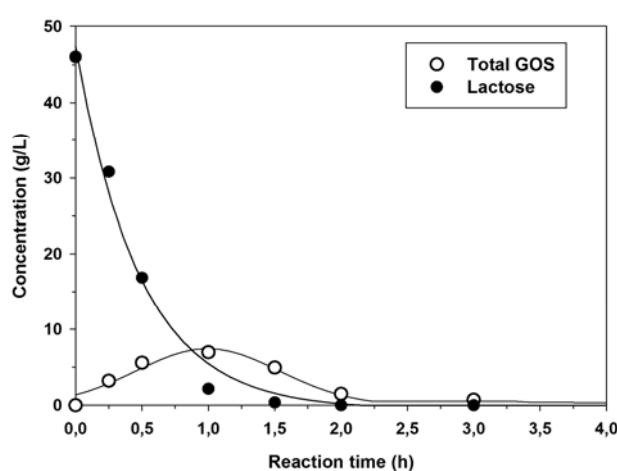


Galactooligosaccharides formation during enzymatic hydrolysis of lactose: Towards prebiotic-enriched milk

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Human milk oligosaccharides (HMOs) constitute a family of more than a hundred structurally diverse carbohydrates. To mimic the multiple benefits of HMOs over breast-fed infants, several related carbohydrates, in particular galactooligosaccharides (GOS) and fructooligosaccharides (FOS) are added to infant formulas.^[1] The incorporation of GOS and FOS into baby foods favours the microbiota composition in the infant's feces (prebiotic effect) and reduce allergenic manifestations (e.g. atopic dermatitis) and infections during the first years of life. Apart from lactose hydrolysis, β -galactosidases (EC 3.2.1.23) catalyze a transgalactosylation reaction in which lactose or other carbohydrates serve as galactosyl acceptors, yielding GOS with different polymerization degree and type of linkages. The formation of GOS in milk during the treatment with several β -galactosidases (*Bacillus circulans*, *Kluyveromyces lactis* and *Aspergillus oryzae*) was analyzed in this work. The maximum GOS concentration was obtained at a lactose conversion of approx. 40-50% with *B. circulans* and *A. oryzae* β -galactosidases, and at 95% with *K. lactis* β -galactosidase. Using an enzyme dosage of 0.1% (v/v), the maximum GOS yield with *K. lactis* enzyme was achieved in 1 h and 5 h at 40°C and 4°C, respectively. Milk containing 7.0 g/L GOS +HMOs concentration is between 5-15 g/L, and with a low content of residual lactose (2.1 g/L, compared with 44-46 g/L in the initial milk sample) was obtained with *K. lactis* β -galactosidase. The major GOS synthesized were 6-galactobiose [Gal- β (1 \rightarrow 6)-Gal], allolactose [Gal- β (1 \rightarrow 6)-Glc] and 6'-O- β -galactosyl-lactose [Gal- β (1 \rightarrow 6)-Gal- β (1 \rightarrow 4)-Glc].



[1] Angus, F.; Smart, S.; Shortt, C. *Probiotic Dairy Products* **2007**, 120-137.

[2] Rodriguez-Colinas, B.; Fernandez-Arrojo, L.; Ballesteros, A.O.; Plou, F.J. *Food Chemistry* **2014**, 145, 388-394.