Good Food, Good Life

Water and a simple sugar may open up novel prospects for Nestlé in benefits offered by bioactive ingredients

Lausanne, SWITZERLAND 14 July 2006 - In the August edition of Nature Materials, a research team from the Nestlé Research Center (Lausanne, Switzerland) reports on molecular investigations of the organization and mobility of water in amorphous and crystalline trehalose. The contribution is available on the Nature Materials Internet site at: http://www.nature.com/nmat/index.html

Biologists have been intrigued for years by the observation that living organisms like baker's yeast can be successively dehydrated and rehydrated without losing their viability. During dehydration, baker's yeast produces high levels of trehalose, a non-reducing disaccharide formed from two glucose units. It was assumed that trehalose was a key factor in biopreservation and that, like all life processes, interactions with the microorganism at a molecular level were involved. But the micromechanics of this molecular process remained largely unresolved.

This paper presents a molecular-level investigation of trehalose, including the first real-time observation of dehydration at this scale. Positron Annihilation Lifetime Spectroscopy was used to study the free volume in trehalose, and demonstrate that changes in free volume are intimately connected with molecular organization and mobility of water in the crystalline and amorphous states The data provides confirmation, at the molecular level, for one of the principal mechanisms proposed for
bioprotection and suggests a new approach to study the survival mechanism of (micro) organisms under conditions of extreme temperature or dehydration.

Nestlé strongly supports these investigations on trehalose, which are part of NRC's extended program with the University of Bristol (UK) on the molecular physics of carbohydrates. There is a growing recognition that molecular level phenomena determine the properties of carbohydrates in foods. The molecular understanding of carbohydrate physics offers the potential for technological advances in the storage of *e.g.* bioactive proteins, probiotics and nutrients and opens new doors in the quest to control certain properties in foods that contribute to their quality, stability and nutritional value.

Reference of the article: D. Kilburn, S. Townrow, V. Meunier, R. Richardson, A. Alam and J. Ubbink, 2006, "Organization and mobility of water in amorphous and crystalline trehalose", Nature Materials, August 2006.

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