated to continue through 2008, domestic milk protein concentrate (MPC) suppliers are gaining insights into process parameters that can make their MPC ingredients perfectly suited for many applications.

MPC can be produced by three different methods: blending, coprecipitation or ultrafiltration. Because of their unique functional properties, MPCs produced through ultrafiltration are of increasing interest to the food and beverage industry. Dairy Management Inc. (DMI) Rosemont, Ill., has identified domestic suppliers of fluid ultrafiltered (UF) milk and dried MPC from fluid UF milk. "Some of these suppliers produce on a limited basis, with production shifting between nonfat dry milk and MPC, depending on market conditions," notes Jim Dodson, director, U.S. Manufacturing and Ingredient Marketing, DMI. MPC is being produced by California Dairies in Visalia, Calif., and Darigold in Seattle, Wash. Select Milk Producers, Inc. is producing UF milk in Artesia, N.M. T. C. Jacoby markets MPC from select plants across the country. Protient is the lone domestic producer of milk protein isolate (MPI) in its Norfolk, Neb., plant, and also produces MPC. Protein levels of domestic ingredients range from 46% to 90%. DMI has been meeting with these companies, as well as with potential new domestic suppliers, to help them identify market opportunities for MPC ingredients and to understand how their process parameters may affect MPC functionality.

Functional characteristics are often interrelated. For instance, solubility is a key functional property for MPC and may also impact other functional characteristics such as foaming, gelation and emulsification. A review of the literature and recent patents for MPC reveals that mineral content can affect solubility. Phil Tong, Ph.D., director, Dairy Products Technology



Center at California Polytechnic University in San Luis Obispo, explains how protein concentration during MPC manufacturing can influence solubility, "The removal of lactose in MPC 85-90 manufacture results in changes in the properties of casein micelles that likely affect the rate of dissolution. During the diafiltration process, as minerals are depleted, there is an increase in non-micellar material and casein micelles become less dense. These changes plus increases in pH cause the casein micelles to aggregate." Tong goes on to explain that heat treatment history and protein interactions during storage can further affect solubility.

By understanding subtle differences in MPC functionality, domestic suppliers can tailor their MPCs for specific applications. For cheese milk standardization, low-temperature UF milk can optimize cheese yield and quality. For fluid cultured products, MPC addition can increase viscosity and gel strength. In frozen dairy foods, MPC and MPI can increase mix viscosity, improve foam stability and support shape retention; in the same application UF milk

can increase protein content, lower stabilizer usage and reduce lactose content.

Nutritional beverages are important applications for MPC ingredients. Ingredient stability in retort or UHT processing is critical. Some companies, such as O-At-Ka Milk Products, Batavia, N.Y., use fluid UF milk in a variety of custom meal replacers, protein drinks and medical nutritional products.

While the industry constantly improves functionality, regulations limit some applications. Food and Drug Administration standards of identity permit UF milk in some cheesemaking applications where dry MPC is not allowed. In other applications such as yogurt, only Grade A MPC is allowed. It is interesting to note that there is no definition of "milk protein concentrate" in either the Code of Federal Regulations or the Codex; standards

are defined for import purposes under the Harmonized Tariff Schedule. MPCs may be used freely in non-standard-of-identity products.

On the sensory side, not all MPCs are alike. A recent study by MaryAnne Drake, Ph. D., associate professor, North Carolina State University, and a researcher with the Southeast Dairy Foods Research Center, Raleigh, N.C., has shown that lower-protein MPCs are characterized by cooked/milky and sweet aromatic flavors. As protein concentration increases, MPCs can exhibit stronger flavor profiles. At the 2007 IFT Annual Meeting + Food Expo, DMI-sponsored applications labs demonstrated how domestic MPC can contribute mild dairy flavor, boost protein and calcium content and improve texture and mouthfeel in two applications—a cheesecake filling and a peach yogurt smoothie. To view these formulas and obtain contact information for domestic suppliers, visit www.innovatewithdairy.com. ■

Sharon Gerdes, is a Technical Support Consultant, Dairy Management Inc.



Sharon Gerdes