

**Health and Exercise Science Senior Thesis Projects  
Spring 2014**

**Title of Thesis: Effects of high-protein low-calorie intermittent-fast diet on plasma toxins and oxidative stress following weight loss**

**Student Name(s): Brad Schuler**

**Faculty Sponsor Name(s): Dr. Paul Arciero**

**Abstract**

In obese subjects, the decrease in fat mass with weight loss is generally regarded as beneficial and may favorably alter oxidative stress. However, it also increases the release of polychlorinated biphenyls (PCBs) from fat depots. Thus, the purpose of this study was to examine the effects of a 10 week higher protein-low calorie diet incorporating intermittent fasting (HPLC-IF) on fat mass, plasma toxins (PCBs) and oxidative stress biomarkers, thiobarbituric acid reactive substances (TBARS) and total antioxidant capacity (TAC) in 43 obese men (n=22) and women (n=21). Fat mass, plasma PCBs and oxidative stress biomarkers were assessed at the beginning (pre) and end (post) of the intervention. Following the 10 week HPLC-IF diet, fat mass decreased significantly ( $P < 0.01$ ) in both groups (males, n=21:  $47.5 \pm 14.8$  vs  $37.4 \pm 13.3$ ; females, n=19:  $49.4 \pm 9.6$  vs  $40.8 \pm 9$ , kg) with males losing more fat mass ( $-21.8 \pm 5.5\%$  vs  $-17.7 \pm 5.3\%$ ,  $P < 0.05$ ; respectively). Eight of 11 individual PCB congeners and total PCB concentration increased significantly overall (Pre:  $86.7 \pm 45.6$  vs Post:  $115.6 \pm 65.9$  ng/g lipid;  $P < 0.01$ ). There were no gender-specific differences in either individual PCB congeners (with the exception of one) or total PCBs. In addition, TAC increased (Pre:  $19.0 \pm 2.6$  vs. Post:  $19.9 \pm 2.6$  nmol/mL;  $P < 0.05$ ), and TBARS decreased (Pre:  $0.24 \pm 0.16$  vs. Post:  $0.18 \pm 0.11$  -specific differences. Interestingly, the percent

increase in TAC and total PCB concentration were significantly correlated with the decrease in total fat mass ( $r=-0.35$ ,  $P<0.05$ ;  $r=-0.42$ ,  $P<0.01$ , respectively). These results suggest that an HPLC-IF diet induces significant reductions in fat mass resulting in elevated PCB concentrations. Nonetheless, this fat loss-induced increase in circulating toxins occurred in the presence of enhanced antioxidant status. Although additional study is required to determine the relevance of PCB release during weight/fat loss, our results suggest that an HPLC-IF diet results in significant improvements in both body composition and antioxidant status.