The use of growth hormone (GH)-dependent markers in the detection of GH abuse in sport: Physiological intra-individual variation of IGF-I, type 3 pro-collagen (P-III-P) and the GH-2000 detection score.

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Background: Growth Hormone is abused by athletes for its lipolytic and anabolic properties. Its use is prohibited by the World Anti-Doping Agency. The GH-2000 project developed a methodology to detect its abuse using the concentrations of two GH-dependent biomarkers, IGF-I and type 3 procollagen (P-III-P). The sensitivity of this method may be improved by considering intraindividual variability.

Aim: The aim of this study was to examine the intra-individual variability of IGF-I, P-III-P and the GH-2000 score.

Subjects and methods: IGF-I, P-III-P and GH-2000 score were evaluated in four longitudinal studies involving 303 elite and 78 amateur athletes. Samples were collected over a period of up to 12 months from a total of 238 men and 143 women aged between 17 and 53 years (mean 24.2). Results: The four studies showed good agreement with no apparent difference in within-individual variation between amateur and elite athletes. The intra-individual variability for IGF-I ranged between 14-16% while the variability for P-III-P was 7-18%. No athlete tested positive for growth hormone during any of the studies. The overall mean intra-individual variability of the GH-2000 score was less than 0.6 units in all studies.

Conclusions: The high stability of marker levels suggests that concentrations are largely genetically determined. Adopting a test based on the concept of an athlete's 'passport' or 'profiling' would take advantage of this and most likely increase the sensitivity of the test. These data also provide strong evidence that a positive test result for GH abuse would not occur as a result of chance variability.