

## **Elite volunteer athletes of different sport disciplines may have elevated baseline GH levels divorced from unaltered levels of both IGF-I and GH-dependent bone and collagen markers: A study on-the-field**

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Seventy-seven Italian elite athletes (42 M, 35 F, mean age $\pm$ SE: 24.4 $\pm$ 0.7 yr, age range: 17-47 yr) of different sport disciplines (sprinters, triathletes, middle-distance runners, road-walkers, cyclists, rowing athletes, skiers, roller hockey players, swimmers) were sampled on-the-field (before a training session) for the determination of basal GH, IGF-I, C-terminal cross-linked telopeptide of type I collagen (ICTP) and amino-terminal propeptide of type III procollagen (PIIINP) levels, two GH-dependent peripheral markers of bone and collagen turnover, respectively. Basal GH concentrations were significantly higher ( $p<0.001$ ) in female (5.8 $\pm$ 1.0 ng/ml) vs male athletes (1.8 $\pm$ 0.5 ng/ml), with a large spread of values in either gender. Mean GH levels of athletes were significantly higher than those recorded in age-matched sedentary controls (females: 2.5 $\pm$ 0.5 ng/ml,  $p<0.001$ ; males 0.5 $\pm$ 0.2 ng/ml,  $p<0.05$  ng/ml). Among female athletes, 7/35 had basal GH values higher than the upper limit of control values (>9.5 ng/ml), while among males 7/42 had values higher than the upper limit of male sedentary controls (>3.6 ng/ml). No significant differences in basal GH concentrations were found between females taking oral contraceptives (OC) and those who did not receive this treatment (5.0 $\pm$ 2.1 vs 6.0 $\pm$ 1.2 ng/ml). IGF-I levels (236.4 $\pm$ 7.8 ng/ml) in the normal range for age in all athletes (except for 1 athlete with slightly increased levels), no significant correlation found between GH and IGF-I levels ( $R^2=0.0393$ ). Mean ICTP (4.6 $\pm$ 0.2 ng/ml) and PIIINP (4.4 $\pm$ 0.1 ng/ml) concentrations of elite athletes were not significantly different from those recorded in age and matched healthy sedentary subjects; 4 athletes showed increased PIIINP levels and 2 had increased ICTP levels. ICTP and PIIINP levels were positively correlated with chronological age ( $p<0.001$ ), a positive correlation being also found between the two markers ( $p<0.001$ ). On the contrary, no significant correlation was found between basal GH/IGF-I levels and ICTP/PIIINP levels. In conclusion, the present study demonstrates that: 1) elite athletes (particularly females), which have frequently increased basal GH on-the-field, have actually normal IGF-I levels; 2) ICTP and PIIINP levels of athletes are similar to those recorded in healthy sedentary, being significantly higher in younger subjects of both groups; 3) the presence of increased basal GH levels, being associated with normal IGF-I, ICTP and PIIINP levels, is probably the result of a transient GH peak in this study group. Further additional studies are requested to verify the possible use of these peripheral GH-dependent markers for detecting exogenous chronic administration of recombinant GH in athletes.

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