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Serum Concentrations of Dehydroepiandrosterone Sulfate and Testosterone in Patients with Allergic Rhinitis and Mild Asthma

Stężenie siarczanu dehydroepiandrosteronu i testosteronu w surowicy chorych na alergiczny nieżyt nosa i łagodną astmę oskrzelową

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Abstract
Background. An immuno-modulating effect of dehydroepiandrosterone on IgE-mediated allergic processes has been reported.

Objectives. To assess the serum concentrations of dehydroepiandrosterone sulfate (DHEA-S) and testosterone in female patients suffering from persistent allergic rhinitis (PAR) caused by allergy to house dust mites (HDMs) and seasonal allergic rhinitis (SAR) due to pollen allergy with or without asthma symptoms.

Material and Methods. Serum concentrations of DHEA-S and total testosterone were measured in 23 hitherto untreated female patients sensitized to HDM (Dermatophagoides pteronyssinus, Dermatophagoides farinae) with PAR without (13 patients) and with (10 patients) concomitant symptoms of mild asthma, 22 untreated female patients sensitized to grass and rye pollens with SAR without (12 patients) and with (10 patients) concomitant mild asthma, and 20 healthy subjects.

Results. No significant differences in serum concentrations of DHEA-S and total testosterone were found among the five groups.

Conclusions. It seems that circulating concentrations of DHEA-S and total testosterone are not altered in patients suffering from seasonal or persistent allergic rhinitis with or without concomitant symptoms of mild asthma (Adv Clin Exp Med 2008, 17, 1, 41–44).

Key words: dehydroepiandrosterone, testosterone, house dust mite, pollen allergy, allergic rhinitis, allergic asthma.

Streszczenie

Wprowadzenie. Obserwowano immunomodulujący wpływ dehydroepiandrosteronu na IgE-zależne procesy alergiczne.

Cel pracy. Ocena stężenia siarczanu dehydroepiandrosteronu (DHEA-S) i testosteronu w surowicy chorych na przewlekły alergiczny nieżyt nosa (PAR) i astmę oskrzelową wywołanych uczuleniem na roztocze kurzu domowego (HDM) oraz chorych na sezonowy alergiczny nieżyt nosa (SAR) i astmę oskrzelową wywołanych uczuleniem na pyłki roślin.

Material i metody. Oznaczono stężenie siarczanu dehydroepiandrosteronu i całkowitego testosteronu w surowicy dotyczącej 23 kobiet uczulonych na HDM (Dermatophagoides pteronyssinus, Dermatophagoides farinae) chorujących na PAR zarówno bez objawów astmy (13 chorych), jak i z towarzyszącymi objawami łagodnej astmy oskrzelowej (10 chorych), 12 kobiet uczulonych na pyłki traw i zbóż chorujących na sezonowy alergiczny nieżyt nosa zarówno bez objawów astmy (12 chorych), jak i z towarzyszącymi objawami łagodnej astmy oskrzelowej (10 chorych) oraz u 20 osób zdrowych.

 Wyniki. Nie wykazano statystycznie istotnych różnic w stężeniu DHEA-S i całkowitego testosteronu między badanymi grupami.


Słowa kluczowe: dehydroepiandrosteron, testosteron, roztocze kurzu domowego, alergia na pyłki, alergiczny nieżyt nosa, alergiczna astma.
Dehydroepiandrosterone (DHEA) and its sulfated compound dehydroepiandrosterone sulfate (DHEA-S) are the major androgens secreted by human adrenal glands and act as precursors for sex hormone synthesis [1]. Testosterone is the most potent androgen secreted in women by the adrenal glands and ovaries [2]. Increasing evidence demonstrates a role for DHEA and testosterone in modulating immune response [1, 3]. DHEA has been suggested to be involved in and important for immune responses, such as autoimmunity and allergic inflammation [4]. Based on studies of allergic diseases, it has been suggested that DHEA promotes a shift in the Th1/Th2 balance towards Th1-dominated immunity, regulates IgE-synthesis, and controls IL-4, IL-5, and IL-2 production; the hormone may thus be one of the modulators in the development of allergic reactions [5, 6].

Using an experimental model of airway inflammation induced by the house dust mite (HDM) Dermatophagoides farinae, it has been recently demonstrated that DHEA supplementation lowered Th2 cell cytokine production and significantly suppressed eosinophilic inflammation and IgE production [7]. Decreased serum concentrations of DHEA and DHEA-S compared with healthy subjects have been demonstrated in patients with different chronic inflammatory diseases [4, 8]. Available data on the behavior of circulating androgens in patients with allergic diseases and asthma are scarce. It was demonstrated previously that there were no significant differences in serum DHEA-S concentration between untreated children not sensitized to house dust mite who suffered from allergic rhinitis and asthma and non-atopic subjects with the same allergic diseases as well as normal values [9]. However, decreased serum concentrations of androgens have been demonstrated in some adult asthmatic patients [10, 11].

The intention behind the present study was to extend our view of the behavior and role of endogenous hormones in allergic processes. Therefore it was investigated whether there are any significant differences in the serum concentrations of androgens, such as DHEA-S and total testosterone, between female patients suffering from HDM-induced persistent allergic rhinitis (PAR) with and without concomitant symptoms of mild asthma, female patients suffering from seasonal allergic rhinitis (SAR) alone or with concomitant mild bronchial asthma symptoms due to pollen allergy, and healthy women.

**Material and Methods**

Forty-five female patients with newly diagnosed inhalatory allergy (moderate to severe symptoms of allergic rhinitis, sensitized, with or without mild asthma symptoms) to house dust mites (Dermatophagoides pteronyssinus and/or Dermatophagoides farinae) or to grass pollens were enrolled in the study. They were divided into four groups. The PAR group consisted of 13 female patients with symptoms of HDM-induced persistent allergic rhinitis in the absence of asthma symptoms; the median age was 26 years (range: 18–30 years). The PAR/asthma group consisted of 10 female patients with PAR and concomitant mild asthma symptoms; the median age was 24 years (range: 18–29 years). The SAR group consisted of 12 female patients with SAR; the median age was 21 years (range: 18–28 years). The SAR/asthma group consisted of 10 female patients suffering from SAR and mild asthma; the median age was 22.5 years (range: 19–27 years). The control group included 20 healthy females; the median age was 25 years (range: 18–26 years). Serum concentrations of dehydroepiandrosterone sulfate and total testosterone were measured by the automated electrochemiluminescence immunoassay “ECLIA” (Roche Diagnostics, Mannheim, Germany). The study was approved by the local ethics committee. All participants gave informed written consent before entering the study.

Data are presented as the median and range. Kruskal-Wallis variance analysis was used for screening differences among the five groups. P-values less than 0.05 were considered significant.

**Results and Discussion**

It was demonstrated earlier that children (8–15 years of age) not sensitized to Dermatophagoides pteronyssinus and suffering from mild allergic rhinitis alone or with concomitant mild asthma symptoms showed no statistically significant differences in serum concentrations of DHEA and DHEA-S compared with non-atopic subjects suffering from those diseases as well as normal values [9]. Based on this study it has been suggested that the role of this hormonal regulation in the Th2 type immune response is not important in patients with allergic diseases in this age group [9]. The present study also points to a lack of significant differences in serum concentrations of DHEA-S and total testosterone between house dust mite-allergic adult patients suffering from moderate to severe PAR with or without mild asthma symptoms and the healthy subjects (Table 1). Moreover, no significant differences were found between patients with SAR alone or with concomitant mild asthma symptoms and the healthy subjects with respect to the serum concentrations...
of these hormones. Taken together, the results suggest that untreated patients with allergic rhinitis and mild bronchial asthma show serum concentrations of total testosterone and DHEA-S similar to those of healthy non-atopic subjects.

The circulating concentration of DHEA-S was decreased in some asthmatic patients using either inhaled glucocorticosteroids, oral steroid therapy, or no known steroid therapy [10]. It has been reported that inhaled steroid therapy reduces serum DHEA-S concentration, which may indicate adrenocortical suppression [12]. On the other hand, it has been demonstrated that postmenopausal asthmatic women have lower serum concentrations of DHEA and DHEA-S, irrespective of whether they were treated with inhaled glucocorticosteroids, compared with healthy women [13, 14]. Low serum concentrations of testosterone were also observed in patients suffering from asthma, probably due to stress, hypoxia, and corticosteroid treatment [11]. Low blood testosterone was more frequent in glucocorticosteroid-treated patients than in patients who had never been treated with such drugs. Among the untreated patients, low testosterone was more frequent in the patients with nonatopic asthma (40.82%) than in those with the atopic (24.67%) and mixed type (27.16%). Low blood testosterone was found mainly in patients with severe (37.76%) and moderate (40%) forms of the disease and very rarely in those suffering from the mild form of bronchial asthma (8.51%) [11]. In the present study, the serum concentration of total testosterone did not differ significantly between patients with allergic rhinitis and those with allergic rhinitis with concomitant mild asthma symptoms and healthy controls.

Some changes in serum concentrations of DHEA, DHEA-S, and testosterone have also been observed in other allergic diseases. Tabata et al. reported lower serum DHEA concentration in male patients suffering from AEDS compared with healthy controls [15]. However, others observed similar serum concentrations of DHEA and DHEA-S in male [16] and female patients [16, 17] with AEDS. Only in male patients with AEDS were the serum concentrations of total testosterone and free testosterone significantly lower than in healthy controls [16].

In conclusion, no significant differences in serum concentrations of DHEA-S and total testosterone were observed in the present study between female patients with HDM-induced persistent allergic rhinitis and pollen-induced seasonal allergic rhinitis in the absence of asthma symptoms and

### Table 1

<table>
<thead>
<tr>
<th>Analyzed hormones (Analizowane hormony)</th>
<th>Control group (Grupa kontrolna) (n = 20) median range (mediana zakres)</th>
<th>PAR group (Grupa chorych na PAR) (n = 13) median range (mediana zakres)</th>
<th>PAR/asthma group (Grupa chorych na PAR i astmę oskrzelową) (n = 10) median range (mediana zakres)</th>
<th>SAR group (Grupa chorych na SAR) (n = 12) median range (mediana zakres)</th>
<th>SAR/asthma group (Grupa chorych na SAR i astmę oskrzelową) (n = 10) median range (mediana zakres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHEA-S (ug/dl)</td>
<td>247.9 116.2–384.7</td>
<td>225.4 157.8–325.5</td>
<td>210.9 125–352.8</td>
<td>204.3 106.5–319.7</td>
<td>197.9 111.1–272.2</td>
</tr>
<tr>
<td>Testosterone – ng/dl (Testosteron – ng/dl)</td>
<td>42.5 10.9–81.4</td>
<td>40 22.8–65</td>
<td>44.4 22.2–93.6</td>
<td>36.4 26.5–84.6</td>
<td>50.2 14.8–59</td>
</tr>
</tbody>
</table>

n – number of subjects.
PAR – persistent allergic rhinitis.
SAR – seasonal allergic rhinitis.
DHEA-S – dehydroepiandrosterone sulfate.
n – liczba chorych.
PAR – przewlekły alergiczny nieżyt nosa.
SAR – sezonowy alergiczny nieżyt nosa.
DHEA-S – siarczan dehydroepiandrosteronu.
with concomitant symptoms of mild asthma as well as healthy subjects. It seems that circulating concentrations of DHEA-S and total testosterone are not altered in patients suffering from seasonal or persistent allergic rhinitis with or without concomitant symptoms of mild asthma.

References


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