The Anti-Nociceptive Effect of Aloe. Vera Aqueous Extract in Fructose-Fed Male Rats

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ABSTRACT

Background & Objective: Aloe Vera extract is used as an anti-inflammatory and anti-bradikinin agent in laboratory animals. The aim of this survey was to evaluate the ant-nociceptive effect of A. Vera aqueous extract in fructose-fed male rats.

Materials & Methods: Forty-five Wistar-Albino male rats were equally and randomly divided into five groups including sham operated and four test groups. Sham operated group consumed tap water and the test groups consumed fructose-enriched water. Test groups 2, 3 and 4 additionally received, 0, 100, 150 and 200 mg/kg of A. Vera extract, respectively, whereas the other test group received distilled water daily. Tail flick reaction time, serum glucose and oral glucose tolerance test (OGTT) were measured. The results were analyzed by SPSS software using ANOVA and Tukey tests. Results were expressed as mean ± SD. Statistical differences were considered significant at $p<0.05$.

Results: The results showed that tail flick reaction time significantly increased in test group 3 which received 200 mg/kg A. Vera extract comparing with that of sham operated group. However, OGTT and serum glucose value were significantly increased in all fructose-fed male rats comparing with those of sham operated group.

Conclusion: These results indicated that A. Vera aqueous extract can affect tail flick reaction time in fructose-fed male rats. Further studies are required to show the exact mechanism of anti-nociceptive effect of A. Vera extract.

Introduction

Herbal medicine has become a major component for human health care because of their few or lack of side effects. Aloe Vera belongs to the Liliaceae family (Chithra, Sajithal, Chandrakasan, 1998), which is used as a traditional treatment for their laxative, anti-inflammatory, immune-stimulatory, anti-septic, wound and burn healing, anti-ulcer and anti-tumor effects (Heggers, Kucukcelebi, Stabenau et al.

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1995; Koo, 1994). Anti-diabetic activity of A. Vera extract has also been reported in the past 20 years (Roman-Ramos, Flores-Saenz, Partida-harnandez et al. 1991; Rajasekaran, Sivagnanam, Ravi, & Sbramanian, 2004.). Administration of A. Vera gel extract can reduced FBS and affect on plasma levels of HDL, cholesterol, LDL, VLDL and oxidative stress (Rajasekaran, Ravi, Sivagnanam, Subramanian, 2006; Saada, Ussama, & Mahdy, 2003). Friedman et al (1999) showed that A. Vera extract administration causes increase in nerves stimulation amplitude and has anti-inflammatory properties (Friedman, Si, 1999) and alters the signaling pathways in patients with diabetes mellitus (Abdullah, Abdullah, Johansson, Bilski, Petry, Redmer, Reynolds, & Grazul-Bilska, 2003). Parihar et al (2004) also showed that memory impairment and motor dysfunction was improved by the plant extracts of A. Vera (Parihar, Chaudhary, Shetty, & Hemnani, 2004). Ethan pharmacological studies have demonstrated that implication of medicinal plants such as A. Vera extract alone or in association with other components has some effects on labor pains (Telefo, Mondipa, Tchouanguep, 2004). Bautista-Perez et al (2004) showed that A. Vera gel can inhibit the bradykinin effects (Bautista-Pérez, Segura-Cobos, Vázquez-Cruz, 2004). On the other hand, previous reports have shown that fructose-enriched diet, developed insulin resistance and dyslipidemia and altered the cell excitability in human and animal models (Bezerra, Veno, Silva, Tavers, Carvalho, CR., Saad, 2001; Anurdha, Hota, Pandhi, 2004). The aim of the present study was to evaluate the effect of A. Vera aqueous extracts on tail flick reaction time in fructose–fed male rats.

Materials & Methods

Fructose, glucose and light ether were purchased from Merck Chemical Company (Germany). Aloe Vera aqueous extract was purchased from Kashan Baridge Essence company (pH= 4.41, specific gravity 1.003, effect substance =0.57% w/v, sterile and the extract was accordance to USP standard). Glucose kit was purchased from Tehran Zist Chime Company (Iran).

The study was performed on 45 adult male Wistar-Albino rats, weighing 160-200 g, which were separately housed in cages (one rat per cage) and had free access to water and food. Animals were maintained in room at 23 ± 2 °C with a fixed 12-h artificial light period. All animals were fed with standard rodent diet. Fructose-induced metabolic syndrome was produced in normoglycemic male rats by 10% (w/v) fructose solution in tap water that was prepared every day. Forty-five rats, after weighing (GOTTL.KERN & SOHN, Japan,), were divided into five groups (n=9 for each) as follows:

a- Sham control group (SC): Rats of this group received standard rodent diet and tap water.

b- Fructose–fed control group (F-f=C): this group received standard rodent diet and tap water supplemented with 10% (w/v) fructose.

c- A. Vera (100 mg/kg) treated fructose–fed rats (F-f+Av 100mg/kg): this group received standard rodent diet and tap water supplemented with 10% (w/v) fructose and A. Vera crude extract at dose of 100 mg/kg in 0.4 ml distilled water per day by gavage.

d- A. Vera (150 mg/kg) treated fructose–fed rats (F-f+Av150mg/kg): this group treated as same as group c, except for the dose of A. Vera extract, 150 mg/kg.

e- A. Vera (200 mg/kg) treated fructose–fed rats (F-f+Av200mg/kg): this group treated as same as groups c and d, except for the dose of A. Vera crude extract, which was 200 mg/kg.

Food and water intake of all the above animal groups were measured daily but body weight were measured two times, before (first weight) and after (final weight) the period of experiment. The experiment was carried out for a month. Tail flick reaction time was measured by tail flick method (UGO BASILE 7360, Italy). The mean of three measurements was calculated for all animals. On 29th day of the treatment duration, animals were given glucose (2 g/kg of body weight, p.o) 60 minutes after administration of A. Vera extract. Blood samples were collected from the tail vein just 45-60 minutes after the glucose administration for measurement of OGTT (oral glucose tolerance test). After 30 days of treatment, the rats were fasted for 14-16 hours (Abdullah, et al., 2003) and the body weights of all rats were consequently measured (final weight). At the end of the treatment period, the animals were sacrificed by cervical decapitation, under light ether (Merck, Germany) anesthesia and blood was collected for serum glucose and OGTT measurements. The SPSS program v.11 was used for the statistical analysis. Analysis of variance was used for comparison of the variables between groups. Using a post hoc multiple comparison tests was used to compare healthy control and diabetic groups and Tukey test to compare diabetic groups. p values less than 0.05 were considered significant.

Results

The effect of oral administration of A. Vera aqueous extract at concentration of 100, 150 and 200 mg/kg on body weight, serum glucose, OGTT, tail flick reaction time, food and water intake in fructose-fed male rats are shown in Tables 1, 2 and 3. The results showed that A. Vera extract at 200 mg/kg dosage, significantly increased the tail flick reaction time in fructose-fed male rats comparing with that of sham operated group, but other dosages did not change this parameter. On the other hands, OGTT increased in all groups which received fructose comparing with that of sham operated group and this dosage of Aloe Vera aqueous extract could not affect this value. The effect of oral administration of fructose in male rats increased the oral glucose tolerance test (OGTT, Table 1). Body weight in none of the fructose-fed male rats was changed (Table 1). Food and water intake significantly decreased in all fructose-fed male rats, but this parameter was not affected due to A. Vera extract consumption.

Groups	Body weight (g)	Glucose (mg/dl)	OGTT (mg/d)
Sham operated	191.33±4.7	98.25±8.89	115±20.18
Fructose –fed (C)	200.88±7.39	114.33±13.97	135±24.9a
F-f+Av 100mg/kg	198.44±5.05	112.55±13.91	175±19.9b
F-f+Av 150mg/kg	187.55±8.29	106±13.91	172.33±16.97c
F-f+Av 200mg/kg	195.33±5.5	116±14.7	155.66±26.85d

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Table 1. Effect of A. Vera extract on body weight, serum glucose and OGTT, in sham operated and test groups (mean ± SD, n=9) . aP<0.02 vs sham operated, b P<0.001 vs sham control, cP< 0.001 vs sham operated, dP<0.03 vs sham operated

Groups	Tail flick reaction time (ms)
Sham operated	6.12±1.25
Fructose –fed (C)	6.85±0.93
F-f+Av 100mg/kg	7.39±1.58
F-f+Av 150mg/kg	7.27 ±1.28
F-f+Av 200mg/kg	9.33 ±2.6[a]

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Table 2. Effect of A. Vera extract on tail flick reaction time in sham operated and test groups (mean ± SD, n=9)

[a]P<0.02 as compared with sham operated

Groups	Food Intake (g)	Water Intake (ml)
Sham operated	21.1 ± 6.95	69.09 ± 19.02
Fructose –fed (C)	13.56 ± 5.88[a]	31.75 ± 7.34
F-f+Av 100mg/kg	16.02 ± 6.6[b]	35.35 ± 7.69
F-f+Av 150mg/kg	12.14 ± 6.18[c]	32.08 ± 8.72
F-f+Av 200mg/kg	15.22 ± 6.94[d]	35.54 ± 7.5

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Table 3. Effect of A. Vera extract on food and water intake in sham operated and test groups (mean ± SD, n=9). aP<0.01, bP<0.02, cP<0.01 and dP<0.04 as compared to sham operated

Discussion

The present study showed that treatment of fructose-fed male rats with A. Vera extract for a period of one month significantly increased blood glucose level. It showed that in serum glucose-loaded animals, food and water intake is significantly reduced but A. Vera could not improve these parameters. The obtained data indicated that insulin resistance was significantly increased in all fructose-fed male rats. The tail flick reaction time was significantly increased in the group which received A. Vera extract at 200 mg/kg dosage. In addition, our data showed that in all fructose-fed male rats, food and water intake was significantly decreased comparing with that of sham operate.

According to our knowledge, nociceptive effects of A. Vera extract in fructose-fed male rats have not been investigated. In a study, Friedman et al in 1999 found that administration of A. Vera extract on excitatory junctional potential (EJPs) at opener muscle of crayfish causes increasing of the nerves stimulation amplitude and has analgesic and anti-inflammatory effects (Friedman, Si, 1999). Our results in Table 1 are in agreement with the above findings. Increasing tail flick reaction time in rats which received 200 mg/kg A. Vera extract, may be due to a combination of the effects of the extract consumption and effects on signal transduction. Our data are in agreement with previous studies, e.g. Bautista-Perez et al, (2004), that showed that A. Vera gel had antibradykinin activity (Bautista-Pérez et al., 2004). Because bradykinin is an important substance in pain production, A. Vera extract may have an inhibitory effect on bradykinin procces and change tail flick reaction time in fructose-fed male rats. As can be observed in Table 3, food and water intake in fructose-fed rats were decreased. Although fructose solution (10%w/v) reduced food intake (probably due to high caloric energy) and water intake (maybe due to sweet taste), supplementation with A. Vera crude extract had no significant effect on food and water consumption. Further studies are required to understand the exact mechanism of A. Vera nociceptive effect.

Conclusion

This study indicated that A. Vera crude extract has nociceptive effect in fructose-fed male rat and can affect the tail flick reaction time; however it can not affect the appetite of fructose-fed male rats.

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