Resistant starch and health: from concept to products

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Improvements in diet and hence in public health are effected optimally through changes in the food supply rather than by individual action. Evidence for this comes from consideration of the increases in dietary fibre consumption by Australians over the past 20 years. Current intakes at the population level appear to be close to recommended and seem to be through foods available generally, not supplements (1). Of the benefits expected of fibre, improved laxation is well established but others (eg protection against colo-rectal cancer) are defined less well. It appears that starch which has escaped small intestinal digestion (resistant starch, RS) may be more important than fibre for large bowel health (2). RS appears to act through the products of its fermentation by the large bowel microflora. In children post weaning and in adults these are short chain fatty acids (SCFA). Among the benefits expected through greater SCFA supply are improved colonic blood flow and motility, lowered risk of colo-rectal cancer and improved fluid and electrolyte absorption. Butyrate is thought to be the most potent SCFA for many of these attributes although proof of a direct protective role for it in human colonic cancer is yet to be established. Some types of RS appear to favour butyrate production and there is interest in promoting RS consumption at the population level. This is a major challenge as Australian starch (and hence RS) intakes are low. In the short term it is impractical to raise total consumption for consumer acceptance and technical reasons. Attention has focussed on promoting the consumption of foods naturally high in RS eg navy beans and brown (whole grain) rice products. Consumption of these at normal serve sizes could make a meaningful contribution to RS intakes. However, caution needs to be exercised, as there is, as yet, no widely applicable method for measuring RS in foods and so estimating intakes by individuals or populations. Similarly, there are no data for the target figure for RS consumption although interventions have shown improved indices of bowel health with high RS foods (eg 3). Other studies have shown a practical route to enrich some foods with RS through the addition of a high amylose starch (4). Foods containing this product are available in Australia and elsewhere and have a range of documented effects including action as a prebiotic. A bowel health product which is a combination of psyllium and RS has also been developed. This product shows enhanced SCFA production compared with psyllium alone and is available commercially.

There seems to be an opportunity to enhance public health through increasing the consumption of foods high in RS. The approaches used so far are rather limited as the list of high RS food products is small and high amylose starches may have some technical limitations. CSIRO Plant Industry and Health Sciences and Nutrition have been collaborating on an alternative – a novel barley cultivar (*Barleyplus*™) which is under development. This is a non-GM mutant with a defect in starch synthesis leading to high levels of amylose with low amylopectin. The starch in this cultivar has a different genetic basis and distinct favourable properties when compared to alternative sources of high amylose starch. This confers resistance to amylolysis together with useful processing characteristics and offers the opportunity to produce a wide range of consumer-friendly products with enhanced nutritional attributes. Commercialisation of the novel barley is proceeding through collaboration within CSIRO and with external partners.

References

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