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Potential Application of Phytases in Food Processing

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Phytase [*myo*-inositol(1,2,3,4,5,6)hexakisphosphate phosphohydrolase], a phosphatase capable of initiating the stepwise dephosphorylation of phytate [*myo*-inositol(1,2,3,4,5,6)hexakisphosphate], is already used as a supplement in diets for monogastric animals to improve phosphate utilisation from phytate, the major storage form of phosphate in plant seeds. Recently, phytases have been found increasingly interesting for processing of food for human consumption, particularly because the decline in food phytate results in an enhancement of mineral bioavailability.

Different strategies could be applied to optimise phytate degradation during food processing and digestion in the human alimentary tract such as adjustment of more favourable conditions during food processing for the phytases naturally occurring in the raw material, addition of isolated phytases to the production process, and use of raw material with a high intrinsic phytase activity either naturally present or introduced by genetic engineering. Phytate hydrolysis during germination, soaking, cooking, and fermentation is a result of the phytase activity naturally present in plants and microorganisms. The capability to dephosphorylate phytate differs greatly between different plant and microbial species due to differences in their intrinsic phytase activities and properties. To optimise food processing in respect to phytate degradation, it is essential to know the properties of the natural occurring phytases and the properties of exogenous phytases added during food processing or heterologously expressed in plants and microorganisms. Furthermore, phytases may find application in the production of functional foods or food supplements with health benefits, because individual myo-inositol phosphates have been shown to have important physiological functions in man, such as prevention of diabetes complications, anti-inflammatory, antiangiogenic and antitumour effects. Phytases render production of defined myo-inositol phosphates in pure form and sufficient quantities possible. Phytases degrade phytate by sequentially removing phosphate from the *myo*-inositol ring in a regio- and stereospecific manner and the majority of phytases generates only one single *myo*-inositolpentakis-, tetrakis-, tris-, and bisphosphate isomer. Purification of the individual isomers from the reaction mixture could be achieved by ion-exchange-chromatography and different phytases pave the way for the production of different partially phosphorylated *myo*-inositol phosphates.

Last but not least, technological improvements are expected to occur due to phytate degradation during processing as shown for breadmaking, production of plant protein isolates, corn wet milling and the fractionation of cereal bran. However, but up to now, no phytase product for a relevant food application has found its way to the market.