

Development and validation of a self-collection blood test for athletic assessment of hormones

Background

- Changes in blood levels of some hormones have been observed in athletes during periods of intense training.^{1,2}
- In particular, elevated cortisol levels and low testosterone levels have been shown to be indicative of overtraining and a decline in performance.³
- Routine assessment of blood levels of these hormones during training may be useful for athletes and coaches.
- However, the need for blood samples to be collected by a medical professional may limit the usefulness of such an approach.
- **Objective:** The investigators developed and validated a self-collected microspecimen blood test for accurate detection of cortisol and testosterone hormones in athletes.

Methods

- The study population included 46 Division I athletes, including 16 men and 30 women, ranging in age from 18 to 22 years.
- Fingertick microspecimens (about 20 µL) and venous blood samples (about 5 mL) were collected.
- Fingertick specimens were analyzed for total cortisol and testosterone using a newly developed microspecimen liquid chromatography-tandem mass spectrometry (LC-MS/MS) assay optimized for small specimen volumes.
- Venous blood samples were analyzed for the 2 hormones using both the microspecimen LC-MS/MS assay and a standard LC-MS/MS assay.
- Agreement between the results of the microspecimen and standard LC-MS/MS assays was evaluated using Deming regression and Pearson correlation analyses.

Results

- Results from the fingertick microspecimen LC-MS/MS assay correlated well with those from the venipuncture standard LC-MS/MS assay for both total cortisol ($r=0.92$; $P<0.0001$) and testosterone ($r=0.99$; $P<0.0001$).
- Results from the fingertick microspecimen LC-MS/MS assay correlated well with those from the venipuncture microspecimen LC-MS/MS assay for both total cortisol ($r=0.96$; $P<0.0001$) and testosterone ($r=0.99$; $P<0.0001$).

Conclusions

- Cortisol and testosterone levels determined by a microspecimen LC-MS/MS assay are in good agreement with levels determined by a standard LC-MS/MS assay.
- Self-collection of blood samples may enhance the ability of athletes and their coaches to assess hormone levels during periods of training.

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