WHEAT BRAN IS PROTECTIVE AT THE INITIATION STAGE BUT NOT THE PROMOTIONAL STAGE OF ABERRANT CRYPT FORMATION IN THE DMH RAT MODEL

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Aberrant crypts (AC) are microscopic precancerous lesions that in general initially involve one colonic crypt which multiplies by fission into larger aberrant foci (ACF). These may proceed into adenomas and finally carcinoma. Dietary factors can be used to modulate formation of AC either at the stage they are formed (initiation stage) or as they progress into larger ACF (promotional stage). In this study we compared the effect of high amylose corn starch (HAMS) a source of resistant starch and wheat-bran (WB)(insoluble dietary fibre) in the rat dimethylhydrazine (DMH) model at both the initiation and promotional stages.

In experiment one, four groups of rats (n=32) were fed nutritionally balanced, modified AIN-76 diets containing either 15% of starch as HAMS, 10% WB, a combination of HAMS and WB (HAMS+WB) or neither (NF). The rats were fed the diets for one week prior to a weekly injection of DMH (20mg/kg) for three weeks and were killed five weeks later. In experiment two, four groups of rats (n=32) were all fed the HAMS diet for the first five weeks (initiation stage) while the rats were injected DMH as in experiment one, the rats were then changed to the above four diets and killed four weeks later. The entire colon was removed, fixed in 10% buffered formalin, stained with methylene blue and the number of ACF and the number of AC within each foci was recorded in an area 3.5cm^2 of distal colon.

The Table shows the total number of ACF from the colon from eight rats on each diet in experiment one when the diets were fed throughout the study, and experiment two when the diets were given after DMH treatment and exerted their effect in the promotional stage of AC formation.

Diet	NF	HAMS	HAMS + WB	WB
Total no. of ACF:				
Experiment 1	200	461	349	227
Experiment 2	815	594	678	2283
No. of ACF containing 6 or more AC.				
Average no. of AC per foci:				
Experiment 1	2	5	2	5
	1.76	2.01	1.89	2.22
Experiment 2	5	1	45	36
	1.73	1.76	2 73	2.42

Rats fed the NF, HAMS+WB and WB diets after DMH treatment had significantly more ACF than in experiment one; the control diet HAMS producing similar numbers between the experiments. There was a dramatic 13-fold increase in ACF with the WB diet and a concomitant increase in larger ACF, however the average number of AC per focus did not alter markedly between experiments.

Wheat bran exerts its suppressive effect on formation of aberrant crypts very early in the process of tumorigensis. When administered after the initiation events, wheat bran actually stimulates aberrant crypt formation relative to a high resistant diet.

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