Junk DNA Could Explain Personality Diversity

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patterns in the brain. In the prairie voles, males with long microsatellites had higher levels of vasopressin receptors in brain areas involved in social behavior and parental care, particularly the olfactory bulb and lateral septum. These males spent more time investigating social odors and approached strangers more quickly. They also were more likely to form bonds with mates, and they spent more time nurturing their offspring.

“This is the first study to demonstrate a link between microsatellite length, gene expression patterns in the brain and social behavior across several species,” said Young. “Because a significant portion of the human genome consists of junk DNA and due to the way microsatellite DNA expands and contracts over time, microsatellites may represent a previously unknown factor in social diversity.”

Hammock and Young’s finding extends beyond social diversity in rodents to that in apes and humans. Chimps and bonobos, humans’ closest relatives, have the vasopressin receptor gene, yet only the bonobo, which has been called the most empathetic ape, has a microsatellite similar to that of humans. According to Yerkes researcher Frans de Waal, PhD, “That this specific microsatellite is missing from the chimpanzee’s DNA may mean the common ancestor of humans and apes was socially more like the bonobo and less like the relatively aggressive and dominance-oriented chimpanzee.”

The researchers’ next step is to build upon previous studies that identified a microsatellite sequence in the human vasopressin receptor that varies in length. “The variability in the microsatellite could account for some of the diversity in human social personality traits,” explains Hammock. “For example, it may help explain why some people are naturally gregarious while others are shy.”

In particular, Young wants his research team to expand upon studies that have identified a link with autism.

Random mutations in the length of the microsatellite DNA regions modify vole social behavior

Why are some people shy while others are outgoing? A study in the June 10 issue of Science demonstrates for the first time that social behavior may be shaped by differences in the length of seemingly non-functional DNA, sometimes referred to as junk DNA. The findings by researchers at CBN and Emory’s Yerkes National Primate Research Center has implications for understanding human social behavior and disorders, such as autism.

In the study, former CBN and Yerkes graduate student Elizabeth A.D. Hammock, PhD, and CBN affiliate collaborator head and Yerkes researcher Larry J. Young, PhD, also of the Department of Psychiatry and Behavioral Sciences at Emory University’s School of Medicine, examined whether the junk DNA, more formally known as microsatellite DNA, associated with the vasopressin receptor gene affects social behavior in male prairie voles, a rodent species. Previous studies, including Dr. Young’s gene-manipulation study reported in Nature’s June 17, 2004, issue, have shown the vasopressin receptor gene regulates social behaviors in many species. The researchers bred two groups of prairie voles with short and long versions of the junk DNA. By comparing the behavior of male offspring after they matured, they discovered microsatellite length affects gene expression.

Carruth Selected for National Academies Summer Institute

Lori Carruth, PhD, CBN educator and associate professor of biology at Georgia State University, has been selected to participate in the 2005 National Academies Summer Institute on Undergraduate Education in Biology, July 31-Aug. 5, at the University of Wisconsin at Madison. The program, which focuses on the latest research in undergraduate education, is designed to introduce faculty to new technologies and methods that will enhance their teaching, especially in large classes.

“Whenever you have more than 30 students in a class, interactions among teachers and students decrease,” said Carruth. “By attending the institute, we will be learning strategies that will make teaching larger classes more exciting and productive.”

Georgia State is among 19 institutions chosen to participate in this year’s institute.

Bartness to Give Address at Nobel Symposium

The new PTSD testing system determines the extent of the impairment in the brain’s fear-control mechanisms. A patient is initially conditioned to fear a series of lights by pairing their appearance with an aversive air blast to the throat. The second set of safety lights are then presented without an air blast. Finally, the two sets of lights are displayed together without an air blast to test the patient’s ability to inhibit their fear of the lights. Electrodes attached under the eye measure fear responses based on blink size in response to the appearance of lights paired with an aversive air blast to the throat.

Illustrations by Nicole Rager Fuller, National Science Foundation

Tanja Jovanovic demonstrates how the post-traumatic stress disorder testing system gauges the brain’s fear response based on variations of blink size in response to the appearance of lights paired with an aversive air blast to the throat.
Maney Wins Presidential Early Career Award

In a June 13 White House ceremony, Donna Maney, PhD, a CBN faculty member and assistant professor of psychology at Emory University, received a 2004 Presidential Early Career Award for Scientists and Engineers (PECASE). The award is the nation’s highest honor for professionals in the early stages of their research careers. Maney studies the neural circuit underlying communication behavior from a multidisciplinary approach combining psychology, neuroscience and evolutionary biology. She is particularly interested in how animals, such as free-living songbirds, perceive, process and respond appropriately to social signals.

In addition to her research, Maney has developed an innovative science-intensive writing course for undergraduates. She also works with high school students to expose them to scientific research.

“We are honored to have Donna as a member of CBN,” said CBN director Elliott Albers. “Her award is a significant accomplishment, and we look forward to her continued success as a neuroscientist and educator.”

In 2004, Maney was awarded a Faculty Early Career Development Program Award from the National Science Foundation. The $600,000 award, which is supporting Maney’s research through 2009, is given to researchers who show significant promise in their fields and develop innovative teaching techniques.

Maney is a member of the affiliation, aggression and reproduction collaboratory.
Neuroscience Brightens Summer for BRAIN Students

BN's undergraduate summer program, Behavioral Research Advancements in Neuroscience (BRAIN), began June 6 with its largest class ever of 42 students. During the 10-week program, students are learning about state-of-the-art laboratory techniques through research immersions in CBEn labs and at Zoo Atlanta. In a study of undergraduate science education models, CBEn educator Kyle Franze, PhD, is comparing outcomes of BRAIN students who take part in a traditional research apprenticeship with those in an alternative teaching laboratory experience. She plans to present her findings in the fall at a national conference of undergraduate science educators hosted by CBEn at Georgia State University.

New Clinical Tool Could Improve PTSD Treatments

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In a preliminary study of Vietnam War veterans, Jovanovic and her colleagues determined PTSD sufferers were more afraid of the lights than control subjects. Veterans with more severe PTSD symptoms also could not inhibit their fear when presented with both sets of lights, indicative of the dysfunction in their fear control mechanisms. “This new system will provide a new way to objectively test their fear control mechanisms,” said Jovanovic. “Our hope is that it will lead to the development of more effective treatments for PTSD other anxiety-related disorders.”

The researchers’ next step is to determine whether specific genes are involved in fear inhibition. Other studies are using functional magnetic resonance imaging to examine brain activation patterns involved in fear inhibition. Development of the human PTSD testing system was based on animal research conducted by Karyn Myers, PhD, and Michael Davis, PhD, of Emory University and CBEn. Additional researchers at the Atlanta VAMC and Emory involved in the human studies include Seth Norholm, PhD, Megan Keys, PhD, and Ana Fiallos, BSEE.

Animal Behavior Comes to Life for Georgia Teachers at Zoo Workshop

Twenty Georgia school teachers learned firsthand about the neurobiology of animal behavior in CBEn’s annual professional development workshop, June 6-10, at Zoo Atlanta. Providing teachers the foundation for incorporating behavioral neuroscience into their curricula, the program featured interactive lectures and demonstrations on how to recognize behaviors through observations of zoo animals. At the end of the workshop, teachers presented their own lesson plans on behavioral neuroscience.

In addition to CBEn, this year’s program was supported by the Georgia Department of Education through an Improving Teacher Quality State Grant. CBEn educator Laura Carruth, PhD, led the workshop.