

Female Sense of Smell

Ahead by a nose

09:26 27 September 00

Our sense of smell has been crucial for human survival, say Israeli scientists, and continues to be underrated.

They have found very few mutations in the genes that code for smell receptors in the nose, suggesting that these genes have been actively preserved by natural selection.

Doron Lancet and colleagues at the Weizmann Institute in Israel studied the thousand-or-so genes that could code for olfactory receptors in the nose. Between 50 and 60 per cent of these genes have accumulated mutations and no longer function. But up to 400 genes have been preserved, implying they were crucial for human survival.

Lancet thinks the mutations in the active genes have been weeded out by natural selection. "We suggest that weak positive selection is responsible for the patterns of genetic variation," the team writes in the journal **Nature Genetics**.

Studies of chimpanzee genes have confirmed that this selection process has taken place on human DNA, rather than on the DNA of a distant ancestor.

"This is very interesting work," says Tim Jacob of Cardiff University. "People do tend to think that smell isn't that vital, and it is very neglected."

Modern humans probably don't use smell in exactly the same way as our ancestors, Jacob says. Today, we don't need to detect the scent of a predator, but it remains important to judge whether food is rotten or whether air is breathable. Jacobs thinks that smell may even assist in our choice of mate.

Vive la différence

"Tests have found that people prefer the smell of people who are genetically dissimilar to themselves," Jacob says. "Though no one really understands the mechanism of how that might happen."

There is some evidence that a person's major histocompatibility complex (MHC) genes can affect their body odour. Different MHCs indicate different immune systems.

There has also been speculation that people may be able to smell fear. "Horses and dogs can smell fear on humans," Jacobs says. "If we could smell anxiety on others, it could be useful for raising levels of alertness if you were going with a group into an area of danger, for example."

Lancet suggests that being able to smell smoke could also boost a person's chances of survival.

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Humans are not as sensitive to smell as many other mammals, but the sense is still more important than most people realise, *Lancet* told **New Scientist**. "As we've become human beings, we have become more oblivious to our nose. We are worse at detecting smells than cats or dogs. But we still use our sense of smell all of the time."

Source: **Nature Genetics** (vol 26, p 221)

Sexual desire boosted by breastfeeding odours

19:00 24 April 02

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The sexual desire of women is boosted by the odours given off by breastfeeding women and newborn babies, researchers have found. The finding adds to the growing body of evidence suggesting that our natural smell influences other people on an unconscious level, and strengthens the argument that human pheromones exist and still exert a subtle influence over us.

In the study, smells associated with breastfeeding increased feelings of sexual intimacy in childless women volunteers. Why this should be so is a mystery, but the researchers suggest it may be a way that women signal to each other that the environment is a good one in which to reproduce.

Julie Mennella of the Monell Chemical Senses Center in Philadelphia and a team at the University of Chicago asked 26 nursing mothers to wear absorbent pads in their bras and under their armpits. The odours collected on the pads probably came from both the mother and the feeding baby.

"Sniff challenge"

Another 45 women, who had never given birth, then spent the next three months undertaking a "sniff challenge". For a month, all the women sniffed control pads with a phosphate buffer on them four times a day.

For the final two months, some women were randomly chosen to sniff pads with the breastfeeding compounds, while others continued with the control scent. Each day the volunteers measured their temperature, took a urine sample and recorded sexual activity.

In 2001, Mennella's group showed that exposure to breastfeeding odours disrupted the menstrual cycles of volunteers: longer cycles got longer and shorter ones got shorter.

The new study reveals a more subtle effect. While the women smelling the breastfeeding compounds did not report increased sexual activity - this behaviour was most obviously influenced by the absence or presence of a partner - they did report significantly heightened and more enduring sexual desire and fantasies.

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"The data are pretty striking," says Mennella, who presents her evidence this week to a meeting of the Association for Chemoreception Sciences in Sarasota, Florida.

Suitable signal

She concludes that the chemicals encourage other women to reproduce, and that they may have evolved as a signal that the environment is suitable for raising young. In many cultures, newly-wed young women are encouraged to spend time around new mothers to increase their own chances of having children, she says.

"I wonder if these cultures have tapped into something." She is eager to find out if the breastfeeding smell has any impact on fertility.

Richard Brown, a psychologist at Dalhousie University in Halifax, Nova Scotia, notes that these are only preliminary findings. But he points out that breastfeeding women have higher than normal progesterone levels.

"Maybe the high progesterone acts like an androgen," he speculates. "Maybe it's the weirdest of possible things and they're producing male-like odours."

Women attracted to men who smell like dad

14:49 21 January 02

A T-shirt sniffing test has revealed that women unwittingly prefer the smell of men who have similar genes to their dads. But this is no Freudian Oedipal complex.

Instead, it appears to be a tactic in a poorly understood evolutionary game, where the prize is either greater resistance to disease, or an unconscious ability to spot distant relatives in a sea of strangers.

The genes in question form part of the major histocompatibility complex, or MHC, and encode various components of the immune system. These genes are thought to be tightly linked to others that dictate our natural odour.

Research on animals has shown that female mice sniff out males with different MHCs to their own, preferring them to mates with a similar genetic make up. Women were also thought to do the same, according to one study in which women sniffed T-shirts worn for a couple of nights by men.

The same, but different

Now a new study paints a more complicated picture. Martha McClintock, Carole Ober and a team at the University of Chicago studied 49 women whose MHC genes and parents' MHC genes were known. As in the earlier T-shirt study, the women sniffed T-

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shirt odours, but this time they had no idea what they were smelling. They were asked to say which odours they would prefer if they had to smell them all the time.

Surprisingly, the women preferred the odours of men who shared the same type of a few MHC genes, or alleles, with themselves. The most appealing odour donors shared 1.4 alleles on average, whereas the least appealing shared 0.6 alleles. What's more, these matching alleles were ones the women had inherited from their fathers and not from their mothers.

That goes against the prevailing theory that outbreeding is always best. Going for a mate with different immune system genes to your own should ensure that your children have the widest possible arsenal with which to attack pathogens. Also, the rarer their MHC, the less likely it is that evolving pathogens will be able to outsmart them.

Limited inbreeding

But McClintock thinks that interpretation is too narrow. Limited inbreeding can work, as it may actually make sense to stick with combinations of genes that are known to successfully fight disease. "There's an intermediate number of matches that's probably optimal," she says.

Wayne Potts of the University of Utah in Salt Lake City has a different explanation. Although mice prefer mates with different MHC genes, they go for nest mates with a similar genetic make-up, probably to ensure they are near their kin. Women may be attracted to their father's odours for a similar reason - reflecting an ability to home in on relatives using smell.

For instance, he says that Ober's own studies show that women tend to marry MHC-dissimilar men (*New Scientist*, 10 February 2001, p 36). "It is probably more reliable to draw conclusions ... from marriage patterns," he comments, "than from odour preference tests where boxes with odiferous, unknown contents are briefly sniffed."

Journal reference: *Nature Genetics* (DOI: 10.1038/ng830)

Family smell

16:52 15 June 01

Ever wondered if you might be adopted? Try giving your brothers and sisters a good sniff. That advice arises from new research that shows that family members can tell each other by smell alone, but only if they are genetically related to each other.

Recognising close relatives by their odour could be down to familiarity, or simply sharing a common environment and common smells. But psychologist James Gall of Wayne State University in Detroit and his colleagues compared members of families in which both blood relatives and step children lived, to see if the genetic link made a difference.

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The results showed that mothers were very good at detecting their birth children by smell, but not their step children. The children themselves were quite good at distinguishing their brothers and sisters over their step siblings.

"We have a basic affinity for our biological relatives," says Gall's colleague, Glenn Weisfeld. He says smell could explain why stepchildren are often more badly treated than children living with their biological parents. "I think it's an important mechanism in how people discriminate against stepchildren," he says.

Sealed bag

In the study, 34 pairs of siblings aged four to 11 took part - 13 full siblings, 10 half siblings and 11 step siblings. All of the pairs had been living in the same home with their parents for at least the last two years.

The children were given a clean T-shirt, and asked to wear it for three nights in a row. During the day, the shirt was kept in a sealed plastic bag to protect it from being contaminated with household smells. The children were all also given the same unperfumed soap to use for the three days.

At the end of the three nights, each shirt was put into a container with a small opening in the top for smelling through. Each mother was given two shirts and asked which smell she preferred, and which she thought was from her own child.

The biological mothers knew which was their child 27 times out of 30. But the stepmothers were wrong five times out of seven.

Because the mothers had all been living with their children, the results mean they must be using smell to recognise their children's genes, Weisfeld says: "Similar environments and close association are not always sufficient."

Telling smell

The researchers also found that the biological mothers preferred the smell of their own children over that of unrelated kids.

The results were the similar for the children. They recognised the smell of full brothers and sisters 21 times out of 30. Half siblings were correct 16 times out of 28, while step siblings performed worse than chance.

Previous studies have found that blindfolded mothers can identify their newborn babies, and that women smelling men's T-shirts find the odour of men less related to them more attractive. But Weisfeld says this study is the first to compare full siblings with half and step siblings. "It's the degree of kinship that's important," he says.

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This research was presented at the Human Behaviour and Evolution Society conference in London, UK.

Smell of female

13:43 04 April 01

Men can tell by smell alone when women are at their most fertile, say researchers from Texas.

They reached this conclusion after getting men to sniff T-shirts worn by women during fertile and infertile stages of their menstrual cycles.

Overwhelmingly, men rated the smells from the T-shirts to be most "pleasant" and "sexy" when they had been worn by women during their fertile phase.

"It may be a cue that men pick up subtly," says Devendra Singh, the psychologist at the University of Texas in Austin who made the discovery. But Singh doesn't think the smell would play as important a role as visual cues in determining sexual attractiveness.

The findings shed light on how our ancestors selected mates and may even open new avenues for treating infertility.

Fresh shirt

Singh and his colleague, Matthew Bronstad, gave a pair of previously unworn T-shirts to women volunteers.

Women slept in the first T-shirt during the fertile phase of their cycle - 13 to 15 days after their previous period. They slept in the other T-shirt during the infertile phase on days 21 to 22 of the cycle.

The women avoided contact with strong odours to avoid masking subtle scent changes. They washed with unscented toiletries, avoided sex and gave up spicy or aromatic foods, such as garlic. Two women had to drop out after indulging in pizzas and cigarettes.

When men sniffed the 21 pairs of T-shirts, 17 gave a resoundingly higher rating to the smells from the fertile phase. They had been told that one set of T-shirts came from women who were more attractive.

The findings were the same when a second set of men sniffed the T-shirts after they'd been stored for seven days. "We wanted to see how stable the smell was," says Singh.

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Advertising strategy

He says that the odours probably enable women to advertise their readiness for fertilisation. But in the modern world they are probably overwhelmed by more obvious cues such as dress, make-up and behaviour.

Singh says it is not known if the odour has a subconscious effect or if it can be detected if a woman wears perfume.

The findings contradict those of a 1999 study by Randy Thornhill and Steven Gangestad of the University of New Mexico. They found men could not smell any difference. But Singh claims his findings carry more weight because each pair of T-shirts came from the same woman.

In Thornhill's study, T-shirts from fertile and infertile phases came from different women. Men may therefore have picked up differences between women, rather than between menstrual phases.

Thornhill acknowledges this. "It's a nice and important study," he says. "Singh and his colleague deal with the problem in our studies of inter-individual differences in body scent," he says.

Thornhill says that his most recent, unpublished study agrees with Singh's, even though shirts again came from different women.

More at: **Proceedings of the Royal Society, London B** (vol 268, p 797)