of AMI, the time of day is of minor relevance; age and sex, however, are more important because these will influence the upper reference concentrations of both these markers. In addition, caution should be taken when using the Mb over FABP ratio to discriminate cardiac from skeletal muscle injury, especially for patients >50 years of age.

We thank N. Drees, Roche Diagnostic Systems, for stimulating discussions and for providing the Mb assays.

References

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Influence of Gender in Growth Hormone Status in Adults: Role of Urinary Growth Hormone

To the Editor:
A recent paper by Engstrom et al. (1) presented marked gender differences in plasma growth hormone (GH) values in young adults (21–26 years of age), evaluated in the consulting room and after overnight fasting. The authors observed higher values in the women than in the men. They proposed that something in the morning triggers a GH burst in almost all of the women but in very few of the men.

Veldhuis in the 24th International Symposium in Antwerp (GH and Growth Factors in Endocrinology and Metabolism, October 1997; information printed by Sterling Press, UK, for Pharmacia & Upjohn) affirmed that gender itself has a major impact on the secretion of GH in adults. Unfortunately, until now the basis of sexual dimorphism in GH secretory patterns/status in humans has not fully understood. However, several works suggest that estrogens play an important role in GH secretion in women compared with men. Lang et al. (2) observed a difference in response to growth hormone-releasing hormone (GHRH) in premenopausal, but not postmenopausal, women compared with men. Therefore, estrogens seem to increase the GHRH-stimulated GH secretion.

Main et al. (3) revealed a significant impact of gender on urinary GH values. They included children in the study and collected the first morning voiding for 3 days per subject.

The urinary GH values, collected from 70 healthy adults (22–61 years) drug free, in the ambulatory state, and after overnight fasting are reported here. This population was divided twice (by gender and age) into four groups to investigate a possible influence of gender in GH status; these groups were as follows: group A, men less than 40 years of age (range, 22–39 years), n = 18; group B, women less than 40 years of age (range, 19–40 years), n = 25; group C, men more than 40 years of age (range, 43–61 years), n = 17; and group D, women more than 40 years of age (range, 41–59 years), n = 10 (five of the women were postmenopausal).

This study was approved by the Bioethics Committee of the Medical School of the University of Padova.

To evaluate GH status, other markers such as plasma GH and growth hormone-binding protein (GHBP) were analyzed. The latter is a circulating protein, generated from the extra-cellular domain of the GH receptor through a proteolytic cleavage.

Statistical analysis was performed using ANOVA-LSD.

The plasma GH concentration and urine GH excretion (reported as ng/L and as ng/g of creatinine) in 70 adults are summarized in Table 1. Values are expressed as mean ± SD.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Male GH values</th>
<th>Female GH values</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>18</td>
<td>2.83 ± 1.52</td>
<td>4.31 ± 2.87</td>
</tr>
<tr>
<td>B</td>
<td>25</td>
<td>2.24 ± 0.98</td>
<td>3.15 ± 1.23</td>
</tr>
<tr>
<td>C</td>
<td>17</td>
<td>2.10 ± 0.86</td>
<td>2.95 ± 1.15</td>
</tr>
<tr>
<td>D</td>
<td>10</td>
<td>2.30 ± 1.02</td>
<td>3.20 ± 1.35</td>
</tr>
</tbody>
</table>

The ratio of male to female GH values was 1:1.5 for group A, 1:1.5 for group B, 1:1.5 for group C, and 1:1.5 for group D.

Further-
more, plasma GH (μg/L) was higher in the women than in the men in both age groups (4.24 ± 5.09 vs 0.32 ± 0.77 for groups B and A, respectively, and 5.13 ± 4.72 vs 0.30 ± 0.38 for groups D and C, respectively).

Urinary and plasma GH were measured with IRMAs (hGH Ucoatria from BioMerieux for urinary GH, and GH IRMA kit from Immunotech for plasma GH).

Plasma GHBP was assayed by size exclusion HPLC, using 125I-GH. The results were given as the bound-to-free ratio (B/F) and as the maximum binding capacity (MBC) (4).

These results confirm a significant gender influence in plasma GH values, as demonstrated previously by Engstrom et al. (1). Urinary GH values also seem to confirm this gender difference in the subjects under 40, whereas in the subjects over 40, this difference seems to fade.

This different behavior of GH in plasma and urine may be a relevant finding. In fact, it could strengthen the hypothesis that estrogens deeply influence GH secretion at the pituitary/hypothalamus. Furthermore, a more complete evaluation should consider other indexes such as the mass of GH secreted per burst and GH pulse amplitude and frequency (5,6). In particular, Eden (7) demonstrated a gender difference in GH peaks in the rat: male GH pulse amplitude was higher, with 3–4 h intervals with lower concentrations, whereas the female rat showed lower pulse amplitude and higher basal concentrations.

To date, the role of gender in plasma and urinary GH in adults has not been well stressed. Plasma GHBP and urine insulin-like growth factor (IGF)-1 have also been evaluated in a group of subjects (20 males and 20 females for GHBP, and 30 males for IGF-1). However, additional investigations are necessary to study their role.

Because IGF-1 is the mediator of several GH effects, data concerning IGF-1 excretion in urine could be very helpful in understanding gender or age differences in GH status. Work is in progress in our laboratory.

The preliminary data, reported briefly here, suggest further investigation in this matter. Finally, the present finding and the other data from the literature suggest that the reference ranges of urine GH, usually described in analytical reports, should indicate distinct male and female values.

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**References**


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**Correction**

In the article by S.J. Winters, D.E. Kelley, and B. Goodpaster, entitled “The Analog Free Testosterone Assay: Are the Results in Men Clinically Useful”, 1998;44:2178–82, the y-axis range for free testosterone in Figs. 1 and 3 (bottom panel in Fig. 1 and top panel in Fig. 3) is incorrect. The range should read “0-300 pmol/L”, not “0-3 pmol/L” as published. The author regrets the error.