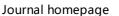


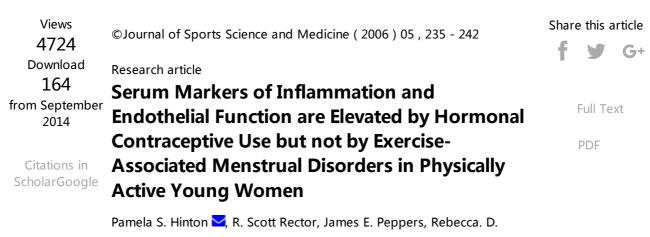
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Imhoff , Laura. S. Hillman

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## ABSTRACT

The purpose of the study was to determine the effects of exerciseassociated menstrual disorders and hormonal contraceptives (HC) on systemic inflammatory markers and endothelial function in female athletes. Thirty-nine active women ( $\geq 5$  h of aerobic exercise per wk), aged 18-33 y, participated in this cross-sectional study comparing women with menstrual disorders (MD, n = 10; 0-9 cycles· $y^{-1}$ ), eumenorrheic women (E, n = 13; 10-13 cycles $\cdot y^{-1}$ ), and HC users (HC, n = 16; 12 cycles  $y^{-1}$ ). Fasting serum samples were collected during the early follicular phase (d2-5) for the menstruating women. Tumor necrosis factor-α (TNFα), interleukin-6 (IL-6), C-reactive protein (CRP), soluble vascular adhesion molecule-1 (sVCAM-1), total cholesterol (TC), high- and low density lipoprotein-cholesterol (HDL-C, LDL-C), triglycerides (TG), reproductive hormones, and cortisol were measured in serum. Estradiol, progesterone, and cortisol were not statistically different between MD and E groups; cortisol was significantly greater in the HC versus E group (p = 0.002). TC (p = 0.005), LDL-C (p = 0.03), and CRP (p = 0.05) were increased in the HC versus MD and E groups. TNF- $\alpha$  was significantly higher in the HC (p=0.001) compared with the E group. There were no significant group differences in the concentrations of sVCAM-1 or IL-6. TNF- $\alpha$  and cortisol were positively

Serum Markers of Inflammation and Endothelial Function are E

correlated (r=0.31, p = 0.058), as were sVCAM-1 and estradiol (r = 0.41, p = 0.010). In conclusion, HC use, but not exercise- associated menstrual disorders, is associated with increased TNF $\alpha$  and LDL-C.

**Key words:** Cytokines, soluble vascular adhesion molecule, female reproductive disorders

## **Key Points**

- Serum lipids and markers of inflammation were not altered by exercise-associated oligomenorrhea or amenorrhea.
- Hormonal contraceptive users had elevated total and LDL cholesterol compared with regularly menstruating non-HC users.
- C-reactive protein and tumor necrosis factor-α, but not soluble vascular adhesion molecule-1, were increased in hormonal contraceptive users.
- The long-term effect of these changes on cardiovascular disease is unknown.

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