Current knowledge on the role of rye in glucose and insulin metabolism – a special rye factor?

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The carbohydrate quality, expressed as foods with low glycemic indices (GI), has been emphasized to play a role in the aetiology of chronic diseases such as type 2 diabetes (T2D) or cardiovascular diseases. For cereal foods, the glycemic response is mostly followed by a parallel insulinemic response as studies with ¹³C labelled cereal-based food have shown that reduced postprandial glycaemic is due to a slower rate of appearance of exogenous glucose with concomitant moderate insulin response. However, repeated studies have demonstrated that rye products in many cases display lower insulinaemic response regardless of their glycemic response. In line with that, studies with catheterized pigs, i.e. pigs equipped with permanent catheters in the portal vein and the mesenteric artery, and with a flow probe attached to the portal vein to monitor the blood flow, have similarly found a lower insulin flux in spite of a similar glucose flux when fed rye as compared to wheat products. This anomaly between glycaemia and insulinenia indicate an improved insulin economy; less insulin needed to regulate the same amount of glucose. The cause has so far not been identified but is in the literature refered to as a special rye factor. The use of the term “factor” in nutritional science is not new and can be considered as a way to account for the lack of knowledge related to specific items. The presentation will address some of the possible contributing factors for the improved insulin economy with rye products: 1) carbohydrate composition, 2) the presence of a variety of bioactive compounds e.g. phenolics, antioxidants, vitamins and minerals, 3) protein composition and profile, 4) production of short-chain fatty acid and butyrate in particular, and 5) structural features of the food.