P41

The effects of voluntary exercise on hepatic gene expression during tumourigenesis

SR Mason, LC Ward
School of Molecular and Microbial Sciences, University of Queensland, St Lucia QLD 4072

Background – Many studies have documented that exercise and nutrition both have regulatory effects upon carcinogenesis. Indeed the progression of lesions and cancers can be reduced or eliminated. Both soy and whey proteins have been shown to have additional health benefits beyond their basic nutritional value, including anti-carcinogenic properties against colorectal, breast and prostate cancers. At present, limited knowledge exists of the mechanisms by which exercise and/or in combination with nutrition exhibit these anti-carcinogenic properties and whether anti-tumour properties extend to other tissues.

Objective – To determine the effects of moderate voluntary exercise on the incidence and progression of N-nitrosodiethylamine (NDEA)-induced, pre-neoplastic lesions and gene expression in the liver.

Design – Pre-neoplastic lesions were induced in the livers of Wistar rats by NDEA injections (25mg/kg body weight, 2 times week for 3 weeks). Rats (9 per treatment) were then allowed voluntary access to exercise for up to 12 weeks. Following euthanasia, liver samples were obtained and the total area occupied by preneoplastic lesions was determined by immunohistochemical staining for GST-yp. DNA microarray analysis was undertaken to investigate the effect of exercise upon gene expression.

Outcomes – This study found that pre-neoplastic lesions failed to progress after 9 and 12 weeks of exercise (P<0.01). Exercising also resulted in altered gene expression profiles which were consistent with enhancement of the immune system. Exercise also counteracted many of the effects upon gene expression due to the presence of lesions.

Conclusions – Moderate exercise has prevented the progression of NDEA-induced preneoplastic lesions in liver compared to sedentary controls possibly via a mechanism involving modulation of gene expression. The interactive effects of exercise with dietary change is being further investigated.

P42

The in vivo antioxidant action and the reduction of oxidative stress by Boysenberry extract is dependent on base diet constituents in rats

TK McGhie, LE Barnett, MB Hunt
The Horticulture and Food Research Institute of New Zealand, Palmerston North, New Zealand

Background & Objectives – Dietary antioxidants are often defined by in vitro measures of antioxidant capacity. Such measures are valid indicators of the antioxidant potential, but provide little evidence of efficacy as a dietary antioxidant. This study was undertaken to assess the in vivo antioxidant efficacy of a berry fruit extract.

Design – Rats were fed basal diets containing fish and soybean oil likely to generate different levels of oxidative stress. After two weeks oxidative stress was assessed by measuring biomarkers of oxidative damage to protein (carbonyls), lipids (malondialdehyde, MDA), and DNA (8-oxo-2′deoxyguanosine urinary excretion) and plasma antioxidant status (antioxidant capacity ORAC, vitamin E). Boysenberry (Rubus loganbaccus x baileyanus Britt) extract was used as the dietary antioxidant.

Outcomes – The basal diets (chow (CD), synthetic/soybean oil (SD), or synthetic/fish oil (FD)) had significant effects on the biomarkers of oxidative damage and antioxidant status with rats fed FD having the lowest levels of oxidative damage and the highest antioxidant status. For example, plasma MDA was 45 ng/mL for the FD fed rats and significantly higher with 182 ng/mL for the SO fed rats. Furthermore the plasma antioxidant capacity was 9.2 mmol TE/L for the FD fed rats and significantly lower at 7.3 mmol TE/L for the SD fed rats. When Boysenberry extract was added to the diet, there was little change in 8-oxo-2′deoxyguanosine excretion in urine, oxidative damage to proteins decreased, and plasma malondialdehyde either increased or decreased depending on the basal diet. For example, the mean protein carbonyl concentration for the CD fed rats was 0.21 nmol/mg protein for the control rats and was significantly lower at 0.07 nmol/mg protein when 10% boysenberry extract was added to the diet. Interestingly for MDA, concentrations decreased to 36% of the control for the SD rats, increased by 256% for the FD, and remain unchanged for the CD fed rats when 10% boysenberry extract was added to the diet.

Conclusion – This study showed that Boysenberry extract functioned as an in vivo antioxidant and raised the antioxidant status of plasma while decreasing some biomarkers of oxidative damage, but the effect was highly modified by basal diet. These results are further evidence of complex interactions between dietary antioxidants, background nutritional status as determined by diet, and the biochemical nature of the compartments in which antioxidants function.