The Mice That Don’t Miss Mom: Love and the μ-Opioid Receptor

Blind, deaf, and hungry, a newborn mouse can’t take care of itself. Take away its mother, and a pup will scream bloody murder for someone to come help it. But take away, along with mom, the neuronal receptors that respond to morphine, and the pup just doesn’t seem to care.

This finding in a study led by Francesca D’Amato of the CNR Institute of Neuroscience, Psychobiology, and Psychopharmacology in Rome, Italy, reported on page 1983, supports pharmacological evidence from a variety of animals that the opioid reward system helps ween ones bond with others. The mutant pups behave typically in other ways—they can smell threatening males and whine uncontrollably when cold, indicating that opioids affect social bonding specifically.

This is the “most robust” evidence to date showing that “a pup needs opiate activation in order to find its mother rewarding,” says neuroscientist Jaak Panksepp of Bowling Green State University in Ohio. “Endogenous opioid activity is a very important player in social feelings, especially of very young and helpless animals.”

Opioids are best known as painkillers. But give morphine to, say, lonely baby guinea pigs crying for mom, and their shrieks turn into whimpers. “There’s an intuitive appeal to the idea that the emotional pain of separation uses the same factors that mediate physical pain,” says behavioral neuroscientist Thomas Insel of the National Institute of Mental Health (NIMH) in Bethesda, Maryland. Pharmacological agents that block or activate morphine receptors in animals from sheep to monkeys support the idea that opioids and their dopamine reward system give baby animals pleasure from nuzzling mom and vice versa, forming a lasting bond—some say it’s love—between them. But four different receptors can interact with opioids, and some believe the cleanest way to test a receptor’s function is to remove it from the organism.

So D’Amato and colleagues tested infant attachment in mouse pups born to parents genetically designed to lack both copies of the μ-opioid receptor gene. The team looked at two different measures of behavior: ultrasonic vocalizations, akin to baby wails, and the pups’ preferences for nesting beds. First, the researchers removed mom from the living quarters and, 5 minutes later, subjected the pups to a new environment. Normal 8-day-old pups screamed incessantly when placed into a beaker with clean bedding; they screamed about half as much when the beaker contained old, mom-smelling fluff. The mutant mice, though, hardly screamed at all. The lack of screeching was not due to an inability to smell or react to adverse circumstances: When threatening males were near, the mutant pups squealed even more than the normal pups, and all pups freaked comparably when placed in a frigid beaker.

The researchers then tested whether the pups showed any preferences for familiar smells by allowing them access to two different cages. When given the choice between their home and fresh bedding, both normal and mutant babes waddled to their old abode. When the mice could choose between their own place or a strange mom’s nest, all of the normal pups chose their own place. But mutant pups chose between the two at random.

2004 ELECTION

Kerry Blasts Bush Over U.S. Science

Science has never been a major issue in U.S. presidential campaigns. But this week John Kerry, the presumptive Democratic nominee, made the state of America’s research enterprise a part of his effort to unseat President George W. Bush.

Speaking in Denver, Colorado, on 21 June, Kerry harshly criticized the president for leading “one of the most anti-science Administrations in history.” The Massachusetts senator also pledged to lift the ban on stem cell research and remove ideology from scientific decision-making if he wins in November.

Kerry’s talk during a Colorado campaign swing came the same day that four dozen Nobel Prize winners released a letter supporting his candidacy. The laureates, including biologist and California Institute of Technology President David Baltimore, Harvard University chemist Walter Gilbert, and retired Department of Energy lab chief Burton Richter, accused Bush of “undermining the foundation of America’s future” by reducing research funding, scaring away foreign talent, and ignoring scientific consensus on the dangers of global warming.

In a fact sheet put out the same day, Kerry’s campaign blasted the Bush Administration for putting “politics over science to please their right-wing constituency.” Kerry, who supports overturning the ban on federal funding for stem cell lines developed after 1981, said, “If we pursue the limitless potential of our science and ... use it wisely, we will save millions of lives and earn the gratitude of future generations.” The Bush campaign wasted no time responding to the attacks. “Only John Kerry would declare the country to be in scientific decline on a day when the country’s first privately funded space trip is successfully completed,” says spokesperson Steve Schmidt. “America is the world leader in patents, research and development, and Nobel prizes, and the president’s 2005 budget [would] raise federal research and development funding to $132 billion, a 44% increase since taking office.”

—ANDREW LAWLER

NEUROSCIENCE

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