

Concurrent Session 4: Resistant Starch

Resistant starch and colonic mucosal integrity

MA Conlon¹, S Toden^{1,2}, AR Bird¹, DL Topping¹

¹Food Futures National Research Flagship, CSIRO Human Nutrition, Kintore Avenue, Adelaide, SA 5000

²Discipline of Physiology, School of Molecular Science, University of Adelaide, Adelaide, SA 5005

Background – Complex carbohydrates are important for the function of the large bowel. Dietary resistant starch (RS) has an important role in this regard. It undergoes fermentation in the colon, resulting in the production of the short chain fatty acids (SCFA), especially butyrate, which helps maintain the normal phenotype of colonocytes. Recent human epidemiological and experimental studies also suggest that high dietary protein intakes have adverse effect on large bowel health. .

Objectives – We have carried out a series of studies in rats to examine if high levels of dietary protein compromise colonic integrity by examining DNA damage (single strand DNA breaks measured by the comet assay) and mucus layer thickness and whether inclusion of RS in the diet can protect against changes that may increase the risk of diseases such as cancer. Changes in large bowel SCFA levels were examined to determine if they are associated with such protection.

Outcomes – Increasing dietary casein from 15% to 25% in the absence of added dietary RS (substituted for digestible starch; 5% wheat bran was included) resulted in a doubling of the number of DNA strand breaks in colonocytes extracted from the colon. Inclusion of cooked red meat at 25% of the diet caused even greater damage, whereas in a different study whey and soy had lesser and greater effects than casein respectively. Inclusion of RS in the diet as high amylose maize starch at high levels (48%) abolished or lowered the levels of the protein-induced DNA damage in the colon in these studies irrespective of protein source. High levels of dietary casein and red meat also resulted in thinning of the colonic mucus barrier, which was reversed by the inclusion of dietary RS. In another study rats were fed 25% dietary protein as casein together with 0%, 10%, 20%, 30% or 40% high amylose maize starch. The RS dose-dependently reduced protein-induced DNA damage in colonocytes with a noticeable effect with as little as 10%. The protection was strongly correlated with caecal SCFA levels, but most strongly with butyrate.

Conclusions - Our data suggest that high protein diets may be harmful to the health of the large bowel but that addition of RS to the diet may protect against this damage.