Autism's DNA Trail

Gene variant tied to developmental disorder

Scientists have taken a promising step forward in untangling the genetic roots of autism. Inheritance of a common variant of a gene that influences immunity, gastrointestinal repair, and brain growth substantially raises the chances of developing autism, at least in families with more than one child diagnosed with the severe brain disorder, a study finds.

Children with autism show severe social difficulties, language problems, and repetitive behaviors. The gene, called *MET*, regulates production of a protein that influences cell proliferation in various parts of the body.

"This is a moderate-to-high-risk autism-vulnerability gene," reports developmental neurobiologist Pat Levitt of Vanderbilt University in Nashville.

Certain variants of the gene, which contain minor alterations in their genetic code, cause several cancers.

Levitt's group had explored how *MET* contributes to brain development. After learning that the gene lies on a stretch of chromosome 7 that other investigators had linked to autism, the group began its new study.

Consulting a large database, the researchers obtained genetic information from members of 204 families in which one or more children had autism. These children ranged from below average to average in intelligence.

The researchers then identified variants of *MET*. Study participants who carried two copies of a specific *MET* variant displayed autism substantially more often than the others did. Levitt's group later found the same association for children with autism in 539 additional families.

Further analyses indicated that the link between the *MET* variant and autism appeared primarily in families with two or more affected children, the researchers report online this week for an upcoming *Proceedings of the National Academy of Sciences*.

Laboratory tests showed that this *MET* form lowers the gene's activity and reduces its production of proteins that bind to various tissues.

If confirmed by other groups, these results would explain controversial reports that people with autism often have immune and gastrointestinal problems, according to Levitt.

> **QUOTE**
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> *PAT LEVITT, Vanderbilt University*

Roughly 47 percent of the population carries at least one copy of the autism-associated *MET* variant. The researchers have yet to learn how it operates in the minority of that group that develops autism, which affects about 1 in 500 individuals, Levitt notes. In some people, beginning before birth, *MET* might respond to unknown environmental influences or interact with other genes to derail brain formation, Levitt theorizes.

Other researchers had reported preliminary associations between DNA regions and autism. "This is the first time someone has identified a candidate gene for autism, replicated their finding, and demonstrated that gene's biological function," remarks geneticist Daniel H. Geschwind of the University of California, Los Angeles. *MET* may contribute to autism in diverse ways, he proposes.

However, *MET* could be just the tip of the genetic iceberg. "Autism will turn out to be many different disorders influenced by hundreds of genes," Geschwind predicts.

An effort is now under way, led by geneticist Anthony P. Monaco of the University of Oxford in England, to gather DNA from as many as 2,000 families with autistic children. When that database is completed in about a year, researchers will use it to confirm whether numerous candidate genes, including the *MET* variant, contribute to autism, Monaco says. —B. BOWER

Horns vs. Sperm

Male beetles on tight equipment budget

A group of dung beetle species that sprout horns like tiny elk, rhinos, or sci-fi invaders often face trade-offs between horn and testes sizes, say researchers.

Among the 2,000 species of *Onthophagus* dung beetles, males sport various styles of swooping prongs, with which they wrestle other males for access to females. "That's like producing another leg and wearing it around on your head for the rest of your life," says Douglas J. Emlen of the University of Montana in Missoula. His earlier experiments showed that as an individual beetle develops horns, they steal resources from other organs, leading to smaller eyes, antennae, or wings.

To test for trade-offs between horns and testes, Emlen and Leigh W. Simmons of the University of Western Australia in Crawley worked with immature *Onthophagus nigriventris* and cauterized cells that would have grown into horns. The prongless males grew testes that were about 30 percent larger than those of comparably sized, horned males, Simmons and Emlen report.

That finding, they note, fits with results from another research team, which stopped genital growth in an *Onthophagus* species. Unusually small males grew horns.

Sperm investment hasn't gotten its due respect, comments Scott Pitnick of Syracuse (N.Y.) University. He welcomes the beetle research as adding to the growing body of work demonstrating that "sperm production turns out not to be cheap, after all." Pitnick and his colleagues have reported that among species of small, insect-eating bats, investing in supersize testes tends to correspond to having smaller brains.

However, Simmons and Emlen didn't find such a straightforward pattern when they analyzed more than 20 species of *Onthophagus* beetles. Big horns didn't correspond to smaller testes, as would be expected if there were a simple constraint on growth.

Instead, some beetle species seem to protect their genital development. "Given enough [evolutionary] time, something will come up that's a way around a constraint," says Emlen.

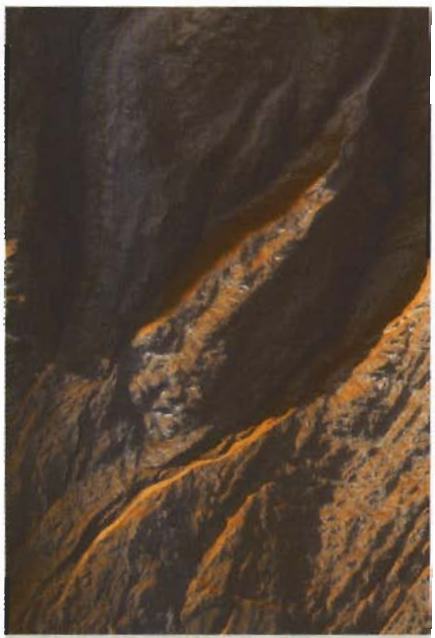
TOUGH GUYS *Onthophagus* **dung beetles grow an extraordinary variety of horns.**

E. GREENE

The beetle species that broke the expected pattern had protected the development of their testes to an unusual degree. Emlen and Simmons report the findings online this week for an upcoming *Proceedings of the National Academy of Sciences*.

The relationships between horn and testes sizes "certainly suggest there's something going on—it's not random," says Gerald Wilkinson of the National Science Foundation in Arlington, Va.

The beauty of studying trade-offs between testes and horn sizes is that reproductive pressures drive them both, Wilkinson says. *Onthophagus* females mate with multiple males, so the competition favors males that deliver abundant sperm. Yet that delivery power doesn't matter unless a male uses his horns to reach the female. —S. MILIUS



A sunrise view of Mars

Darkened gullies slice down the edge of a crater in one of the first high-resolution images sent by the Mars Reconnaissance Orbiter. The sharp edges of the channels suggest that they are no more than a few million years old. NASA scientists say that the braided gullies look as if sediment-rich streams had carved them, supporting the notion that water once flowed across much of the Red Planet. "This shows a soaking-wet Mars," says Alfred McEwen of the University of Arizona in Tucson. The orange areas, enhanced for greater contrast, show clay-rich soil, which the scientists say could have formed only in the presence of water. The lightest areas in the picture are covered in carbon dioxide frost, which will burn off during the Martian day. —J. REHMEYER

Back on the Table?

Element 118 is served up again

New research suggests that the periodic table may once again reach 118. A team of nuclear chemists from the United States and Russia has announced the brief appearance of the unnamed element, the heaviest to date.

A report of element 118 had made a splash before. In 1999, a group at Lawrence Berkeley (Calif.) National Laboratory claimed that it had created the element by bombarding lead with krypton ions (*SN: 6/12/99, p. 372*). But the researchers retracted the finding 2 years later (*SN: 8/4/01, p. 68*), after other labs couldn't reproduce the results.

The new work synthesized element 118 from different materials—an isotope of californium and calcium ions. During each of two several-months-long experimental runs, the research team pummeled the californium with 10 million trillion calcium ions, says Mark A. Stoyer of Lawrence Livermore (Calif.) National Laboratory, which partnered with the Joint Institute for Nuclear Research in Dubna, Russia, for the project.

Three times—once in the first run in 2002 and twice in the second run in 2005—atoms of californium and calcium combined to form the new element, which contains 118 protons and 176 neutrons.

Each of the three atoms of element 118 remained on the scene for just under one-thousandth of a second. The element then decayed to element 116, then to element 114, and finally to element 112 before splitting in two, says Lawrence Livermore team member Dawn A. Shaughnessy.

At this point, the data "look good," comments Kenneth E. Gregorich, a nuclear chemist at Lawrence Berkeley. "The decay properties that they are measuring are as expected," he says. The results, published in the October *Physical Review C*, await independent confirmation.

The U.S. and Russian team had previously discovered elements 113, 114, 115, and 116. None of its experiments has been confirmed by an outside laboratory, although recent research by a Swiss team working at the Russian facility provides evidence for 114, notes Gregorich.

Element 118 resides near the so-called island of stability (*SN: 2/6/99, p. 85*), a group of heavy elements that theoretical physicists predict will have "magic numbers" of protons and neutrons that make them highly stable.

Some physicists expect that these heavy elements, if they exist, will persist for "hours or days or even a year," says Stoyer. "If you could find something that heavy and that long-lived, maybe you could find some more useful chemical properties," he says. "That's what excites people in this kind of work."

The U.S. and Russian team will next try to synthesize element 120, Stoyer says. When researchers can no longer cram protons into a nucleus, "that will be the end of the periodic table," he adds. —A. CUNNINGHAM

Quirky Cardiology

Crocs' hearts may aid their digestion

The crocodile's ability to direct oxygen-depleted blood to its stomach may be instrumental in digesting large, bony meals and recovering from hunting-induced accumulation of lactic acid, some researchers propose. But other scientists argue that the croc's unique circulatory system is instead an adaptation for lengthy dives, during which the animal must hold its breath as it stalks and then drowns its prey.

The hearts of crocodilians, including crocodiles and alligators, have four compartments. Two chambers send oxygen-rich blood to most of the body, and two move deoxygenated blood toward the lungs to be replenished. Mammals and birds use that same basic hardware.

But unlike mammals and birds, crocodil-

HUNT AND SHUNT **A research team proposes that alligators shunt deoxygenated blood to their stomachs to aid digestion of bones, such as the one seen in this X ray.**

UNIV. ARIZONA, JPL/NASA; FARMER