TACSM Abstract

The Effects of Physical Activity on Markers of Hepatic Inflammation During Weight-Loss

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ABSTRACT

Non-alcoholic fatty liver disease (NAFLD) represents a continuum that begins with accumulation of lipid in hepatic cells progressing to hepatic steatosis with inflammation (steatohepatitis), fibrosis, and cirrhosis. Weight-loss using dietary modification and physical activity are common strategies used for the treatment of NAFLD; however, it remains to be determined the effects of physical activity on hepatic inflammation during weight-loss. The purpose of this study was to determine the therapeutic role of physical activity on plasma and hepatic inflammatory markers during weight-loss. Male C57BL/6 mice were fed either a low-fat (LFD; 10% kcal fat) or high-fat (HFD; 60% kcal fat) diet for 10-weeks. Following 10-weeks, the HFD group was randomly assigned to either a LFD (Diet) or LFD with physical activity (Diet+PA) to induce weight loss for 8-weeks. After 8-weeks, reductions in body mass were observed in both Diet and Diet+PA groups (see Table 1.). Interestingly, the Diet+PA group lost significantly ($P<0.05$) more body mass than the Diet group. Despite significant ($P<0.05$) reductions in body mass and HOMA-IR, plasma TNF-α remained elevated in the Diet and Diet+PA groups. Moreover, Diet+PA plasma TNF-α was significantly ($P<0.05$) greater than the HFD obese controls. Elevated plasma TNF-α in the Diet+PA was matched by a greater hepatic expression of IL-1β and IL-6 mRNA when compared to all groups. Interestingly, the expression of TGF-β1 mRNA was significantly ($P<0.05$) reduced in the Diet+PA when compared to all groups. The elevated plasma TNF-α and expression of IL-1β and IL-6 mRNA are likely due to physical activity. It remains unclear as to the pro-inflammatory effects of physical activity during weight-loss; however, this may be part of a protective adaption to regular exercise. Furthermore, the reduced hepatic TGF-β1 mRNA levels suggest a protective strategy against fibrogenesis in the spectrum of liver disease.

Table 1. Whole body and hepatic metabolic characteristics following weight-loss.

Variables	LFD (n=12)	HFD (n=12)	Diet (n=12)	Diet+PA (n=12)
Body mass (g)	30.2 ± 1.1	48.8 ± 0.5*	30.3 ± 0.7†	26.1 ± 0.3*,†,‡
HOMA-IR	22.9 ± 1.2	187.3 ± 7.5*	19.4 ± 8.8†	25.3 ± 10.5†
IL-6 (pg/mL)	6.4 ± 0.7	6.2 ± 1.0	5.9 ± 0.9	6.4 ± 0.9
TNF-α (pg/mL)	30.8 ± 6.7	60.6 ± 5.3*	74.0 ± 8.1*	82.5 ± 7.7*,†
IL-1β mRNA	1.00 ± 0.51	0.97 ± 0.34	1.20 ± 0.59	2.83 ± 0.62*,†,‡
IL-6 mRNA	1.00 ± 0.45	1.53 ± 0.50	1.16 ± 0.72	2.36 ± 0.55*,†,‡
TNF-α mRNA	1.00 ± 0.09	0.89 ± 0.08	0.94 ± 0.14	0.83 ± 0.06
TGF-β1 mRNA	1.00 ± 0.06	1.02 ± 0.06	1.02 ± 0.10	0.84 ± 0.05†

Note. Data are presented as mean ± SEM. *Significantly ($P<0.05$) different than LFD; †significantly ($P<0.05$) different than HFD; ‡significantly ($P<0.05$) different than Diet.