The Scientist

News & Opinion

# Swapping DNA in the Womb

## A new study finds male genes in women's brains, the first evidence of microchimerism in the human brain.

**By Beth Marie Mole | September 27, 2012**



Wikimedia Commons, David Roseborough

DNA from male cells, most likely from a fetus or sibling, are often found in the brains of women, according to a study released yesterday (September 26) in *PLOS ONE*. The findings are the first demonstration of microchimerism—in which cells that originated in one individual integrate into the tissues of another—in the human brain, and could have implications for disease.

"Knowing cells are in the brain brings home the idea that we're a little more diverse than we thought we were," said Nelson. "So conceptually, it may be more appropriate to think of ourselves as an ecosystem rather than a single genetic template."

Researchers have suspected that the human brain may harbor microchimeric cells, which are present in other human organs, and previous studies in mice have shown that such foreign cells can break through the blood-brain barrier. But the study, led by Lee Nelson of the Fred Hutchinson Cancer Research Center in Seattle, revealed that microchimeric cells could not only migrate to the brain, but do so frequently: more than 60 percent of autopsied brains contained DNA from another individual.

Microchimerism most commonly arises during pregnancy when cells from a fetus pass through the placenta and into the mother's body—and vice versa. The foreign cells can then migrate to various tissues and set up chimeric cell lines, which has raised many unanswered question about immune

disorders and other links to disease risks. Other studies have found that fetuses can also acquire microchimeric cells from a twin or even from an older sibling, as some fetal cells linger in the uterus. In rare cases, microchimerism can occur from blood transfusions in immunocompromised patients.

To quantify microchimerism in the brain, Nelson and colleagues selectively looked for a gene found on the Y chromosome in brain sections from 59 female cadavers. It's not the case that this can only happen with male fetuses or siblings, Nelson explained, it's just technically easier to identify DNA from males in female subjects. In total, the researchers found that 37 women harbored such foreign genes in their brains. They also found evidence of cells in the brain, suggesting that microchimeric cells can and do cross the blood-brain barrier.

Also during the study, the team compared the level of microchimerism between female subjects that were healthy at the time of death to those that suffered from Alzheimer's disease. Women who have been pregnant are known to be at a higher risk of developing the disease, and the researchers hypothesized that this might result from having more microchimeric cells in their brains. But in fact, they found the opposite: women with Alzheimer's had lower amounts of microchimeric cells than the healthy group.

"It's a correlation," said William Burlingham of the University of Wisconsin, who specializes in transplant surgery and studies microchimerism in the context of immune tolerance, and was not involved with the study. "But, like a lot of things in the field of microchimerism, you don't know exactly what the correlation means yet."

Next, Nelson and her lab plan to looks for microchimerism in fetal brains and investigate whether or not microchimeric cells establish functional cells in the brain.

"The study raises a lot of questions," Burlingham said.



---