Microbial fructans: an industrial alternative.

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Fructansucrases (GH68) are enzymes that catalyze the transfer of the fructosyl unit of sucrose to a growing fructan polymer (transferase activity) chain or to water (hydrolytic activity). Depending on the chemical nature of the resulting fructosyl bond, these enzymes may be classified as levansucrase (LS) that produce levan or inulosucrase (IS) responsible for inulin synthesis. In 2003, we first reported the unusual mosaic structure of inulosucrase (IslA) in *Leuconostoc citreum* CW28, a strain isolated from Pozol, a corn fermented product from the south of México. As most bacterial fructansucrases, IslA has a propeller catalytic domain with identity to *Bacillus subtilis* LS, but has additional domains found in glucansucrases from *Leuconostoc, Lactobacillus* and *Streptococcus* strains. Later on, various LSs with similar structural features were identified in *Leuconostoc* strains, including the industrial strain *L. mesenteroides* NRRL B-512F. Based on these results, a general structural pattern of fructansucrases in *Leuconostoc* species has been proposed. Glycosyltransferases from lactic acid bacteria are of particular interest from both basic and applied research. Both glucansucrases and fructansucrases from *Streptococcus* spp. are implicated in biofilm synthesis and extracellular carbohydrate storage compounds production during the pathogenesis of dental caries (Burne, *et al*. 1996), while fructansucrases from *Lactobacillus* and *Leuconostoc* spp. are implicated in the synthesis of products important for human health due to their prebiotic nature with demonstrated antitumour, antiulcer and inmunomodulating activity (Korakli, *et al*. 2002 and references herein). IslA is is highly specific for inulin synthesis, a process that has been studied by our research group up to pilot scale level. The resulting inulin is a very high molecular weight product with potential applications in the food industry as demonstrated in preliminary studies carried out with chickens. Inulin and levan present in *pozol* and *pulque*, may be responsible for some of the nutritional advantages associated to the consumption of these traditional products.From structural studies in levansucrase (SacB) and inulosucrase IslA we have designed mutants that no longer produce levan or inulin but exclusively oligosaccharides. It is important to mention that in all these reactions the hydrolysis of sucrose is always a contaminating activity which may be reduced either by handling reaction conditions or through structural modifications. We have also found that the additional domains in the chimeric FTFs -among other consequences- reduce the amount of hydrolytic activity in favor of the transferase reaction. In this context out IS and LS mutants may be useful for the synthesis of FOS from sucrose.

In this conference several aspects related to the structural properties, production and application of fructosyltransferases are addressed, particularly those related to potential applications in the food and pharmaceutical sectors.