

Effect of Garlic Extract on Locomotor Activity of Male Mice

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Abstract. Fresh garlic extract at doses of 1, 5 and 10 mg/kg body weight was injected subcutaneously into male Swiss-Webster mice. The injections (constant injectable volume 0.1 ml) were given daily for 5 days, and on the last day the mice were subjected to behavioral tests, including numbers of squares crossed, wall rears, rears, washes and squats. All the elements except squats, showed a significant increase in locomotory activities of the treated animals. Further studies on garlic extracts and their isolated active fractions are suggested.

Introduction

Garlic, the fresh bulb of *Allium sativum* L., is a vegetable food item of the family Alliaceae, widely used both in the West and the East. It has traditionally been reported to have expectorant, diaphoretic, disinfectant and diuretic properties [1]. Recently, garlic has been reported to have lipid lowering properties in blood [2, 3]. Recent studies have indicated that garlic is a contact dermal sensitizer due to the presence of active substances like alliin [3] and diallyldisulphide [4].

In animal studies it has been reported that garlic extract could be used as a natural agent for the treatment of hypertension in spontaneously hypertensive rats [5]. However, Ruffin and Hunter [6] claimed that garlic extract, when used as a hypertensive agent, causes various side effects in rats.

From these literature surveys it appears that no work has been carried out on the effect of garlic on animal behavior. The purpose of this study was to investigate the effects of fresh garlic extract on the locomotory behavior of the male mice.

Materials and Methods

Animals

Swiss-Webster albino mice (*Mus musculus*), were used in the present study. Adult male mice of approximately the same age and weight were housed (six per cage) in plastic cages measuring 30 x 12 x 11 cm, in an environmentally controlled room with an ambient temperature of 20-22°C and a 12-hour light/dark cycle. Unless otherwise stated, Pilsbury's mouse food and water were provided *ad libitum*.

Garlic extract

Fresh garlic bulbs were purchased from the local markets in Riyadh. A known weight of peeled garlic (1, 5 and 10 g) was minced finely, squashed and mixed separately with 100 ml normal saline (0.9% NaCl) and electromagnetically stirred at low speed overnight at room temperature. Subsequently, the mixture was filtered under a low vacuum and the filtrate was used in a constant injectable volume (0.1 ml) containing 1, 5 and 10 mg garlic extract per kg mouse body weight. Each dose was injected subcutaneously for five consecutive days. The control animals received saline (0.9%) injections only. On the last day, the animals were subjected to locomotory studies.

Locomotory tests

The animals were placed in experimental wooden arena measuring 80 x 80 x 30 cm and the floor was divided into 64 equal sized squares. Various behavioral "elements" were observed as described by Ajarem [7]. Observations on locomotor activity were based on the "number of squares crossed" by walking or running in the arena and the "number of squats" (sitting on all four paws with very little or no signs of autonomic arousal). For postures, the "number of rears" (the whole body front raised from the ground in the air), the "number of wall-rears" (the whole body front raised from the ground and placed against the arena-wall to support the upper part of the body) and the "number of washes" (licking of the fore-paws and rubbing the over head and ears) were observed. The observations in the arena lasted 300 seconds for each animal.

Statistical analysis

The data were initially subjected to analysis of variance (ANOVA) using the Minitab program. Subsequently, paired comparisons were carried out using Mann-Whitney U-tests [8].

Results

Behavioral data (medians with ranges) for the incidences of acts and postures shown by the three groups of male mice in the locomotory test are given in the Table. The lower dose of garlic (1 mg/kg) is ineffective in bringing a significant change in the observed activities. However, the higher doses of 5 and 10 mg/kg, bring about a significant increase ($P < 0.05$) in all the activities observed in comparison to controls, except the number of squats, which remain unaffected by garlic administration.

Table. Effect of garlic extract on the incidences of acts and postures shown by male mice in locomotory test

Treatment dose	Median (with ranges) number of acts and postures				
	Number of squares crossed	Wall rears	Rears	Wash	Squats
Control	128.1 (109-138)	19.4 (17-26)	4.2 (2-10)	5.3 (3-9)	1.6 (0-3)
1 mg/kg	157.6 (102-169)	22.3 (13.33)	5.8 (3-14)	14 (0-17)	1.8 (0-4)
5 mg/kg	178.3* (161-180)	25.8* (19-32)	8.2* (3-15)	12.6* (6-21)	1.3 (0-3)
10 mg/kg	183.6** (175-186)	31.5* (24-41)	16.3* (5-21)	20.7* (5-29)	1.2 (0-4)

*P<0.05 by Mann-Whitney U Test

**P<0.02 by Mann-Whitney U Test

Number of mice in each treatment groups was ten.

Discussion

The results of the present study indicate significant stimulatory effect of garlic extract on the locomotory activity of the male mice in an open-field arena. Since no study was available on the effect of garlic or its isolated active fractions [3, 4] on biological living systems with respect to their behavioral observations, it is rather difficult to compare the present results with those of any previous studies. However, the behavioral changes detected in these male mice could well be indicators of stimulatory effects incited by garlic extract. The principal use of garlic is as a foodstuff, with a secondary use as a topical treatment [9, pp. 110-115]. Whilst statistically significant behavioral changes have taken place in the present study following subcutaneous injection, this method of entry into the body is highly abnormal for garlic. The pharmacological effects of garlic are primarily of interest in humans. Since garlic is known not to be toxic to humans by oral administration, changes in behavioral studies could be conducted on human volunteers without difficulty by the hospitals and health centers. It would be worth investigating the effect of garlic extract and the sensitive active substances present in garlic [3, 4] in experimental models including humans to understand the interactions between behavioral changes and the usage of garlic as a traditional herb.

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دراسة تأثير مستخلص الثوم على السلوك الحركي لذكور الفئران المخبرية

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ملخص البحث . لقد درس تأثير مستخلص الثوم الطازج على السلوك الحركي لذكور الفئران المخبرية ، وذلك بحقيقتها تحت الجلد يوميا ولمدة خمسة أيام وبتراكيز مختلفة من مستخلص الثوم هي ١ ، ٥ ، ١٠ ملجم/كجم / وزن الجسم، بالإضافة إلى الكنترول. وأختبر سلوكها الحركي (عدد المرات المقطوعة ، عدد مرات الوقوف على الجدار ، عدد مرات الوقوف في الهواء ، عدد مرات التنظيف ، عدد مرات الجثوم) في المنطقة المفتوحة ، وكانت مدة الاختبار خمس دقائق لكل حيوان .

النتائج عموما تشير إلى أن المعالجة بمستخلص الثوم أحدثت زيادة معنوية لعدد المرات المقطوعة ، عدد مرات الوقوف على الجدار ، عدد مرات الوقوف في الهواء ، عدد مرات التنظيف .

تقترح الدراسة إجراء مزيد من التجارب الدقيقة على الثوم وذلك باستخدام المواد الفعالة الموجودة به .