COLONIC EPITHELIAL BIOLOGY: COMPARISON OF EFFECTS OF RESISTANT STARCH TO SOLUBLE AND INSOLUBLE DIETARY FIBRES

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Starch escaping digestion in the small intestine (resistant starch, RS) passes to the colon where it is subject to bacterial fermentation. Fermentation products, especially butyrate (But), influence epithelial biology. The purpose of this study was to determine whether RS has similar effects in the colon to dietary fibre.

Sprague-Dawley rats were fed one of five AIN-76-based diets: a) no fiber, 25% of carbohydrate as RS of corn origin (RS25), b) no fiber, 50% of carbohydrate as RS (RSSO), c) 10% guar gum (GG), no RS, d) 10% wheat bran fiber (WB), no RS, e) no fiber, no RS (NF). After feeding the diets for four weeks, we measured: faecal 24h output, pH and short chain fatty acids (SCFAs); caecal pH, mass of contents and SCFAs; and cells(C)/crypt in the distal colon. The vincris-tine-metaphase arrest (MA) method was used to measure epithelial proliferation.

	NF	RS25	GG	WB	RSSO
% as RS	2	28	2	8	50
Faecal					
- pH	$7.0\pm0.1^{a-d}$	6.2 ± 0.3^{ae}	6.4 ± 0.2^{bf}	6.3 ± 0.2^{cg}	5.5 ± 0.2^{defg}
-g/24h	$0.6\pm0.1^{a-d}$	2.8 ± 0.3^{ae}	3.8 ± 0.5^{bf}	8.1 ± 0.3^{cefg}	3.4 ± 0.7^{dg}
-But (mM)	$9.2\pm1.7^{a-c}$	2.9 ± 1.3^{ad}	1.5 ± 0.6^{be}	9.1 ± 2.7^{def}	2.5 ± 0.5^{cf}
Cells/crypt	$26.6\pm0.3^{a-d}$	32.5 ± 1.2^{ae}	31.9 ± 1.0^{bf}	33.7 ± 1.0^{cg}	36.6 ± 0.7^{defg}
MA/crypt	1.6 ± 0.2^{a}	2.2 ± 0.5^{b}	2.3 ± 0.4	2.7 ± 0.3	3.5 ± 0.8^{ab}

All groups (n = 8) gained weight at similar rates. As shown in the Table (means ± SEM; common superscripts indicate a significant difference, $P<0.05$), RS had a mild laxative effect, similar to GG but less than WB, and acidified faeces in a dose-dependent way. RS and GG gave low faecal butyrate, and other SCFA, levels. NF caused epithelial atrophy which was reversed by both fibres and RS (dose-dependent) - in each instance due to an increase in epithelial proliferation as reflected by increased metaphases/crypt. RS caused a substantial dose-dependent enlargement of the caecum, similar to that seen with GG, along with a significant decrease in caecal pH. While corn-derived RS is a poor laxative relative to wheat bran and gives lower fecal SCFA concentrations, this RS has comparable effects to the soluble fibre, guar gum, and the insoluble fiber, wheat bran, on faecal pH and epithelial cell mass and kinetics.

As a generalisation, RS of corn origin has similar effects to those of the soluble fibre, guar, on rat colonic biology.

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