Some women actually have men on the brain

By Melissa Healy, Los Angeles Times

For the Booster Shots Blog

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For decades after a woman has carried a male child in her womb or shared her mother's womb with a brother, she carries a faint but unmistakable echo of that intimate bond: male fetal DNA that lodges itself in the far recesses of her brain.

That astonishing finding, published Wednesday in the journal Public Library of Science One (PLoS One), suggests that the act of having a child is no mere one-way transmission of genetic material and all that goes with it: There is an exchange of DNA that passes into the part of us that makes us who we are. That, in turn, may alter a woman's health prospects in ways her own DNA never intended.

In the study, researchers from the Fred Hutchinson Cancer Research Center and the University of Washington examined, post-mortem, the brains of 59 women. In 63% of the brains, they found fetal DNA that could only have come from a male. While scattered throughout the brain, the genetic traces of this other individual were clustered heavily in the brain's hippocampus -- a region crucial to the consolidation of memories -- and in the parietal and temporal lobes of the brain's prefrontal cortex, areas that play roles in sensation, perception, sensory integration and language comprehension.

When a person takes on the DNA of another, as happens, for instance, in bone marrow transfusions, she is called a "chimera" -- in mythology, a beast that is the fusion of two or more creatures. The discovery that a person can carry the fetal DNA of another person has given rise to a variant: This is dubbed microchimerism.

This line of research, says rheumatologist J. Lee Nelson, coauthor of the study, "suggests we need a new paradigm of the biological self" and how it is formed. We think of ourselves as the product of two biological parents and a one-time roll of the genetic dice. That, says Nelson, appears to be wrong: In the womb, we may also pick up the DNA of older siblings left over from their stay, or of a fetal twin who never made it to daylight. In the course of our lives, we may take on the DNA of the sons we bear, or even of the sons we conceived and miscarried. And that DNA can stay with us long after our big brothers have moved on and our sons have grown up and moved away.

The sources of our DNA "are much more diverse than we know," said Nelson in an interview. And these
exchanges of DNA may play an evolutionary role far greater than we have ever imagined, she added. Walt Whitman once wrote, "I contain multitudes," and Nelson says she and her colleagues now glean new meanings from the observation.

The new study shows that this evolutionary X-factor is also at work in the brain.

It hasn't been many years since scientists first learned that a baby's DNA could cross the placental barrier from baby to mother and lodge itself in her blood and organs. The current study finds that it can also penetrate the vaunted "blood-brain barrier," which is thought to protect the brain from toxins and foreign invaders.

Once there, Nelson said, the DNA of another person may alter a woman's propensity to certain brain diseases -- conferring protection in some cases and vulnerability in others. It may carry the switches that turn brain cancers on -- or off. It may harden the brain against trauma or psychiatric disease -- or make it less resilient. Future research will need to determine how, say, carrying a male fetus may influence a mother's likelihood of developing Alzheimer's disease or auto-immune diseases such as multiple sclerosis.