Effect of Athletic Activity on Hormone Levels in High School Female Athletes

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Introduction

• There is a gender-related discrepancy in anterior cruciate ligament (ACL) injuries. This may be related to circulating endogenous hormones and exercise-related dys-synchrony of hormone patterning menstrual cycle phases.
• The frequency of ACL injuries in the late follicular phase and ovulatory period suggest that estrogen and progesterone concentrations may be a factor.1-2
• Estrogen and progesterone receptors have been identified in the human ACL, suggesting a role for these steroids in ligament structure and/or function as they have been correlated with ACL stiffness.3

Research Hypothesis

• The estradiol-progesterone profile of high school women participating in training, conditioning, and competition will significantly differ from physically inactive age-matched women over a 3-month period.
• Athletic training/conditioning will alter the body composition (muscle, bone, fat) leading to an increasingly greater lean body mass to fat mass ratio and accompanying hormone change.

Methods

• 106 women, ages 14-18 years, were prospectively monitored over a 13-week period with weekly physical activity assessments and 15 urine samples for estrogen (E1c), luteinizing hormone (LH), creatine (Cr), and progesterone (PdG) levels.
• Each participant underwent lower extremity strength test and body composition measurements, both prior to and after the study period.

Results

• 74 of the 98 women that completed the study were classified as athletes.
• The mean age for the athlete group was 15.7 years (SD, 95% CI: 1.2, 13.4–18.1). The mean age for the non-athlete group was 16.3 years (SD, 95% CI: 1.2, 13.9–18.6)

Results (cont.)

• Neither pre- nor post-observation BMI levels were significantly different between athletes and non-athletes at the 0.05 level.
• Mean log(E1c/Cr) levels were slightly higher in non-athletes compared to athletes, in cycles of <24 or >35 days’ duration, but these differences were not statistically significant (Figure 2).
• No significant difference in log(E1c/Cr) mean levels according to tertiles of activity, regardless of activity tertile. While women in the least active tertile had slightly higher levels of log(PdG/Cr) at mid-cycle, the differences were not significant (Figure 3).

Discussion

• There were no significant differences in estrogen or progesterone levels between the female groups.
• Athletic activity did not significantly alter body composition over the course of the study. However, not all of the participants began the study in the pre-season, opening the possibility that an initial change in body composition was missed by the monitoring period.

Conclusions

• In this cohort of high school females, the level of athletic or physical activity did not influence urine concentrations of estrogen, progesterone or luteinizing hormones.
• A significant number (17%) of women in both groups were amenorrheic during the 3-month study period.

Clinical Significance

• Physical Activity does not appear to influence estrogen, progesterone, and luteinizing hormone levels in this age and activity group.

References


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