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Altering Physical Behavior Through Pheromones

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Martha McClintock's brilliant scientific career blossomed during Summer 1968, as a Wellesley College student studying menstrual synchronization and suppression. As a graduate student, McClintock published a paper examining the shift in menstrual cycles among women in dormitories, known as menstrual synchronization (5). Over years of research, McClintock assessed how pheromones stimulate this synchronization. Pheromones are airborne chemical signals released by individuals that alter physiological behavior of others and have continued to shape McClintock's research concerning reproductive networking (1). While the functional significance of menstrual synchronization is unknown, McClintock has uncovered key mechanisms involved in menstruation, allowing for a deeper understanding of menstrual cycle control (2). Since olfactory communication between females may trigger menstrual synchrony, the chemicals involved in this communication network can be isolated to identify a more natural method of regulating menstrual cycle or ovulation (2). Thus, the purpose of this paper is to discuss the contributions McClintock has made to advance the field of pheromone induced synchronization and physiological behavior by examining theories and evidence McClintock has generated throughout her scientific career.

While it has long been known that animals can communicate through chemical signals, McClintock's recent discovery of menstrual synchronization has opened doors for scientists to explore the influences chemical signals have on specific human behaviors. Aside from synchronizing their reproductive cycles, pheromones can also cause humans to respond to others' moods and recognize their kin (Blum 2011). Pheromones can be received through olfaction, ingestion, or absorption by mediating signals that alter the length of the estrous cycle (2). However, there are a number of ways in which humans can either enhance or dampen the effects of pheromones. For example, women sweating in close proximity may enhance pheromonal responses while wearing perfumes or deodorants may dampen these pheromonal responses. Additionally, emotional attachment has been shown to boost chances of menstrual synchronization. Nonetheless, menstrual synchrony is facilitated by a variety of factors, including psychological, interpersonal, and pheromonal stimuli (2).

To study the effects of these stimuli on menstrual synchronization, McClintock studied female rats living in close proximity. McClintock studied the rat's olfactory exposure to other rats, and deduced that a pheromonal mechanism was partially responsible for the estrous synchronization observed (2). Two pheromones have been shown to mediate the process of ovarian synchrony in rats. The first is produced before ovulation and shortens the ovarian cycle, and the second is produced at ovulation and lengthens the cycle. Through computer stimulation, these two opposing pheromones were predicted to not only maintain synchrony, but also to provide cycle stabilization. McClintock applied this model to humans, demonstrating the existence of pheromones, as well as a potential pheromonal mechanism for menstrual synchrony and social regulation of ovulation (4).

While pheromonal regulation may act through olfaction, ingestion, or absorption, McClintock demonstrated rational arguments that olfactory signals are the foundational source of pheromone induced menstrual regulation. To examine the effects of olfactory induced pheromones, McClintock conceptualized the ovarian cycle as an oscillator, in which synchrony is a coupling of various sets of oscillators. Therefore, a coupled oscillator model would expect two opposing signals to result in synchrony (2). Knowing rats exhibit different odors depending on different phases of the menstrual cycle, McClintock developed a method of applying the coupled oscillator model to human menstrual patterns. McClintock and her colleagues collected body odor on cotton pads from female donors and wiped the pads under other females' noses daily for two menstrual cycles. After analyzing the data, the researchers discovered that pre-ovulatory females' odor accelerated the menstrual cycles of those who has sniffed the pre-ovulatory cotton pads. Comparatively, post-ovulatory females' odor delayed recipients' menstrual cycles (3). Since both McClintock's rat and human subjects exhibited menstrual synchronization, McClintock affirmed her model of olfactory induced cyclic synchronization. In doing so, McClintock opened doors for research linking menstrual synchrony to other physiologically significant events.

Based on McClintock's investigations concerning menstrual synchrony, other researchers have examined the pheromonal effects menstruation has on males. Arguments claiming that males are subconsciously more attracted to females near ovulation supports McClintock's idea of olfactory stimulated pheromonal responses. For example, some males living in polygynous societies claim that unless females' cycles were synchronized, these males would receive conflicting signals from various females whom he shared. Therefore, McClintock and other researchers have argued that the biological foundation of synchrony enables men to accurately identify when women ovulate, increasing the probability of conception (2).

Finding evidential roots in biology enables scientists like McClintock to identify the main chemicals responsible for conveying these pheromonal signals and to discover the body's reactions to these signals. To address these concerns, McClintock has recently focused on designing a detailed map of the strong chemosignals, mainly a steroid compound known as androstadienone. McClintock has discovered that this compound significantly affects stress hormones and alters emotional response. To test this discovery, McClintock, and her colleagues exposed one group of subjects to gauze pads containing androstadienone and another group to gauze pads without androstadienone. Following exposure to gauze pads, both subject groups filled out a long and tedious questionnaire test. Results from post-test questionnaire data showed that subjects exposed to androstadienone stayed cheerful longer throughout the tedious questionnaire test. Additionally, a brain-imagining scan showed activated brain regions associated with attention, emotion, and visual processing in subjects exposed androstadienone (Blum 2011). To McClintock and her colleagues, this activation indicated that pheromones cause biological changes in the physiological function of the recipient.

Throughout her scientific career, McClintock has advanced current understanding of pheromone-induced behavior by generating theories and evidence through numerous reputable experiments. Discovering the biological foundation of menstrual synchrony and other pheromone induced physiological responses has opened doors for further research examining the effects of specific pheromones. While McClintock and her colleagues discovered that both rats and humans communicate through pheromones, studying pheromonal responses within other species may broaden current understanding of how various pheromonal responses are triggered and received. Doing so may enable humans to modulate various components of their endogenous neuroendocrine conditions based on that of another's endogenous neuroendocrine environment (4).

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