The Effects of Hydroalcoholic Extract of Devil's Claw on Serum Levels of Obestatin and Body Weight in Male Rats

Shiva Saleh¹, Hossein Kargar Jahromi²,³*, Yaser Sarikhani², Zahra Kargar Jahromi²,³, Hamidreza Dowlatkhah²,³

¹Student Research Committee, Jahrom University of Medical Sciences, Jahrom, Iran.
²Research center for Noncommunicable Diseases, Jahrom University of Medical Sciences, Jahrom, Iran.
³Zoonoses Research center, Jahrom University of Medical Sciences, Jahrom, Iran.

*Corresponding Author: Hossein Kargar Jahromi (Email: hossein.kargarjahromy@yahoo.com)

Abstract

Introduction previous studies have referred to the moderating effect of devil's claw on appetite process. Obestatin is a peptide with 23 amino acids secreted from parietal cells of gastric mucosa. This hormone inhibits food intake and body weight reduces. This study was conducted to study the effects of hydroalcoholic extract of devil's claw on serum levels of obestatin and body weight in male rats.

Method In this experimental study, 40 male Wistar rats with an average weight of 180-200 g were randomly divided into 5 groups of 8 animals (control, testator, and the experimental groups receiving the hydroalcoholic extract of devil's claw in concentrations of 150, 300 and 600 mm g per kg of body weight). Hydroalcoholic extract of devil's claw (HAEDC) was administered to animals in gavage for 28 consecutive days. One day after the last injection, the rats were weighed, and after getting blood samples and separation of serum, obestatin concentration was measured using ELISA kits for rats. Data analysis was performed using ANOVA with SPSS 21 and Duncan's test.

Results 300 and 600 mg/kg of HAEDC significantly increase serum levels of obestatin and reduce body weight compared to the control group (p<0.05). Conclusion HAEDC reduces body weight by increasing secretion of obestatin that restrains the appetite.

Keywords: devil's claw, Obestatin, Body weight, Rat.

Introduction

Weight changes during the life depend on the interaction between behavioral, heredity, and environmental factors. Regulation of body weight and energy homeostasis is connected to complex regulatory mechanisms that maintain the balance between energy intake, energy used, and energy storage (1 and 2). Among the important hormones in this regard is obestatin. Obestatin is a peptide with 23 amino acids and molecular weight of 2516.3 Dalton that Zhang et al. identified in the stomach of mice in 2005 (3). Obestatin is secreted from the parietal cells or gastric oxyntic mucosa. In fact, this peptide is released from the cells of fudic gland in the body and the base of the stomach. It has been shown that obestatin affects gastrointestinal motility, glucose homeostasis, cell proliferation, secretion of hormones, thirst, sleep, memory, emotion, water intake, body weight, energy costs, and the emergence of mental illness (4). The concentration of obestatin of plasma is adjusted by hunger, satiety (5), carbohydrate-rich meals (6), weight loss (7) and obesity (8). Intracerebral injection of obestatin inhibits food intake, which indicates the effect of this hormones on the central nervous system (9, 10, 11). Researchers have suggested that increase of obestatin after weight loss is an essential mechanism for maintaining weight loss (7).

Devil's claw is a perennial plant with the scientific name Harpagophytumprocumbens.
and belongs to the family Pedaliaceae that grows in South and East Africa. In traditional medicine, this plant had been used as anti-inflammatory, antioxidant, anti-allergic, anti-diabetic, anti-rheumatism, anti-cancer as well as moderating appetite (12, 13, 14). Scientific studies on devil’s claws have shown its analgesic, anti-inflammatory and therapeutic value in the treatment of musculoskeletal, rheumatoid arthritis and osteoarthritis (15 and 16).

The main ingredient of devil’s claw is Harpagoside, which belongs to the family of iridoid glycoside, and is the main and effective composition of this plant (13). However, this plant also contains other compounds such as flavonoids (such as campherol, apigenin), triterpenes, phytosterols, phenolic acids, fiber, and sugars (17).

Considering that, few studies have been conducted on the effects of devil’s claw on appetite and hormones affecting appetite, this study has been conducted to investigate the effect of HAEDC on serum concentration of obestatin in male rats. The results of this study can help identify the exact mechanisms of this plant in the regulation of appetite and body weight.

Materials and Methods

In this experimental study, 40 male Wistar rats with an average weight of 180-200 g were used. For one week the rats were kept in an animal fostering room of Jahrom University of Medical Sciences to adapt to the environment. Throughout the study, the animals were kept under 12 hours of light and 12 hours of darkness and ambient temperature 25-20 °C and had free access to food and water. Humidity was about 50 to 55 percent.

According to previous articles, prescribed concentrations of HAEDC were determined as 150, 300 and 600 mg per kg of body weight (15). The rats were randomly divided into 5 groups of 8 animals as follows: Control group: during the experiment (28 days), this group did not receive any treatment.

Testator group: during the experimental period (28 days), this group received 1 ml of distilled water as gavage according to body weight. Experimental groups 1, 2 and 3, respectively, received 150, 300 and 600 mg per kg doses of HAEDC as gavage for 28 days based on body weight.

At the end of the study (day 29), after weighing the animals, blood samples were directly taken from the heart of the animals with 5 cc syringe (under anesthesia by diethyl ether), and their serum was collected by centrifugation device (for 15 min at 3000 RPM) and kept in freezer at -20° until the experiment. ELISA kits for rats were used to measure obestatin hormone.

ANOVA was used for the analysis of data. In cases where statistical difference of the groups was significant, Duncan test was used to understand means differences. Statistical analysis was performed using SPSS 21 and significance level was considered P<0.05. Data were measured and compared as Mean ± SEM in the results section.

Findings

Based on the results listed in Table 1, mean serum concentration of obestatin showed significant increase, in the groups receiving 300 and 600 mg/kg of HAEDC, compared to the control group at the level P≤0.05. In comparison of groups receiving different doses of devil’s claw, it was found that the dose 600 mg/kg, compared to the other doses, has more effect on increasing serum levels of obestatin.

The results of measuring the mean of change in body weight also showed that 300 and 600 mg/kg of HAEDC led to significant decrease in body weight compared with the control group (P≤0.05) (Table 1).

<table>
<thead>
<tr>
<th>HAEDC</th>
<th>HAEDC</th>
<th>Sham</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>(600mg/kg)</td>
<td>(300mg/kg)</td>
<td>(150mg/kg)</td>
<td></td>
</tr>
<tr>
<td>45.26±1.04</td>
<td>40.72±1.01</td>
<td>36.72±1.54</td>
<td>33.62±1.15</td>
</tr>
<tr>
<td>23.60±.40</td>
<td>24.80±.37</td>
<td>27.40±.51</td>
<td>27.60±.93</td>
</tr>
<tr>
<td>33.82±.89</td>
<td>28.20±.58</td>
<td>Body Weight Change</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Comparison of changes in serum levels of obestatin and body weight in the experimental groups receiving different doses of HAEDC with the control group.
Discussion and Conclusion

The results showed that oral administration of 300 and 600 mg/kg doses of HAEDC increases serum levels of obestatin and reduces body weight in rats.

In the study conducted by Torres-Fuentes et al. in 2014, inhibiting effects of devil's claw extract on appetite have been reported (18). According to the results of these researchers, anti-orexigenic effects of devil's claw are applied through inhibiting the secretion of growth hormone receptor (GHS-R1a) (18). Ghrelin is considered as the endogenous ligand GHS-R1a (19). Thus, with the inhibition of GHS-R1a, ghrelin is unable to apply its orexigenic (appetizer) effects.

Ghrelin and obestatin are two gastrointestinal peptides derived from preproghrelin. Ghrelin has positive effects on energy balance, stimulating food intake, gastric acid secretion, and gastrointestinal movement, whereas obestatin acts contrary to the effects of ghrelin. In contrast to the effects of ghrelin in appetite stimulation, obestatin acts as anorectic hormone by reducing food intake, gastric ejection activity, body weight, and preventing the contraction of the stomach (19 and 20).

According to the researchers, obestatin regulates performance of ghrelin (21). Evidence shows that obestatin inhibits secretion of ghrelin-induced GH (21). Thus, according to the results of the study by Torres-Fuentes (18) and the present study, it appears that anti-orexigenic effects of devil's claw are associated with increased serum levels of obestatin. Probably, increase in obestatin hormone by devil's claw inhibits secretion of growth hormone by ghrelin and thus reduces appetite and food intake.

Although Harpagoside has been introduced as the main an effective material of devil's claw (13), the study by Torres-Fuentes et al. found that Harpagoside extracted from the roots of devil's claw has no effect on the performance of GHS-R1a receptor and thus anti-orexigenic effects of this plant (18). Thus, given the very close relationship between the ghrelin and obestatin, probably, increasing effects of devil's claw on obestatin in this study is not associated with the main ingredient of this plant that is Harpagoside.

Fibers are of other main components of devil's claw (18). Fibers have anti-obesity effects such as increased satiety, reduced hunger, and reduced food intake. Fibers apply their anti-obesity effects through affecting the digestive system and through various mechanisms such as increased gastric distension, delaying gastric emptying, reducing the digestion and absorption of nutrients, increasing insulin, decreasing fat absorption, and affecting the secreted hormones by the digestive system, such as glucagon-like peptide (GLP-1), peptide YY, and Neurotensin (22 and 23). However, no studies have been conducted on the effect of fibers on other hormones of digestive system such as obestatin and ghrelin or the receptors of these hormones. Therefore, further studies to identify precise mechanism and the detection of the effective ingredients of devil's claw in reducing appetite and body weight seem necessary.

Conclusion

Devil's claw extract leads to weight loss through increasing obestatin secretion and thus restraining the appetite.

References


