MULTIFUNCTIONALITY OF PHEROMONES

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Abstract: Pheromones are low molecular weight chemical substances that are produced by a plant or animal and cause a response in another individual of same or another species. Pheromones can be of many different chemical types, to serve different functions even for survival of the individual. Pheromones are sending out subconscious scent signals to male or female that naturally trigger attraction, arousal and readiness for sex for propagation of specie. This is perhaps the most vital factor in attraction. These pheromones are detected through the nose and it in turn immediately sends signals to the brain, making the individual subconsciously attracted to opposite sex.

Key words: Pheromones

INTRODUCTION

Pheromones are low molecular weight volatile substances that are released by an individual into the environment, which affect the physiology or behavior of other members of the same species. The actions of pheromones are well defined. Insects and other animal species including human produce wide spectrum of effects due to pheromone release. For example, pheromones influence mating preference in hamsters, dominance relationships among male elephants, timing of weaning in rats and learning to distinguish edible foods from poisons in rat pups and the level of stress experienced by a mouse in a new environment [1]. For the most part, pheromones are used to stimulate sexual interest in the opposite sex mate. These claims generally are greatly exaggerated for commercial purposes and have not been demonstrated scientifically [see website 1].

The first pheromone ever identified (in 1956) was a powerful sex attractant for silkworm moths. The minutest amount of it made male moths beat their wings madly in a “flutter dance” which is named as “bombykol” “It has been soberly calculated that if a single female moth were to release all the bombykol in her sac in a single spray, all at once, she could theoretically attract a trillion males in the instant,” wrote Lewis Thomas in The Lives of a Cell [see website 3].

Scientists researching pheromones say that mammals think through their noses. Virtually all organisms, from yeast to insects to humans, produce volatile smelly pheromones that act as sexual magnets and send other messages such as dominance or fear. Most studied pheromones are volatile smells but others are transferred by direct skin-to-skin contact. Pheromones are primarily present in the skin and the glands of skin, in saliva, urine, and vaginal fluids [3].
**PHEROMONES IN PLANTS**

The truffles prized by French gourmets as aphrodisiacs are a fungi that has an odor nearly identical to androstenol, a chemical component of male sweat, a sex attractant for pigs and very similar to chemicals that act as sex attractants in humans [see website 3].

Plants produce aromatic volatile compounds for defense and reproduction. Plants use chemicals to attract bees and other pollinators to their flowers. Some plant pheromones have similar chemistry to animal pheromones. Plant pheromones such as, muskmelons, musk hyacinths, musk cherries, musk thistle, musk rose, musk plums and musk wood are similar to musk deer, musk ducks, musky moles, muskrats, musk ox and musk beetles. But similar pheromones exist in perfumes arose from plant oils with smells similar to animal pheromones. Plant oils with the strongest similarity to human sexual pheromones come from jasmine, ylang ylang and patchouli. Traditional plant pheromones all have soothing properties, encourage calmness, and are used for meditation and religious ceremonies. Unlike animal pheromones, plant pheromones do not attract individuals of same species. No explanation is given so far.

**ECONOMIC IMPORTANCE OF INSECT PHEROMONES**

In addition to attracting a mate for reproductive purposes, pheromones are also used by insects for purposes of finding food. Ants leave pheromone trails behind them to show others a source of food. Queen bees emit pheromones that ensure her dominance over a hive by repressing the development of all worker bee ovaries and persuading them to work for her alone to produce more honey. Insects use pheromones as a silent alarm system, altering others to danger [see website 6].

In a scientific breakthrough, now it was shown that insect pheromones to be a reliable and eco-friendly source of pest management. Farmers and gardeners have discovered that certain insect pheromones are more effective and less destructive than insecticides at controlling common pests. Pheromones used on tomato plants in Mexico suppress the mating of pinworms to 4 percent in treated fields versus 50 percent in non-treated fields. Cabbage loopier moths ignore female pheromones if they are present in overwhelming quantities. In addition to disrupting the mating pattern of pests, pheromones also are used as bait to catch large insect populations, spread disease in targeted insects and determine the timing and necessity of insecticide spraying and tracking pest population and development. Unlike insecticides, pheromones have no damaging effects to human or beneficial insect populations [see website 4&5].

**PHEROMONES IN MAMMALS**

In mice, certain pheromones cause male mice to kill other male mice. The attacks depend largely on odor cues (male odors increase attacks, female cues decrease attack). In many mammals such as lions and bears, males will kill the offspring of a female so that they may mate with the female. Sex hormones stimulate production of urinary pheromones that increase the intensity of fighting in rodents. But the urine of castrated rats lacks the aggression-provoking pheromone. Conversely, the urine of female rats contains an aggression-inhibiting pheromone.

A pheromone in pigs triggers both sexual attraction and aggression in boars. The key pheromone in pigs is androstenone, which gives the characteristic odor to urine from boars (male pig) and some of the odor to human male urine also. Female pigs are extremely aware of the smell of androstenone as are human females to male smells. Pig breeders spray androstenone from aerosol cans on the backs of female pigs to determine whether the female is ready for breeding - if the sow arches her back, she is sexually receptive [see website 3].

**TYPES OF PHEROMONES IN MAMMALS**

Releaser Pheromones: Many mammals (e.g., dogs and cats) deposit chemicals in and/or around their “territory”. As these vaporize, they signal to other members of the species the presence of the occupant of the territory. Domestic rabbit mothers release a mammary pheromone that triggers immediate nursing behavior by their babies (pups). A good thing, too, as mothers devote only 5–7 minutes a day to feeding their pups so they had better be quick about it.

Many animals, including mammals, signal with alarm pheromones. Although neither the source nor the chemical nature of alarm pheromones are known in
any mammal, stressed animals release something that triggers quick behavior (e.g., flight or fight) in other members of their species. The pheromone is detected in a special cluster of cells located at the very tip of the nose and thus in a position to detected airborne molecules even before the vomeronasal organ (see below) or nasal epithelium can. The detectors on these cells are primarily cilia present on the epithelium cells.

**Primer Pheromones:** Rats and mice give off pheromones that elicit mating behavior. However, the response is not immediate as it is in the releaser pheromones of mother rabbits and insects. Instead, detection of the pheromone primes the endocrine system of the recipient to make the changes suited for ovulation, which is needed for successful mating.

Primer pheromones are detected by the olfactory epithelium with which normal odors are detected and also in most mammals (except humans) by the vomeronasal organ (VNO). The VNO is a patch of receptor tissue in the nasal cavity distinct from the olfactory epithelium. The receptors are G-protein-coupled transmembrane proteins similar to those that mediate olfaction, but encoded by entirely different genes. The neurons leading from the VNO take a separate path into and through the brain

**HUMAN PHEROMONES**

The existence of human pheromones was first suggested by the demonstration that women living together can develop synchronized menstrual cycles under specific conditions. Experimental data demonstrate that humans have the potential to communicate pheromonally [4]. Apocrine glands (active only during reproductive maturity), eccrine glands (which produce sweat that contains pheromones), produce human pheromones. These compound also found in saliva and urine, exfoliated epithelial cells due to bacterial action [5, 3 &6] and/or dependent on ovarian functions in females and prostate functions in males. Pheromones act in two ways. The “signal pheromones” cause others to become aware of presence and cause immediate changes in behavior by activating certain areas of the brain. The “priming pheromones” trigger GnRH production and often induce kissing or skin-to-skin contact. This in turn, increases production of many hormones that affect development, metabolism, and mating behavior.

Phenomenally induced alterations in gonadotropin releasing hormone (GnRH) pulsatility [7] allow for a life-long causal linkage among olfaction [8], neurotransmission, autonomic responses, luteinizing hormone/follicle stimulating hormone ratios, steroidogenesis, neurotransmission, and hormonally induced behavioral changes [9]. Pheromones induce an intra cerebral release of GnRH with short -term, non--genomic, (e.g., neuromodulatory and extrapituitary) effects on GnRH receptor systems, which undergo important age -dependent changes. The disruption of the GnRH neuronal system and the initial decline of reproductive function may be associated with many of the more common effects that are manifest in aging. GnRH might be involved very early in the initiation of a sexually organized response. The sexual chemistry works on VAK: Visual - On meeting someone within first fifteen seconds a judgment about their attractiveness, success, background and intelligence is established. You are also instantly reminded of anybody you have known previously who looks like this new person.

**Auditory** - The sound of someone’s voice can evoke all sorts of delicious or grating sensations within us.

**Kinaesthetic** - This describes all the physical or sensory sensations, which are aroused because of being in a certain situation. With a sexual attraction, the body’s response can be embarrassingly immediate, with a man getting an erection and a woman getting that wet feeling. (Fig.1) It is also likely, that intense chemistry is fired by the automatic release of the sex hormones – pheromones — that are responsible for the intense desire to have sex [10].

Accordingly, humans and other primates typically are believed to be microsmatic (i.e., worse smellers) equipped with highly developed powers of vision that supposedly make humans “visual creatures.” This concept needs reconsideration since many recent studies have shown that olfaction plays a very important role in human reproductive biology, which in turn affects human behavior. It is said that man thinks through his nose. (Fig 2) The nasal mucosa can functionally be divided into two areas: the respiratory region and the olfactory region, which contains the sensory cells [11].

**Pheromones-Genes:** A very significant part of the human genome (about 5.0% or about 1,500 genes of our 30,000 human genes) is used to code the receptors
of smell. Two anatomically distinct organs respond to smell, the olfactory system located in the upper part of the nasal cavity, and the VMO in the nasal septum [see website 3].

Once the genes for such receptors are definitively identified, it should be relatively easy to find out whether equivalent genes exist in humans. Scientists could then determine, once and for all, whether such genes are expressed in the human nose. If they are, the receptors may provide a new scientific clue to the compelling mystery of attraction between men and women—some evidence of real, measurable sexual chemistry [see website 3].

Pheromonal influences on GnRH-directed rhythmicity of hypothalamic function are of key importance with respect to humans falling in love [12] and pheromones remain a factor in properly timed human reproductive sexual behavior [13, 14]. Other studies have demonstrated that the smell of androstadienone, maintains higher levels of cortisol in females [15], and that the compound is detected via the olfactory mucosa [16]. The ability of this compound to influence the endocrine balance of the opposite sex makes it a human pheromonal chemosignal.

Women often call men as pig (or vertical pig). On the other hand, men very rarely use this term when talking about women. Since the domestication of wild pigs 7,000 years ago, women have intuitively known that many male human hormones are very similar to those of pigs [see website 3]. It may also be due to the fact that wild boar ejaculates half-liter semen and those men who ejaculate lot of semen are named as pigs (17).

AROMA THERAPY

In addition to our sense of smell, do we have the ability to sense certain chemical signals emitted by people around us—without being aware of it? Many other mammals use a separate set of sensory receptor cells in their nose to receive social and sexual information from members of their own species, and there is growing suspicion that we do, too [see website 7]. In fact plant aromatic compounds and human pheromones since ages were used for Aroma Therapy, an alternative system of medicine system (1).

A Swedish study says men and women receive scent signals from the opposite sex. While it is well documented that females and males of many species can communicate through chemical signals called pheromones, there has remained some question as to whether humans can communicate this way as well. Using brain imaging, Swedish researchers have found new evidence that men and women can in fact send and receive subconscious odor signals. And, the men and women, it seems, respond to the smells differently. The strongest evidence for pheromone signaling between humans had been revealed by Dr. Martha McKlintock, who discovered in 1998 that the menstrual cycles of women living together tend to synchronize because of the chemical messages released in their sweat (see website 9).

The study of pheromones, used PET (positron emission tomography) scanning techniques to analyze the brains of 24 men and women while they smelled chemicals almost identical to the naturally produced sex hormones estrogen and testosterone. The scientists, led by Dr. Ivanka Savic of the Karolinska Institute, found that the hormone-like smells “turn on” the brain’s hypothalamus, which is normally not activated by regular odors (see website 9).

Pheromones may make us more attractive to potential mates by bringing out our best qualities and allowing us to appear more self-assured and relaxed. That “feeling of well being” may also make us a lot more pleasant to be around. The ability of these sex hormone-like chemicals to activate areas of the brain that control hormones indicates they may have more broad-ranging therapeutic value as well. For example, Pherin Pharmaceuticals is currently developing numerous synthetic pheromones that it hopes will be effective in decreasing symptoms of anxiety disorders, premenstrual syndrome in women, and prostate enlargement in men.

Berliner has personally tested many of these compounds. “I love it!” he enthuses. “And it takes only seconds to work. It is very hard to explain with words, but it makes you feel relaxed. All of a sudden your internal life changes for the better, although the outside world has not changed at all” [see website 9].

Numerous scientists have observed that as cultures advance to higher levels of bathing, interpersonal
Fig. 2. The basic pathways for processing olfactory information: Sensory input is generated when odorant molecules (1) present in aroma, bind to the odorant receptors (2), localized on olfactory sensory cells (3). These sensory cells are small part of the nasal epithelium (4). Signals from olfactory sensory cells are relayed in the glomerulus (5) present in the olfactory bulb (6). Receptor cells of the same type are randomly distributed in the nasal mucosa but converge on the same glomerulus. In the glomerulus, the receptor nerve endings excite mitral cells (7) that forward the signal via the olfactory tract into the olfactory lobe of the brain. From here, olfactory input is projected via the thalamus to the neocortex and to the limbic system (8). Nasal cavity (9); Bone (10). The square on nasal rout (A) is enlarged in (B) and square on (B) is enlarge on (C).

Fig 1 Men who applied a pheromone infused cologne noticed the above mentioned responses from women.
bonding seems to decline. They suggest that the washing removes skin pheromones and weakens the interpersonal bonding in families and between couples [see website 3].

Overall, the human sweat smell is a natural, animal-like, musky aroma, which can be emotionally stimulating and sexually attractive. The pheromone 'androstenone' (a musky odor) has been identified in the sweat and urine of men and is presumed to be a sexual stimulant to women, especially when a day or two from, and during, their monthly ovulation [see website 1].

**CONCLUSION**

Our discussion indicates that pheromones are chemicals released by an organism into its environment enabling it to communicate with other members of its own type. Pheromones can play an important role in pest management, sexual stimulation; Pheromone was used for the preparation of scent and aromatic oils and also used for some therapeutic purposes.

**REFERENCES**


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