

Concurrent Session 1: Obesity, Diet and Disease

Anxiety following increased hind-gut fermentation

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Background - Previous investigations into the effects of carbohydrate on behaviour have focussed on behavioural changes 2-4 hrs after consumption of the diet and have not considered the effect of site of digestion. Fermentation and lactic acid production in the caecum and colon can lead to detrimental effects in several animal models, including adverse behaviour in horses.

Objective - To determine changes in anxiety promoted by the consumption of fermentable carbohydrate and increased fermentation in the hind-gut of rats.

Design - Randomised control trial with 3 iso-energetic dietary treatment groups, a soluble carbohydrate diet containing wheat (n=12), a fermentable carbohydrate diet based on cooked and cooled rice (n=12) and a basal control rat and mouse Chow diet (n=12). Behaviour was assessed 3 and 21 hrs after dietary consumption by the light dark emergence test.

Outcomes - The 3 diets promoted different fermentation patterns in terms of pH and lactic acid concentrations in the caecum of rats 3 or 21 hrs after consumption. The length of time spent in the dark compartment of the light dark emergence test, indicating increased anxiety, was associated with increased concentrations of D- and L-lactic acid in the caecum ($r^2 = 0.97$ and 0.96 respectively; $P < 0.01$) irrespective of dietary group.

Conclusions - Fermentation of carbohydrate leading to increased concentrations of lactic acid in the caecum of rats was associated with increased anxiety in rats. This has important implications in terms of those diets promoting increased fermentation (eg. with a high intake of resistant starch) without considering any possible detrimental effects.

Effects of phenolic acids and wheat bran on aberrant crypt foci development in the rat

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Background - Phenolic acids have been implicated in the chemopreventive effect associated with whole-grain cereal consumption. Phenolic acids such as ferulic and p-coumaric acid are structurally associated with the polysaccharide matrix of the outer layers of cereal. It is not established whether these phenolics are bioavailable and/or protective against colon carcinogenesis when consumed in free form or as an intrinsic constituent of a cereal diet.

Objective - To determine the effect of phenolic acids (ferulic, p-coumaric, vanillic, syringic) when fed as isolated compounds or as part of the wheat bran matrix on development of colonic aberrant crypt foci (ACF) in the rat.

Design - 75 rats were randomly allocated to five dietary groups as follows: control (10% cellulose), Wheat Bran (WB, 20%), PA1 (10% cellulose + phenolic acids equiv. 20% WB), PA2 (10% cellulose + phenolic acids equiv. 40% WB) and PA4 (10% cellulose + phenolic acids equiv. to 80% WB). All diets were based on a modified AIN93 diet, providing 20% fat and 10% fibre. After four weeks, rats received two weekly doses of azoxymethane to induce ACF. After 13 weeks of feeding, rats were euthanased and their colons were removed for ACF analysis.

Outcomes - There was an 80% increase in ACF number in the colons of WB-fed rats compared with all other groups (all $P < 0.001$). Feeding of isolated phenolic acids (PA1, PA2 and PA4 groups) did not significantly alter the number of colonic ACF in relation to control.

Conclusions - Phenolic acids fed at concentrations equivalent to or greater than that provided by wheat bran, offered no additional protection against ACF development compared with control. In contrast, wheat bran enhanced ACF development.