

PHYTIC ACID AND INOSITOL PHOSPHATES DURING GASTRO-INTESTINAL DIGESTION IN PIGS

Schlemmer, U.¹, Jany, Kl.-D.¹, Schulz, E.² und Flachowsky, G.²

Institut für Ernährungsphysiologie, Molekularbiologisches Zentrum

¹Bundesforschungsanstalt für Ernährung (IEP/MBZ), Karlsruhe

²Bundesforschungsanstalt für Landwirtschaft (ITE), Braunschweig

Phytate, the hexaphosphate ester of myo-inositol, is widely spread in the plant kingdom. Its highest levels occur in plant seeds as cereals and legumes (0.5-5% of DM). During gastrointestinal digestion phytic acid (IP₆) is degraded in part and inositol phosphates which do not inhibit the intestinal absorption of trace elements and minerals as Zn and Fe are formed. Moreover, biologically active inositol phosphates as Ins(1,4,5)P₃ may also arise. As the mechanisms of enzymatic hydrolysis of IP₆ during digestion have not yet been elucidated and the degradation products have not yet been determined completely, pigs (n=4) were fed with a diet rich in phytic acid and samples from stomach, jejunum and ileum were analyzed for IP₆ and the other inositol phosphates IP₅, IP₄, IP₃, IP₂, IP₁ using an ion exchange HPLC method.

In the content of stomach IP₆ together with nine other inositol phosphates were determined. Due to a preliminary evaluation of the results the predominant inositol phosphates are Ins(1,2,3,4,5)P₅, Ins(1,3,4,5)P₄, Ins(1,2,3,5)P₄ and IP₃. Two other IP₅ isomers [Ins(1,2,4,5,6)P₅; Ins(1,2,3,4,6)P₅] and one more IP₃ isomer [Ins(1,5,6)P₃] as well as traces of IP₂ and IP₁ are present in the stomach. In the jejunum the same inositol phosphates as in the stomach occur, however, in lower concentrations. The pattern of the different inositol phosphates stays unchanged. The same has been observed for the inositol phosphates of the intestinal content in the ileum. The results indicate that IP₆ mainly is hydrolysed in the stomach by the plant enzymes of feed. Due to the unchanged pattern of inositol phosphates in the intestinal contents of jejunum and ileum it is assumed that no further enzymatic degradation in the small intestine takes place. About 2/3 of the inositol phosphates formed are IP₄, IP₃, IP₂ and IP₁, which do not interfere with the intestinal absorption of Fe and Zn. Whether biologically active inositol phosphates arise is not yet clear.

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ABSTRACTS