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Utilization of cellobiose 2-epimerases for epilactose production in milk

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It was reported recently that enzymes belonging to the emerging class of cellobiose 2-epimerases (CE) from various aerobic microorganisms converted lactose into epilactose in defined buffer systems. Lactose (4-O-β-D-galactopyranosyl-D-glucose) is a main component of cow milk, with an average content of about 4.5 % (w/v). Apart from this main sugar also traces of lactulose (4-O-β-D-galactosyl-D-fructose) and epilactose (4-O-β-D-galactosyl-D-mannose) can be found in UHT treated milk. These sugars are formed by isomerisation and epimerization during the heating process. Both lactulose and epilactose seem to possess prebiotic properties. Therefore, enzymatic in situ production of these sugars may introduce an added value for dairy products. We showed that CE from two mesophilic microorganisms, Flavobacterium johnsoniae DSM 2064 and Pedobacter heparinus DSM 2366, were capable of converting lactose into prebiotic epilactose in a complex milk system.

The bioconversions of milk lactose were carried out at an industrially relevant low temperature of 8°C in order to avoid undesired microbial contaminations or chemical side reactions. Both enzymes were reasonably active at this low temperature, due to their origin from mesophilic organisms. A conversion yield of about 30 to 33% epilactose was achieved with both enzymes. No side products apart from epilactose were detected.

After successfully showing the direct conversion of milk lactose at reaction parameters typically used for milk processing in the dairy industry, the development of further processes, such as using whey, seem conceivable. Thus, the utilization of CE in the dairy industry opens up new perspectives for the generation of products with potential prebiotic properties.

Biography

Manuel Krewinkel graduated from RWTH Aachen University in 2011 with a Master deegree in Biology, specialized in biotechnology. Thereafter he started his PhD studies at the University of Hohenheim, Germany where he currently works for the Department of Biotechnology. His work is focused on food associated enzyme technology. In this field he has major expertise on identification, acquisition and application of isomerases and hydrolases in milk systems.

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