Iranian Journal of Pharmaceutical Sciences
Autumn 2006: 2(4): 209-214
www.ijps.ir

Original Article

Effects of Camphor on Sexual Behaviors in Male Rats

Akram Jamshidzadeh[a,*], Javad Sajedianfard[b], Ali Akbar Nekooeian[c], Fateme Tavakoli[a], Gholam-Hossein Omrani[d]

[a]*Department of Pharmacology and Toxicology, and Pharmaceutical Research Center, Faculty of Pharmacy, Shiraz University of Medical Sciences*
[b]*Department of Physiology, Faculty of Veterinary Medicine, Shiraz University*
[c]*Department of Pharmacology, Faculty of Medicine, Shiraz University of Medical Sciences*
[d]*Endocrine and Metabolism Research Center, Namazi Hospital, Shiraz University of Medical Sciences, Shiraz, Iran*

Abstract

According to Iran's folk medicine, camphor, a crystalline ketone obtained from essential oils of *Cinnamomum camphora*, has both sexual behavior attenuating and enhancing properties. This study examined the effects of camphor on sexual behavior in male rats. Twenty four sexually mature male Sprague-Dawley rats were randomly divided into 4 groups receiving daily i.p. injections of olive oil as vehicle (2.5 ml/kg) or camphor at 2.5, 12.5 or 50 mg/kg for 7 days. Afterwards, mount latency (ML), mount frequency (MF), intromission latency (IL) and intromission frequency (IF) of male rats in the presence of sexually receptive females rats were recorded. There was no significant difference in MF or IF from control and experimental groups. However, at the 50 mg/kg dose, camphor reduced the ML and IL relative to that of control rats. The finding indicates that at this dose, camphor had sexual desire and sexual performance enhancing properties.

Keywords: Camphor; Intromission latency; Mount latency; Sexual behavior.
Received: July 19, 2006; *Accepted:* October 2, 2006

1. Introduction

Camphor is a ketone obtained from *Cinnamomum camphora* L., or produced synthetically. Camphor is derived from the Arabic word of 'Kafur', which means chalk. It has been used for centuries as aphrodisiac, contraceptive, abortificient, cold remedy, antiseptic and suppressor of lactation [1]. Also it has been widely used as a fragrance in cosmetics, flavoring food additive, scenting agent in a variety of household products, active ingredient in some old drugs, and intermediate in the synthesis of perfume chemicals [2]. Recently, investigations have shown that camphor containing compounds have uterotrophic [3], antitussive [4], anticonvulsant [5], nicotinic receptor blocking [6], antiimplantaion [7], antiestrogenic [8] as well as estrogenic [8-11] activities, and reduced serum triglyceride and thyroid

*Corresponding author: Dr. Akram Jamshidzadeh, Department of Pharmacology and Toxicology, Faculty of Pharmacy, Shiraz University of Medical Sciences, Shiraz, 71345-1583, Iran
Tel (+98)711-2424128, Fax (+98)711-2426070
E-Mail: ajamshid@sums.ac.ir

hormone [12].

In Iran's folk medicine, camphor has been used both as an aphrodisiac and antiaphrodisiac. In small doses, camphor is used as an aphrodisiac to excite the reproductive organs, causing considerable heat in the urethra and nocturnal emissions. However, in large doses, it is used as an antiaphrodisiac to diminish urino-genital irritation. Moreover, it has been suggested to decrease libido and sexual performance [13]. The effects of camphor on sexual performance have never been examined using scientific methods. Therefore, the present study was designed to examine the effects of camphor on sexual behaviors in adult male rats.

2. Chemicals and Methods

2.1. Chemicals

Camphor was purchased form Kimya Mavad Chemical Company, estradiol valerate and progesterone from Abooryhan pharmaceutical company, olive oil from Levieh company, ethanol and diethyl ether form May & Baker LTD, Dagenham, England.

2.2. Animals

Adult Sprague-Dawley rats (50-60 day-old) of both sexes were obtained from Razi Institute, Shiraz, Iran, and were housed in a temperature (19-23 °C) and light-controlled (12 h light/12 h dark) condition, with access to rat chaw and tap water *ad libitum*.

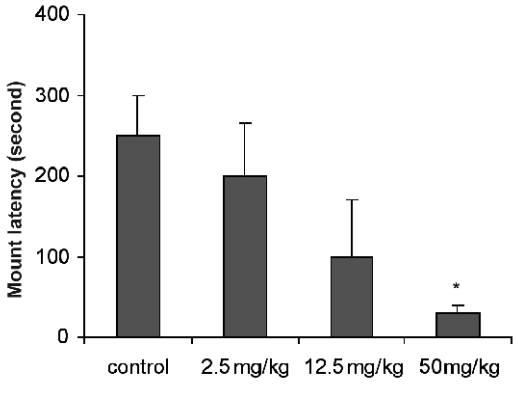

Figure1. Mount latency (mean±SEM) from the olive oil (vehicle) and camphor-treated groups (n=6 each) after receiving daily i.p. injections of olive oil (2.5 ml/kg) or camphor (2.5, 12.5 or 50 mg/kg) for 7 days. * Significantly (p<0.05) difference from olive oil-treated group.

2.3. Experimental design and protocol

Twenty four male rats were equally assigned to a control and three treatment groups. The control group received daily i.p. injections of the vehicle (olive oil; 2.5 ml/kg) for 7 days. Treatment groups received camphor in olive oil at 2.5, 12.5 or 50 mg/kg, respectively. Twenty four female rats were also used to study sexual behavior of male rats. They were brought to sexual receptiveness by intramuscular injections of estradiol valerate (0.1 mg/rat) and progesterone (1 mg/rat) at 72 and 3 h before behavioral recording, respectively [14].

Twenty four h after administration of the last dose of vehicle or camphor, sexual behaviors were studied in an isolated room. Five minutes after the placement of male rats in a Plexiglas container, female rats were introduced. Afterwards, mount latency (ML), mount frequency (MF), intromission latency (IL) and intromission frequency (IF) were recorded for 15 min. to assess sexual behaviors. ML was the latency in seconds from the introduction of a female rat to the first mount by a male; MF was the number of mounts by a male rat without intromission within a series; IL was the latency in seconds from the introduction of a female rat to the first intromission, and IF was the number of intromissions in a series [14].

2.5. Statistical analysis

The data, presented as mean±SEM, were analyzed using one-way analysis of variance (ANOVA). Where a significant difference was detected by ANOVA, the treated groups were compared with the control one using Dunnett test. A probability of committing type one error was set at a p<0.05.

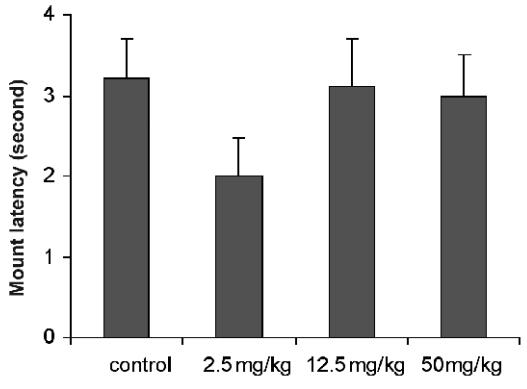

Figure 2. Mount frequency (mean±SEM) from the olive oil (vehicle) and camphor-treated groups (n=6 each) after receiving daily intraperitoneal injections of olive oil (2.5 ml/kg) or camphor (2.5, 12.5 or 50 mg/kg) for 7 days.

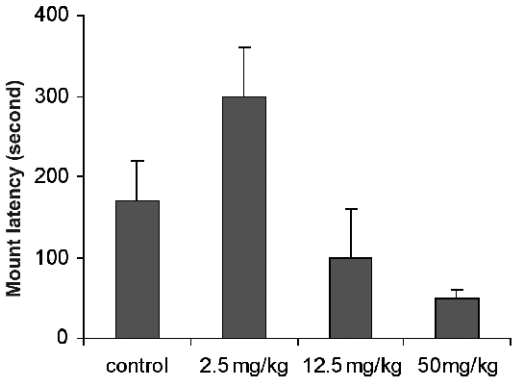

Figure 3. Intromission latency (mean±SEM) from the olive oil (vehicle) and camphor-treated groups (n=6 each) after receiving daily intraperitoneal injections of olive oil (2.5 ml/kg) or camphor (2.5, 12.5 or 50 mg/kg) for 7 days.

3. Results

There was no significant difference in MF or IF from rats treated with olive oil and those treated with camphor at doses of 2.5, 12.5 or 50 mg/kg (Figures 2 and 4). However, the ML and IL of groups received camphor at 50 mg/kg were significantly different from those of the control group (Figures 1 and 3).

4. Discussion and conclusion

Camphor is sometimes mixed into the Betel quid for its stimulating and aphrodisiac properties. However, whether camphor acts as an aphrodisiac or antanaphrodisiac seems to be a matter of dosage. Islamic sects and certain Buddhist groups use the incense to 'cool off' any Venusian drives, while Tantric sects value it for its stimulating effect. Medicinally, camphor has a long established history, not just in the Far East, but also in Europe. In Ayurvedic medicine, it is used to increase prana, open the senses and to clear the mind. It is said to cool the nerves in cases of hysteria [15].

One of the methods for assessing male reproductive capacity in human is the evaluation of reproductive history and behavior parameters including sexual desire, motivation, performance and satisfaction [16]. In the rat model of sexual behavior ML, MF and IL can be considered as measures of sexual desire and motivation and IF and IL as measures of performance [17].

The findings of the present study showed that there were no significant differences in MF and IF from the control and camphor-treated groups. However, there were significant decreases in ML and IL in rats received camphor at a dose of 50 mg/kg compared to that of the control group. The reduction of ML indicates that camphor enhanced sexual desire and motivation, and the reduction of IL is suggestive of enhanced sexual performance.

The enhancement of sexual desire by camphor might be mediated through the increase of the synthesis of testosterone in male rats. The peak of plasma testosterone levels in the rat occurs around 50-60 days of age [18]. Therefore, rats with such an age range were employed in the present study. There is a large body of animal data documenting hormonal regulation of male sexual behavior and the neural site of action of these hormones [16]. Libido and male behavior are probably mediated by testosterone receptors in the CNS [19]. It would be interesting to examine the effects of camphor on serum levels of testosterone, and to study as to whether or not it is correlated with the sexual performance.

The effects of camphor on sexual performance might also be mediated via its effects on sympathetic nervous system, since

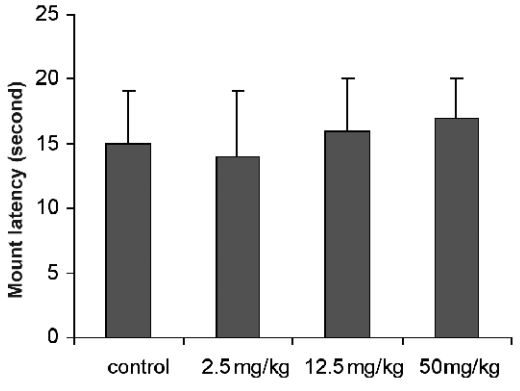

Figure 4. Intromission frequency (mean±SEM) from the olive oil (vehicle) and camphor-treated groups (n=6 each) after receiving daily intraperitoneal injections of olive oil (2.5 ml/kg) or camphor (2.5, 12.5 or 50 mg/kg) for 7 days.

an earlier report showed that camphor specifically inhibited catecholamine secretion by blocking nicotinic acetylcholine receptors [6]. Libido is under psychosomatic, neurogenic, vascular and hormonal (primarily testosterone) controls [19]. Considerable recent evidence indicates that drugs which alter brain monoamine levels also affect copulatory behavior in male rats. Moreover, it is believed that copulatory behavior may be regulated in part by a balance between serotonergic and noradrenergic tone [14]. The role of sympathetic and parasympathetic systems in male sexual behavior as well as the ability of camphor to inhibit catecholamine secretion might suggest that the effects of camphor on sexual behavior might be mediated through modulation of sympathetic nervous system.

In conclusion, the findings of the present study indicate that camphor at the highest dose used did enhance the sexual desire and performance, which might be due to its effects on serum testosterone levels or modulations of sympathetic nervous system. Further studies, however, are needed to elucidate the mechanisms camphor-induced enhancement sexual desire and performance.

Acknowledgments

This research was financially supported by Grant no. 2442 from Endocrine and Metabolism research Center. Namazi Hospital, Shiraz, Iran.

References:

[1] Rabl W, Katzgraber F, Steinlechner M. Camphor ingestion for abortion (a case report). *Forensic Sc Int* 1997, 89: 137-40.

[2] Leikin JB, Paloucek F. *Poisoning and toxicology hand book*. 3rd edition, Lexi-Comp, INC Hudson, Ahio; 2002, pp. 316-7.

[3] Tinwell H, Lefevre PA, Moffat GJ, Burns A, Odum J, Spurway TD, Orphanides G, Ashby J. Confirmation of uterotrophic activity of 9-(4-methylbenzylidine) camphor in the immature rat. *Environ Health Prospect* 2002; 110: 533-6.

[4] Laude EA, Morice AH, Grattan TJ. The antitussive effects of menthol, camphor and cineole in conscious guinea pig. *Pulmon Pharmacol* 1994; 7: 179-84.

[5] Chatterjie N, Alexander GJ. Anticonvulsant properties of spirohydantoins derived from optical isomers of camphor. *Neurochem Res* 1986; 11:1669-76.

[6] Park TJ, Seo HK, Kang BJ, Kim KT. Noncompetitive inhibition by camphor of nicotinic acetylcholine receptors. *Biochem Pharmacol* 2000; 61: 787-93.

[7] Ho DD, Lau CP, NG KH, Kong YC, Cheng KF, Chan KP. Antiimplantation activity of S(-) and (+) camphor-yuehchukene in rats. *Eur J Pharmacol* 1991; 205: 209-12.

[8] Ng PC, Ho DD, Ng KH, Kong YC, Cheng KF, Stone G. Mixed estrogenic and antiestrogenic activities of yuehchukene a bis-indole alkaloid. *Eur J Pharmacol* 1994; 264: 1-2.

[9] Mueller SO, Kling M, Arifin Firzani P, Mecky A, Duranti E, Shields-Botella J, Delansorne R, Broschard T, Kramer PJ. Activation of estrogen receptor alpha and Erbeta by 4-methylbenzylidene-camphor in human and rat cells: comparison with phyto- and xenoestrogens. *Toxicol Lett* 2003; 142: 89-101.

[10] Holbech H, Norum U, Korsgaard B, Poul B. The chemical UV filter 3- benzylidene camphor causes an estrogenic effect in an in vivo assay. *Pharmacol Toxicol* 2002; 91: 204-8.

[11] Schlumpf M, Cotton B, Conscience M, Haller V, Steinmann B, Litchtensteiger W. *In vitro* and *in vivo* estrogenicity of UV screens. *Environ Health Prospect* 2001; 109: 239-44.

[12] Seidlova-Wuttke D, Christoffel J, Rimold G, Jarry H, Wuttke W. Comparison of effects of estradiol with those of octymethoxycinnamte and 4-methyl-benzylidene camphor on fat tissue, lipids and

pituitary hormones. *Toxicol Appl Pharmacol* 2005; 214: 1-7.
[13] Mirhaydar H. Medicinal plant facts, applications in prevention and treatment of diseases. Volume 5, Tehran: Islamic Culture Press, 1992; pp. 85-9 (in Persian).
[14] Dewsbury DA. Effects of tetrabenazine on the copulatory behavior of male rats. *Eur J Pharmacol* 1972, 17: 221-6.
[15] Avicenna, 1024. *Al Qanun Fil Tibb*, Vol. 2. English translation. S Waris Nawab, New Delhi: Senior Press Superintendent, Jamia Hamdard Printing Press, 1998.
[16] Robbins A. Androgens and male sexual behavior from mice to men. TEM 1996, 7: 345-50.
[17] Eckstein P, Zukerman S. *Marshall's physiology of reproduction.* In: Parker AS., 1960, Vol. 1, pp. 127-9.
[18] Padoin MJ, Lucion AB. The effect of testosterone and DOI (1-(2, 5-dimethoxy-4-iodophenyl)-2-aminopropane) on male sexual behavior of rats. *Eur J Pharmacol* 1995; 277: 1-6.
[19] Waller DP, Kilinger JM, Zaneveld LJD. Physiology and toxicology of the male reproductive tract, In: Thomas JA, Korach KS, Mclachlan JA (editors). *Endocrime toxicology*, New York: Raven Press. 1985.