

Dietary methyl depletion and folate status in male rats fed casein or soy diets

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We investigated different means of achieving methyl depletion by feeding weanling Sprague-Dawley rats modified AIN diets depleted respectively of folate (FD), choline (FCD) and methionine (FCMD) and examined consequent effects on folate status, homocysteine levels and methylation status. Control rats were fed a 12% protein diet consisting of either casein or soy protein isolate (SPI) and containing 2 mg/kg folate, 0.2% choline and 0.4% methionine.

After 4 and 8 weeks on diets, whole blood folate concentration was measured and found to be significantly depleted in the folate deficient treatments compared with controls at 4 weeks ($P=0.001$), this reduction being significantly greater ($P=0.03$) in casein fed rats (60%) than SPI fed rats (32%). Omission of choline and methionine from the diet had no further influence on whole blood folate. A significant inverse correlation was observed in the casein fed rats after 8 weeks between mean plasma homocysteine concentration and decreasing methyl content of the diet ($r^2=0.978$, $P=0.002$), an effect not seen in the corresponding SPI fed rats.

The ratio of S-adenosylmethionine (SAM) to S-adenosylhomocysteine (SAH) used as an indicator of methylation status, in the liver showed a significant decline from the control treatments as the methyl content of the diet was decreased ($P<0.05$). This decline was present in both casein and SPI fed rats. However, when examining the colonic methylation ratio no significant differences were observed. Hypomethylation of hepatic DNA evidenced by a reduction in 5-methylcytosine content, was present in the casein rats fed FCD and FCMD relative to control ($P<0.05$).

The results obtained in the present work support the hypothesis that a methyl depleting diet may lower folate status, increase plasma homocysteine levels and induce hepatic DNA hypomethylation in casein fed rats. These changes in DNA methylation status may be of relevance to cancer risk.