

Peptide Improvements

A search of Mintel's GNPD shows hydrolyzed whey protein appearing in beverages around the world. In Gatorade's G Series 03 Recover Protein beverage, it is the second ingredient listed, following water. The drink is described as "a post-game protein energy beverage, with electrolytes and carbohydrates for athletes and for performance."

Whey protein hydrolysates (WPH) have many formulation advantages. They are antioxidants, help prevent gelation of proteins and have enhanced heat stability compared to some other proteins, says MaryAnne Drake, Ph.D., Department of Food, Bioprocessing & Nutrition Sciences at North Carolina State University and director of Dairy Management Inc.'s sensory applications lab, administered by the Dairy Research Institute. Additionally, they can be very rich in bioactive peptides, such as those that may benefit hypertension. Research also points to benefits for enhancing athletic performance and in meal replacements. Like many other protein sources used in food and beverage formulations, WPH can sometimes create a bitter taste and "off-aromas," two sensory aspects that are independent of each other.

A study (Leksrisompong, et al. 2010. *J. Agric. Food Chem.* 58 (10):6318-6327), in which Drake was the principal investigator, evaluated 22 WPHs from eight global suppliers. Samples were extensively characterized by both instrumental and descriptive sensory analysis. GC-MS was used to quantify 15 aroma-active compounds. Results include that "potato/brothy, malty, and meaty flavors and bitter taste were key distinguishing sensory attributes of WPH." However, although a greater degree of hydrolysis (DH) was correlated with a higher concentration of low molecular weight

peptides and higher bitter taste intensity, these characteristics were not necessarily associated with intense flavors, says Drake.

Off-aroma thresholds are significantly lower than thresholds for bitter taste and should be considered separately, when formulating. However, some bitterness may be acceptable in certain applications, such as coffee, chocolate and even strong mango-flavored beverages, says Drake.

The manufacturing process for WPH is generally to create a slurry with the unhydrolyzed protein; add hydrolyzing enzyme(s); monitor the process until the desired degree of hydrolysis occurs; inactivate the enzyme with heat; and then spray-dry.

"Process optimization will help minimize undesirable flavors," says Drake. The Southeast Dairy Research Institute is looking at ways to resolve these issues, including length of time for enzyme hydrolysis, time/temperature profiles in the enzyme deactivation, and cool-down and spray-drying. Other considerations involve the enzyme cocktail itself, which suppliers consider very proprietary.

Research is also underway to evaluate masking taste and aroma. "Some suppliers sell masking components with WPH, but they work best with specific applications," she offers. One should also look at the masking ability of other components in a food/beverage matrix.

Formulators should shop around for WPHs, suggests Drake. Great variability in aromatic flavors occurred among the samples studied. Two WPH ingredients with the same degree of hydrolysis and from the same supplier can even have different aromas. For more information, see www.ncsu.edu/sensory.

—Claudia D. O'Donnell, Chief Editor