Hormones associated with the menstrual cycle appear to drive sexual attraction more than we know.

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Print version: page 44

Most animals aren't shy about showing their interest in mating. The male frigate bird puffs out his throat into a gigantic red balloon. Female cats yowl and spray urine during estrus, their time of ovulation and sexual receptivity. And in female chimps, estrus swellings of the external sex organs can get as large as a cantaloupe — not something a male could easily miss.

In humans, signs of sexual interest aren't nearly so obvious. The male of the species generally doesn't broadcast his constant readiness for sex, and during her window of fertility at ovulation, the female doesn't display any outward signs. Some biologists and anthropologists have theorized that this "loss of estrus" in people makes us less driven by sex hormones than other animals.

But according to a steady stream of new studies by evolutionary and biological psychologists, that may not be the case. This research indicates that the hormonal changes of a woman's monthly cycle may be more powerful than we've ever conceived — compelling women to advertise when they're ovulating, and men to notice. Although women aren't showing off swellings, yowling or spraying, studies suggest they may dress more provocatively, flirt more, and possibly become more sexually excitable, for roughly six days mid-cycle, before and after ovulation. They even show minuscule shifts in voice pitch, scent and skin tone, some studies suggest.

These changes are not lost on men, whose own hormones and mating behavior respond to a woman's cues, as well as how the woman treats them, says Jon Maner, PhD, a hormones researcher and associate professor of psychology at Florida State University. To illustrate: In one of his studies, men actually inched closer to a woman — and mimicked her gestures more — when she was ovulating.

There are, of course, critics of this line of research, who believe that it's overly focused on ovulation-related behavior, and that it doesn't necessarily translate into what happens in real-world relationships. "These lab studies have never, to my knowledge, been extended into actual partner choice," says hormones researcher Sari van Anders, PhD, an assistant professor of psychology and women's studies at the University of Michigan, Ann Arbor. "If ovulation affects real-life mate choice so strongly outside the lab, why haven't we seen these results?"

There is also research to suggest that women aren't the only ones with hormonal cycles that affect behavior: Men's testosterone appears to cycle throughout the day, month, and possibly even the seasons, affecting their moods and sexual desire. Also, drops in testosterone with age may trigger something of a male menopause, or "andropause." Yet another source of debate is the degree to which hormones may respond to people's sexual behavior, versus directly influencing it.

This much, however, is not debatable: Both men and women (topics/women-men/index.aspx) have little to no awareness of just how much these hormonal machinations in their bodies affect what they do.

"The vast majority of all this occurs outside of our conscious awareness," says Maner. "It's kind of like chemistry between two people. You know when you have it, but you're not sure what it is."
Cycling attraction

The real world notwithstanding, hormones certainly appear a formidable force in the lab. One psychologist investigating how ovulation affects women's preferences in men is Steve Gangestad, PhD, distinguished professor of psychology at the University of New Mexico. In recent work, Gangestad and his colleagues recruited 66 young couples, assessed the male partners' intelligence and, using photographs, gauged their facial attractiveness and features. Meanwhile, they required the women to complete questionnaires about their sexual feelings toward their partners and other men at fertile and non-fertile points in their cycles.

The study, in press at *Evolution and Human Behavior*, produced results consistent with previous research: Women paired with feminine-faced men were more attracted to men other than their partners, relative to their partners, when ovulating. The same effect was found for women with facially unattractive men, though not when the researchers controlled for men's facial masculinity or femininity. No significant effects were found for men's intelligence.

Gangestad has found similar patterns for stereotypically male behavior traits. In a study of 238 college women published in APA's *Journal of Personality and Social Psychology* (Vol. 92, No. 1) in 2007, he and his colleagues found that, in mid-cycle, women tended to prefer flings with "caddish" men. On average, fertile women were more interested in short-term relationships with men who came across as confident, or even cocky, on videotape. In comparison, at other points in their cycle, they gravitated toward longer-term relationships with kinder, more conscientious, deferential types — good father material.

Interestingly, these mid-cycle preferences for hyper-masculine men seem to disappear among women taking birth control medication that suppresses normal ovulation. All this may seem counterintuitive. Wouldn't it make more sense for a woman to make babies with a nurturing man? Someone more likely to stick around?

You would think, says Gangestad, but, in an evolutionary sense, women want manly men's superior genes. Masculine features and dominance over other males indicates stronger genetic fitness, according to "good genes theory," he explains.

"Infidelity may be part of the strategy," says Gangestad. "But while there has been selection for conditional unfaithfulness, it's also very possible that there was never selection of that sort — that estrus is a carry over from pre-pair-bonding, and has not been modified in the context of pair-bonding (for example, for infidelity)."

But what about men? Do they have hormonal cycles too? Some hormones researchers say no; men don't cycle. Others say yes, but their cycles are less studied and less dramatic than women's. Men's testosterone cycles fluctuate from higher in the morning to lower each evening, and, according to some Australian, Russian and Dutch studies, the hormone level fluctuates seasonally as well, peaking in October and ebbing in April, notes psychologist Jed Diamond, PhD, author of several books on men and hormones.

Testosterone also declines as men age, and as their levels drop, they experience increases in moodiness and irritability, says Diamond, who in 1977 published the book "Male Menopause," one of the first U.S. works to raise awareness that, during the midlife period of what he calls "andropause," men's hormones change, just as women's do.

"The whole idea that men show hormonally based changes or change of life has not been studied much in this country, or has been seen as a joke, but in fact there is a lot of research on this happening outside the United States," says Diamond, a Northern California psychotherapist who most recently published "Mr. Mean: Saving Your Relationship from the Irritable Male Syndrome" (Vox Novus, 2010).

Sharp-dressed women

Meanwhile, ovulation remains the primary focus for U.S. researchers studying sex hormones and behavior, though so far, there's no evidence to prove that women act on a supposed ovulation-induced desire for extracurricular sex. "But there are data trends in those directions," says psychologist Martie Haselton, PhD, who has studied infidelity and mate preferences with Gangestad. Though there aren't studies showing that women seek sex more in mid-cycle, there is evidence that women take more care to look alluring during ovulation, notes Haselton, an associate professor at the University of California, Los Angeles.

In a study published in 2007 in *Hormones and Behavior* (Vol. 51, No. 1), she and colleagues had 40 judges determine the degree to which 30 young women tried to look attractive at different points in their menstrual cycles. The judges
rated separate photos of each woman on grooming and eye-catching dress. One photo was taken as the women’s levels of luteinizing hormone (LH) surged before ovulation, and the other was taken in the non-fertile luteal phase.

At well above chance levels, the raters labeled more of the ovulating women than luteal-phase women as “trying to look attractive” (60 percent versus 40 percent). However, none of the women in this study chose very revealing clothing. They were, after all, headed to a university lab where they might run into their professors. But it appears that ovulating women do select skimpier apparel than their luteal sisters when attending parties and other such social events, finds psychologist Kristina Durante, PhD, a postdoctoral fellow at the University of Minnesota’s Carlson School of Management.

In one study, conducted with Haselton and published in 2008 in Personality and Social Psychology Bulletin (Vol. 34, No. 11), Durante’s team had 88 women draw pictures of outfits they planned to wear to a hypothetical party that evening. Not only were fertile-phase women more likely to draw more revealing outfits, but those in happy long-term relationships planned outfits that were almost as provocative as those of single women.

Durante theorizes that the committed women may have opted for slinkier outfits to retain their partners’ interest.

“They were told there’d be lots of sexy people at the party,” says Durante. “So it’s possible these women want to be on their game since others may be vying for their man’s attention.”

**Nature’s perfume**

Men also get more possessive of their women, and more loving toward them, during ovulation, find various studies by Gangestad and Haselton. Most likely this is also to stave off the competition.

But how do men tell when women get their LH surge? Most obvious are the visible cues: the increased flirtatiousness, the more attractive dress. But there are also more subtle biological signs that research is just beginning to uncover.

Some of these studies suggest that women’s voices get higher, that their soft tissue becomes more symmetrical — even that their skin tone changes, becoming more textured and vascular.

Among the most compelling findings in this area are those concerning smell. In many species, the male couldn’t be more certain what chemicals he’s seeking: Male dogs and apes, for example, will sniff females’ behinds to discern signs of sexual readiness. And the male giraffe will instigate urination in the female with a nose tap, then check her output for signs of estrus.

Nothing that obvious goes on in humans. But men do respond hormonally to the scents of ovulating women, according to research Maner has conducted with Florida State graduate student Saul Miller. In a study published online in Psychological Science (Vol. 23, No. 2) in December 2009, 105 undergraduate men smelled T-shirts of young women who were either near ovulation or far from it. In two studies, the men also smelled unworn T-shirts, which served as controls.

Results showed that men who sniffed the ovulation-scented shirts displayed higher levels of testosterone than men who sniffed the non-ovulation or control shirts.

But how strong was the response, and what could this mean? “The effects on testosterone are medium, and we’re not sure of the behavioral effects, but other studies suggest the testosterone effects are large enough to produce changes in behavior,” says Maner. “So it stands to reason that a man is more likely to be attracted to an ovulating female and to pursue her as a partner.”

Not that spikes in testosterone are dependent on ovulation. Most heterosexual men get a significant testosterone boost after just briefly chatting with an attractive woman, suggests a study of 149 undergraduate men, published in 2010 in the Proceedings of the Royal Society (Vol. 277, No. 1,678). In comparison, testosterone stays level or drops after a conversation with another man.

Testosterone levels also tend to drop when a man enters a committed relationship and has children, says Gangestad. "Probably the most effective way, short of castration, for men to reduce testosterone levels is to have a child," he says.

The effects of sex and relationships on hormones could be quite different, however, for gay men, notes psychologist Aaron Lukaszewski, PhD, a co-author of the Proceedings of the Royal Society study and visiting postdoctoral scholar at the Haas School of Business at the University of California, Berkeley.
Other individual differences showed up in the study as well. "On average, testosterone was increasing 10 to 12 percent, but some men were showing huge increases, while others were showing none," says Lukaszewski.

The amount of testosterone, and men’s responses to it, appears written in their genetic code — in particular, their androgen receptor gene sequence. The stress hormone cortisol also appears to play a role, actually squelching testosterone levels when men get stressed. And, of course, hormone levels and effects also vary across women.

Also, when it comes to women, some behavioral neuroendocrinologists think their fellow researchers overemphasize the link between women’s hormones and heterosexual relations.

"It is striking how well this corresponds to cultural notions of women’s value lying in their sexual connections to men," says hormones and women’s studies researcher van Anders. "In contrast, there are research groups that ask questions, including evolutionary questions, about sexuality (topics/sexuality/index.aspx) and hormones that see a point in studying women beyond their sexiness vis-à-vis men."

For example, notes van Anders, her lab has looked at masturbation’s effects on women’s hormones, and University of Chicago psychologist Martha McClintock, PhD, has found evidence that breastfeeding women and their infants may emit a chemosignal that increases sexual desire in other women.

Sexual motivations and individual differences aside, one thing is certain: We are, despite our modern advancements and sophistication, animals whose genes and hormones continue to drive our behavior at the most basic levels. Without our realizing it, bodily chemicals are constantly at work to ensure our continued existence. Estrus, it seems, is still very much with us.

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