

develop dopamine-related illnesses such as Parkinson's disease, schizophrenia, and addiction. Together with another new study, the work suggests that women and men have distinctive dopamine-regulating systems.

The gene, called *Sry*, is found on the Y chromosome and is therefore exclusive to men. *Sry* determines gender, signaling an embryo's gonads to develop into testes rather than ovaries.

Unexpectedly, the gene also performs a function not related to sex, says geneticist Eric Vilain of the University of California, Los Angeles. The researchers found that *Sry* makes a protein that controls concentrations of dopamine, a neurotransmitter produced in a central brain region called the substantia nigra. Dopamine carries signals from the brain to the body that control movement and coordination.

In people with Parkinson's disease, dopamine-producing neurons in the substantia nigra start to die off, and the brain gradually loses control of physical movements. Tremors and eventually paralysis result. Men are 1.5 times as likely as women to develop the degenerative disease.

To test the effect of *Sry*, the researchers suppressed the gene's expression in one side of the substantia nigra of male rats. The rats lost 38 percent of the dopamine-producing neurons on that side, the team reports in the Feb. 21 *Current Biology*. The rats also suffered Parkinson's-like loss of motor function on the side of the body controlled by the altered portion of the brain.

"What this research implies is that the mechanisms of control and production of dopamine are just different between men and women," Vilain says. He adds that the study provides the first evidence for a nonhormonal factor that produces sex differences in the brain.

Because women's brains also produce dopamine, Vilain suggests that *Sry* "must compensate for something that's present in females and not males."

Estrogens are one possibility, and they could also explain women's apparent advantage when it comes to Parkinson's disease, says neurologist Charlotte Haaxma of Radboud University's Nijmegen Medical Centre in the Netherlands. She notes that men tend to develop Parkinson's at a younger age than women do. Furthermore, women are more likely to develop a milder form of the illness.

At the World Parkinson Congress in Washington, D.C., on Feb. 22 to 26, Haaxma and her team presented data suggesting that estrogens may control dopamine concentrations and stave off the onset of Parkinson's disease. For 96 women with Parkinson's, the team compared estrogen-boosting or -depleting events, such as pregnancies and menopause. The onset of Parkinson's was delayed by an average of 2.7 years per child born, and each year of fertility beyond the group's average age of menopause held off the disease by half a year.

Vilain agrees that these data suggest that estrogen is probably the factor that drives dopamine regulation in women. Investigating such gender differences in the brain, he adds, is "an emerging field." —C. GRAMLING

#### QUOTE



**The mechanisms of control and production of dopamine are just different between men and women."**

ERIC VILAIN,  
University of California,  
Los Angeles

## Unique Explosion

### Gamma-ray burst leads astronomers to supernova

Using scores of telescopes, astronomers worldwide are chasing one of the most intriguing stellar explosions detected in nearly a decade. The supernova—a cata-

## Smoldered-Earth Policy

Created by ancient Amazonian natives, fertile, dark soils retain abundant carbon

Shortly after the U.S. Civil War, a research expedition encountered a group of Confederate expatriates living in Brazil. The refugees had quickly taken to growing sugarcane on plots of earth that were darker and more fertile than the surrounding soil, Cornell University's Charles Hartt noted in the 1870s.

The same dark earth, *terra preta* in Portuguese, is now attracting renewed scientific attention for its high productivity, mysterious past, and capacity to store carbon. Researchers on Feb. 18 at the annual meeting of the American Association for the Advancement of Science in St. Louis presented evidence that new production of the fertile soil could aid agriculture and limit global greenhouse-gas emissions.

Prehistoric farmers created

dark earth, perhaps intentionally, when they worked charcoal and nutrient-rich debris into Amazonian soils, which are naturally poor at holding nutrients. The amendments produced "better nutrient retention and soil fertility," says soil scientist Johannes Lehmann of Cornell.

Charcoal forms when organic matter smolders, or burns at low temperatures and with limited oxygen. Nutrients such as phosphorus and potassium readily adhere to charcoal, and the combination creates a good habitat for microorganisms. The soil microbes transform the materials into dark earth, says geographer William I. Woods of the University of Kansas in Lawrence.

If some of today's Amazonian farmers were to use smoldering fires to produce dark earth rather than clear fields

with common slash-and-burn methods, they "would not only dramatically improve soil and increase crop production but also could provide a long-term sink for atmospheric carbon dioxide," says Lehmann.

Slash-and-burn land clearing releases about 97 percent of the carbon that's in vegetation. Smoldering the same fuel to form charcoal releases only about 50 percent of the original carbon, Lehmann previously reported. The rest of that carbon remains in dark earth for centuries.

However, dark earth requires extra nutrients, such as those in compost. International agreements on greenhouse gases don't provide financial incentives for farmers to make the effort to create dark earth, Woods says.

Nevertheless, ongoing field

experiments in Brazil suggest that the fertility associated with *terra preta* could provide its own incentive, reports Beáta Madari of the Brazilian Agricultural Research Corporation in Rio de Janeiro.

Brazil contains a wide range of dark earths with varying compositions. The scientists found differences between the soils used for ancient backyard gardens, which received more nutrients, and soils from distant fields.

Farmers of the time "certainly would have immediately learned about the properties of that soil, however [it] formed," says anthropologist Michael J. Heckenberger of the University of Florida in Gainesville. But the knowledge about how to make dark earth disappeared after contact with Europeans decimated the indigenous population. —B. HARDER