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Pheromonal Influences on Sociosexual Behavior in Men

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This study tested whether synthesized human male pheromones increase the sociosexual behavior of men. Thirty-eight heterosexual men, ages 26–42, completed a 2-week baseline period and 6-week placebo-controlled, double-blind trial testing a pheromone "designed to improve the romance in their lives." Each subject kept daily behavioral records for 6 sociosexual behaviors: petting/affection/kissing, formal dates, informal dates, sleeping next to a romantic partner, sexual intercourse, *and* self-stimulation to ejaculation *(masturbation) and FAXed them each week. Significantly more pheromone than placebo users increased above baseline in* sexual intercourse *and* sleeping with a romantic partner. *There was a tendency for more pheromone than placebo users to increase above baseline in* petting/affection/kissing, *and* informal dates, *but not in* self-stimulation to ejaculation *or in* formal dates. *A significantly larger proportion of pheromone than placebo users increased in* ≥ 2 *and* ≥ 3 *of the 5 sociosexual behaviors involving a female partner. Thus, there was a significant increase in male sociosexual behaviors in which a woman's sexual interest and cooperation plays a role but not in male masturbation which involves only the man. These initial data need replication but suggest that human male pheromones affected the sexual attractiveness of men to women.*

KEY WORDS: human pheromone; men; sexual attractiveness; sexual behavior; social behavior.

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INTRODUCTION

The term "pheromone" was introduced to the scientific literature in 1959 by Karlson and Luscher who defined it as: "a substance secreted by an animal to the outside of that individual, which is then received by another individual, classically of the same species, which then elicits some behavioral or developmental response in the latter." According to most biologic views, perception is not necessary. Rather, a change in behavior is sufficient evidence that pheromones exist even in the absence of awareness of behavioral change.

By 1986, pheromonal excretion from glands at the anus, urinary outlet, breasts, mouth, and axillae in a variety of species was well established (Cohn, 1994; Filsinger *et al.*, 1984; Gower, 1972; Gower *et al.*, 1985; Russell, 1976). Furthermore, experiments demonstrated changes in species-specific reproductive or social behavior as well as the female reproductive cycle in response to both naturally occurring and artificially applied pheromones (Bartoshuk and Beauchamp, 1994; Cowley and Brooksbank, 1991; Gustavson *et al.*, 1987; Singer, 1991). The manufacture of chemical duplicates led to efficient methods of artificial insemination in swine, diversion of destructive pests from vegetation, and most recently, to sex attractants in cosmetics (Singer, 1991; Gower and Ruparelia, 1993; Knowlton, 1994).

A discrete, and highly specialized anatomic locus for the reception of pheromonal stimuli is well established in nonhuman mammals within the vomeronasal organ (VNO), a specialized olfactory structure (Meredith, 1991; Wysocki and Lepri, 1991). The VNO is essential for the full and rich panoply of normal reproductive function in some cases as evidenced by both stimulation and ablation experiments (Wysocki and Lepri, 1991). Recently the VNO was clearly identified as present in normal human anatomy (Garcia-Velasco and Mondragon, 1991). Putative pheromones puffed into the nose were shown to cause a slow electrical potential from the region of the VNO (Monti-Bloch and Grosser, 1991). However, no studies have reported on behavior change in response to stimulation of the human VNO receptors.

In her landmark study, McClintock (1971) demonstrated menstrual synchrony among women living together and hypothesized that such synchrony was due to pheromones. She suggested that women in close contact with each other transmitted a pheromone that affected menstrual onset timing.

Between 1979 and 1989, a series of related publications by Cutler and her colleagues demonstrated that a woman's sexual exposure to a man at least once per week—but not masturbation—was associated with an increased frequency of regular 29.5 $\pm$ 3 day menstrual cycles (Cutler *et al.*,

1979a, 1983, 1985), an increased incidence of fertile-type basal body temperature (BBT) graphs (Cutler *et al.*, 1985), and double the estrogen level in the luteal phase (Cutler *et al.*, 1983; Cutler, Garcia, *et al.*, 1986; McCoy *et al.*, 1985). Studies that analyzed details of sporadic and celibate patterns of behavior revealed that when sexual activity occurred sporadically, increases in total frequency were associated with an increased incidence of subfertile cycles (Cutler *et al.*, 1979b, 1980). These studies found a relationship between sexual activity and menstrual cycle parameters (length, estrogen level, fertile-type BBT graph) but provided no definitive evidence concerning the reason for this association.

In 1983, Veith *et al.* showed that women who "slept with" a man two or more times during a 40-day study period had a significantly higher incidence of ovulation than those who had slept with a man less often. In 1991, Burleson *et al.* defined sexual behavior according to the *weekly, sporadic,* and *celibate* criteria described by Cutler *et al.* (1979a) and replicated their findings concerning menstrual cycle length. They reported that weekly active women had significantly less variable cycle lengths than did women with either celibate or sporadic patterns, and that mean cycle lengths were not different among the three behavioral groups, just the variation about the mean, i.e., their aberrance. They also replicated Cutler *et al.*'s findings of a lack of association between masturbation frequency and cycle length. In a later report, Burleson *et al.* (1995) attempted to test sexual behavior frequency patterns using a 7-day moving average without first dichotomizing behavior into weekly and < weekly. They then reported that higher average counts of sexual behavior per week were associated with less fertile-type cycle lengths. Because women with higher "average weekly counts" may be sporadically active, Burleson *et al.*'s failure either to cite their own 1991 replication of Cutler *et al.* or to include an analysis and explanation to account for the seemingly paradoxical effect of increased sexual behavior associating with increased infertility, leaves the reader unable to interpret the meaning of their 1995 paper.

The search for the source of both the menstrual synchrony effects as well as men's putative influences on women's cycle lengths led to the demonstration in double-blind placebo-controlled trials that pheromones appear to exist in humans (Cutler *et al.*, 1986; Preti *et al.*, 1986, 1987). Further studies of women suggested that application of female pheromones to the skin under the nose, 3 times per week, increased the frequency of their sexual behavior (Cutler, 1987; Cutler and Stine, 1988).

Although studies of menstrual cycle length and incidence of weekly coitus suggest that both men's and women's pheromones may affect the reproductive functioning of women, studies examining the effect of male pheromones on the sexual behavior of women have not been reported pre-

viously. This double-blind placebo-controlled study, begun in September 1994, tested the effect of human male pheromones on the sociosexual behaviors of men and by implication, the sexual responses of the women they encountered, as well as the men's perception of these effects.

MATERIALS AND METHODS

Subject Recruitment

From local press releases and news announcements, men responded to an opportunity to participate in an experiment that was described as testing whether a male pheromone added to their aftershave lotion would "increase the romance in their lives." Participants were required to be male, heterosexual, between the ages of 25 and 42, in self-reported good health, neither unusually handsome nor unattractive, have a clean-shaven appearance, shave regularly, and have adequate social skills vis-à-vis women.

The men were screened for adequate social skills based upon the Eyesenck Personality Inventory (EPI-Q). Any man whose score was more than 2 standard deviations above the Eyesenck's Manual standardized neuroticism, extraversion, and psychoticism statistic was disqualified. Men also signed the following statement that was included in the application materials: "I further affirm that my basic social skills are already adequate to allow me to enjoy the company of a romantic partner and to treat her in a mannerly way."

The men completed an extensive history, an application form acknowledging willingness to fulfill the terms of the study, and a medical history form that detailed sickness, diseases, family history, and sexual history. Concurrent use of recreational or prescribed drugs or serious disease were further criteria for disqualification. Each man's signature attesting to the accuracy of his data was accepted, and no further attempt at verification was made.

As an inducement to complete the study, the men were informed that their treatment condition would be revealed at the end of the study, and at that time, all placebo subjects would receive a vial of the pheromone.

A questionnaire completed at the end of the study asked whether the man had followed the protocol, prospectively recording data, or had waited

to fill in the daily records when it was time to FAX. Any man indicating that he backfilled was disqualified.

Sample

Of 53 respondents, 48 arrived for an intake interview and 1 of these was eliminated based on EPI-Q score. Thirty-eight men completed the trial: 17 pheromone; 21 placebo. Of the 9 subjects lost, 3 did not complete the baseline period, 1 lost his job, 1 moved away, 2 quit without explanation, and 2 others were disqualified for failing to follow the protocol. Although no restrictions were provided for race, all but one initial applicant and all 38 who completed the study were White.

Average age of the men was 33.5 years (SD = 5.0). The initial status of their relationships was either *not dating but would like to be* (ND), *dating* (D), *keeping steady company* (KC), or *married* (M). Table I shows the number of men in each of these four categories as well as their mean age, height, and weight by group assignment (pheromone, placebo). A 2 (Group) × 4 (Relationship Status) chi-square analysis revealed no significant difference between the two groups in relationship status, $\chi^2(3, N = 38) = 4.82, p = 0.19$. Analyses also revealed no significant differences between the two groups for age, $t(36) < 1$, height, $t(36) = 1.4, p = 0.16$, and weight, $t(25.17) < 1$. The degrees of freedom for the analysis of group differences in weight were adjusted because of unequal variances revealed by Levene's Test for Equality of Variances.

Table I. Initial Age, Height, Weight, and Relationship Status for Subjects by Treatment Group

	Pheromone (n = 17)		Placebo (n = 21)	
	$\bar{x}$	SD	$\bar{x}$	SD
Age (years)	33.1	4.9	33.8	5.2
Height (inches)	69.6	2.5	71.7	2.7
Weight (pounds)	189.7	32.4	187.0	19.7
Relationship status	*n*	%	*n*	%
Not dating but would like to be (ND)	7	41.2	9	42.8
Dating (D)	2	11.8	8	38.1
Keeping steady company (KC)	2	11.8	1	4.8
Married (M)	6	35.3	3	14.3

Procedure

The men attended an initial intake interview to complete screening, sign informed consent forms previously approved by the Athena Institute's Human Studies Committee, adopt a code identity, and review the study protocol. Each man brought his aftershave lotion with him, and the technician examined it to make sure it was a nonspray, alcohol-based product. The name of the aftershave was recorded, and each subject was instructed to use it after each shave and at least three times per week.

Subjects were given printed behavioral calendars for FAXing. The six behaviors to be recorded daily and FAXed weekly to the senior author's office, for the next 8 weeks, were *petting/affection/kissing, formal dates* (prearranged), *informal dates* (not arranged before that day), *sleeping next to a romantic partner, sexual intercourse,* and *self-stimulation to ejaculation* (masturbation). The men were also requested to report weekly whether they had noticed any change in their experiences with women. Data were gathered from men only; this study did not gather data from the women who interacted with our subjects.

At the end of the baseline period lasting 2 weeks, each man returned with his aftershave lotion and selected a coded 5-ml vial containing either ethanol or pheromone with ethanol. The technician poured the vial's contents into 2 ounces of the subject's aftershave. Vials were identical in appearance and neither the technician nor the subject knew whether the selected vial contained pheromone or placebo. The code from the selected vial was recorded on the subject's behavioral calendars for FAXing.

Pheromones

The pheromone formulation was a synthetic version of a pheromone naturally secreted by men and described in earlier work (Preti *et al.*, 1987). The development of the pheromone involved refining a proprietary formula, characteristic of heterosexual men in their sexually most active years. The identity of these substances will be disclosed when the patent process is completed.

Statistical Evaluation

The occurrences of each of the six sociosexual behaviors and men's perception of a change in their experience with women was evaluated. SPSS for Windows (SPSS, 1993) was utilized for all data analyses, as detailed below.

Behavior

For each man the total number of days on which a measured event occurred was scored for each of the six behaviors for each week of the 2-week baseline and the 6-week trial period. A subject was characterized as showing an increase over baseline when (i) his average weekly score for the experimental period exceeded his average weekly score for the baseline weeks and (ii) his highest weekly baseline score was exceeded at least once during the experimental period, if his baseline score was not already at maximum. For each behavior, as appropriate to the sample size, a chi-square or Fisher exact probability test was used to test for differences between the two groups in the number of subjects showing an increase over baseline.

Perceptions

Each week men were asked to report whether they had noticed any change in their "experiences with women." The number of individuals perceiving positive changes during any of the experimental weeks was counted. A Z test was used to compare those using placebo with those using pheromone; the test examined the proportions of men who perceived positive change in sexual behavior as a function of which additive (pheromone or placebo) they used.

RESULTS

Aftershave Usage

During the 6 experimental weeks, daily calendars showed an average use of the aftershave of 5.82 ($\pm$0.98) times per week for pheromone users and 5.29 ($\pm$1.24) times per week for placebo users. Usage did not differ significantly between the two groups, $t(36) = 1.49$, $p = 0.15$.

Sociosexual Behavior

The reported weekly behaviors are presented in Table II. Data that fulfilled the definition of increase above baseline are underlined. Contingency tables (2×2) were used to assess the significance of the difference between the two groups in the number of men who increased over baseline for each of the six sociosexual behavior categories. With the exception of

Table II. Weekly Number of Days of Occurrence of Each of Six Sociosexual Behaviors for Each Subject for the Two Baseline and Six Experimental Weeks[a]

Condition	Initial relationship status	Sexual intercourse	Sleeping next to a romantic partner	Petting affection kissing	Informal dates	Formal dates	Self-stimulation to ejaculation
Pheromone							
Subject							
S10	ND	00000001	00012001	23453345	22210221	01003001	21223232
S16	ND	00000010	00000010	10100111	00100010	10000101	00000000
S21	ND	00000000	00001000	01021010	00010110	01011000	77565473
S45	ND	01111231	30121221	00122221	43001001	00120010	25333303
S46	ND	00000000	00000000	00000001	00100111	00001001	00000000
S47	ND	00000001	00000001	00001011	00010001	00001011	00000000
S34	ND	00000001	00000000	00000000	00000000	00001000	11111110
S14	D	00000000	00000000	00000000	00000000	00000000	77773777
S36	D	00000000	10000000	10000000	00000000	10000000	10010000
S39	KC	42445445	66445445	66045445	00001002	66544443	10231221
S08	KC	00000000	00000000	33213312	10112011	23301322	00000000
S06	M	22223232	71767777	75777777	33000000	00002000	11211116
S09	M	00011000	77576774	00011000	00000000	00000000	01000031
S42	M	32233202	57655243	64475223	11021000	00010031	00000000
S02	M	31111122	75774777	11111101	00000000	00000000	12101111
S07	M	21120221	76777774	76777774	00000000	00000000	00000000
S51	M	00000000	67263476	12000000	00000000	00000000	34035434
Placebo							
Subject							
S33	ND	00000000	00000000	00000111	00001101	00000010	45545444
S48	ND	00010110	01100112	04242522	11020110	12113323	21202100
S03	ND	00000000	00000000	00000000	00000000	00100000	22123222
S17	ND	01010000	00000000	01010010	01010000	00000010	00000000
S24	ND	00000000	00000000	00000000	00000000	11000110	00000000
S25	ND	00000000	00000000	00000000	00000000	00000000	00000000
S29	ND	00000000	00000000	00000000	00000000	00000001	76646357
S30	ND	01000000	00000000	01200000	00000100	01000010	00000000
S35	ND	00000000	00000000	00000000	00000000	00000000	00000000
S18	D	22423434	25433535	06323534	12100001	10000503	00001100
S41	D	00000000	00000000	00002300	00000000	11123301	00000000
S05	D	00000000	00000000	20000000	01111110	32120222	32231222
S13	D	11011000	00001000	23222241	20020121	33213120	76677474
S20	D	22001102	34222343	54223303	22000000	32302030	00000000
S23	D	04200000	04000000	04000000	00000000	00000000	11030111
S32	D	10100100	10000000	21211300	00000000	32421310	10000000
S38	D	20212210	20101110	41423221	20222221	21202110	00000000
S15	KC	00000000	00000000	41411140	00000000	00000000	21331221
S11	M	24114410	77777777	77777777	00000000	00000000	10221222
S27	M	12101011	77777777	13202202	00000000	00000000	77507777
S40	M	01010101	77777575	11010101	00000000	00000000	00000000

[a]Cells that are underlined show an increase over baseline.

Table III. Number of Subjects with an Increase Over Baseline for Each of Six Sociosexual Behaviors by Treatment Group

	Treatment				
	Pheromone (n = 17)		Placebo (n = 21)		
Sociosexual behavior	n	%	n	%	p
Sexual intercourse	8	47.0	2	9.5	.01
Sleeping next to a romantic partner	6	35.3	1	4.8	.02
Petting/affection/kissing	7	41.2	3	14.3	.07
Informal dates	6	35.3	2	9.5	.06
Formal dates	7	41.2	7	33.3	.62[a]
Self-stimulation to ejaculation	4	23.5	2	9.5	.23

[a] $\chi^2(1, N = 38) = 0.25$.

the analysis of *formal dates,* all probability levels are from Fisher exact probability tests. For each behavior, the number of subjects in the pheromone and placebo groups who increased over baseline and the Fisher exact probability levels are presented in Table III.

A significantly higher proportion of pheromone users than placebo users showed an increase over baseline for *sexual intercourse* and *sleeping next to a romantic partner.* There was a tendency for a greater number of pheromone users to increase above baseline in *petting/affection/kissing* and *informal dates.* The proportions of pheromone and placebo users showing an increase over baseline in *self-stimulation to ejaculation* and *formal dates* did not differ significantly.

The number of participants showing increases above baseline in more than one of the five sociosexual behaviors involving a female partner revealed that increases above baseline in two behaviors or more were significantly more frequent for those in the pheromone (n = 10/17, 58%) than those in the placebo (n = 4/21, 19%) group, $\chi^2(1, N = 38) = 6.4$, $p < 0.02$. In addition, significantly more men in the pheromone (n = 7/17, 41%) than in the placebo (n = 2/21, 9.5%) group showed an increase above baseline in three or more behaviors (Fisher exact test, $p = 0.03$).

Perceptions

A statistically significant and substantially higher proportion of pheromone users perceived positive results during the experimental 6-week pe-

riod than did the placebo users (pheromone users 47% vs. placebo users 24%; $Z = 5.05$, $p < 0.001$).

DISCUSSION

In this prospective double-blind, placebo-controlled study of six discrete sociosexual behaviors, human male pheromones caused a statistically significant and distinct increase in the two most intimate behaviors: sexual intercourse and sleeping with a woman. These are sociosexual behaviors in which the willingness of a female partner plays a major role. There was a tendency for pheromones to increase the next most intimate behaviors of petting/affection/kissing and informal dates. Human male pheromones did not cause an increase in those behaviors in which a woman does not play a major role. Neither, masturbation, which may reflect a simple increase of libido, nor formal dating, which requires advanced planning and assertion, were increased by the pheromone.

The perception of effects, while significantly higher in pheromone users than in placebo users, was not as substantial as the actual increase over baseline of the prospectively recorded, sociosexual behaviors. Men, it seems, did not always accurately perceive the romance in their lives.

It is particularly noteworthy that the masturbation rate did not increase in men who used the pheromone compared with men who used placebo, while the number of days of sleeping with a partner and of sexual intercourse did. If replicated in larger and more diverse samples, these results would suggest that pheromones in humans have effects that are not fundamentally different from those in other animals and insects; the underlying physiologic mechanisms are probably similar given that pheromones appear to have mediated sexual attraction between our subjects and their partners. A good candidate for the potential site of neuronal reception would be the VNO (Gower and Ruparelia, 1993; Takami *et al.*, 1993).

The thesaurus defines "attraction" as the "quality that elicits admiration or pleased responsiveness or a relationship of people . . . that are drawn together and exert influence on each other." "Sexual" attraction would refer to this quality in the sexual sphere. Although we have gathered data only from heterosexual men, we deduce that male sexual attractiveness must have increased because the male pheromone users increased their rate of intimate behaviors with women while the rate of masturbation and formal dating did not differ significantly from that of placebo users.

The more subtle issues that could influence the potential response to pheromones should be addressed in future studies. For example, the role of an established relationship in the response to pheromones is of consid-

erable interest. The presence of a partner (dating or married) may make it easier to see results due to the availability of a partner. On the other hand, if the relationship is a troubled one, an ongoing relationship may make it more difficult to see positive effects of pheromones. Thus, both the existence of an established relationship and the length and quality of that relationship are important variables for future research studying the effects of men's pheromones on sociosexual behavior.

Initial relationship status was not held constant in this study and varied from "not dating but would like to be" to "married." However, we suspect that the status "not dating but would like to be" probably represents the group most unlikely to be subject to competing relationship influences that might obscure evidence of increased sexual attraction due to pheromones. Forty-one percent (n = 7) of the men who used pheromone and 43% (n = 9) of the men who used placebo had this status. All 7 of the "not dating" men (100%) who used the pheromone showed increases above baseline for at least two of the five sociosexual behaviors involving a female partner; 6 of the 7 (86%) increased in three or more such categories. In comparison, only 2 (22%) of the 9 "not dating" subjects in the placebo condition showed increases over baseline in two or in three or more of these sociosexual behaviors. Thus, the strongest support for the effects of male pheromones occurred in men who, it can be argued, were potentially most likely to reveal it.

Although both pheromone and placebo users had reason to have the same expectations, significantly more pheromone than placebo users showed an increase over baseline in the two most intimate behaviors requiring the willingness and participation of a female partner—but not those in which the partner played a minor role. Thus, it is suggested that human male pheromones, as applied here, increased the sexual attractiveness of men to women in our study.

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