

New Tool Targets Rare Brain Disease

Researchers have developed new insight into a rare but deadly brain infection. Most frequently found in people with suppressed immune systems, the disease, called progressive multifocal leukoencephalopathy (PML) disease, had long evaded study as well as tests for new treatments.

In the *Journal of Clinical Investigation*, Steve Goldman, the Dean Zutes Chair in Biology of the Aging Brain and Distinguished Professor in Neurosciences, and Maiken Nedergaard, the Frank P.

Smith Professor of Neurosurgery, reported that a tool they developed provided a new platform for studying the elusive disease and the virus that causes it.

The two, who are the codirectors of the Center for Translational Neuromedicine, say that the new model revealed that the virus attacks cells known as astrocytes rather than oligodendrocytes, as previously believed.

Researchers estimate that the virus behind the disease is so common that 70 to 90 percent of

Americans have been exposed to it and may carry it in a dormant form. For the vast majority, the virus will never become infective or trigger disease.

But in some people with compromised immune systems, the virus can eventually make its way to the brain. Once there, it can trigger PML, an almost uniformly fatal infection of the brain's white matter.

First seen in leukemia and lymphoma patients in the 1950s and '60s, PML became more

common during the AIDS epidemic in the 1980s, prior to the widespread use of antiretroviral treatments. More recently, it has been increasingly observed in people undergoing long-term immunosuppressive treatments for autoimmune diseases like multiple sclerosis.

The findings may enable researchers to focus on potential ways to identify the early symptoms of the disease, as well as to develop new therapies.

—Mark Michaud

Playing Action Video Games Can Boost Learning

A new study shows for the first time that playing action video games improves not just the skills taught in the game, but learning capabilities more generally.

Published in the *Proceedings of the National Academy of Sciences* and led by Daphne Bavelier, a research professor in brain and cognitive sciences, the study first used a pattern discrimination task to compare action video game players' visual performance with that of people who don't play action video games. Then the team conducted another experiment to see if habitual players of the games may be endowed with better templates independent of their game play, or if the action game play led them to have better templates.

Prior research by the group and by other scientists "has shown that action gamers excel at many tasks. In this new study, we show they excel because they are better learners. And they become better learners by playing the fast-paced action games," says Bavelier.

Being a better learner means developing the right templates faster and thus achieving better



performance—and playing action video games, the research team found, boosts that process. The researchers also found that the action gamers' improved performance is a lasting effect. When tested several months to a year later, the action-trained

participants still outperformed the other participants, suggesting that they retained their ability to build better templates.

Bavelier's team is now investigating which characteristics in the games are key to boosting players' learning.

"Games other than action video games may be able to have the same effect," she says. "They may need to be fast-paced, and require the player to divide his or her attention, and make predictions at different time scales."

—Monique Patenaude

Damaging Brain's 'Garbage Truck' May Accelerate Dementia

A new study in the *Journal of Neuroscience* shows that traumatic brain injury can disrupt the brain's waste removal system, allowing toxic proteins to accumulate in the brain and setting the stage for neurodegenerative diseases such as Alzheimer's and chronic traumatic encephalopathy.

"We know that traumatic brain injury early in life is a risk factor for the early development of dementia in the decades that follow," says Maiken Nedergaard,

the Frank P. Smith Professor of Neurosurgery and senior author of the research. "This study shows that these injuries set into motion a cascading series of events that impair the brain's ability to clear waste, allowing proteins like tau to spread throughout the brain and eventually reach toxic levels."

The findings are the latest in a series of insights that are changing how scientists understand neurological disorders. In a 2012 study, Nedergaard and colleagues

described a previously unknown system of waste removal that's unique to the brain and which researchers dubbed the "glymphatic system." The body's normal waste removal system doesn't extend to the brain, but waste removal is essential to prevent the accumulation of toxic proteins and other debris. The team showed that mice, whose brains are similar to those of humans, pump cerebral spinal fluid—the fluid that surrounds the brain—through brain tissue,

flushing waste from the spaces between the brain's cells.

The protein tau helps stabilize the fibers, or axons, that nerve cells use to communicate with their neighbors. But during trauma, large numbers of these proteins are shaken free from the axons and drift into the space between the brain's cells. Once unmoored, the sticky proteins are attracted to each other and, over time, form "tangles" that can become toxic to brain function.

—Mark Michaud

Concussions Derail Batting Performance for MLB Players

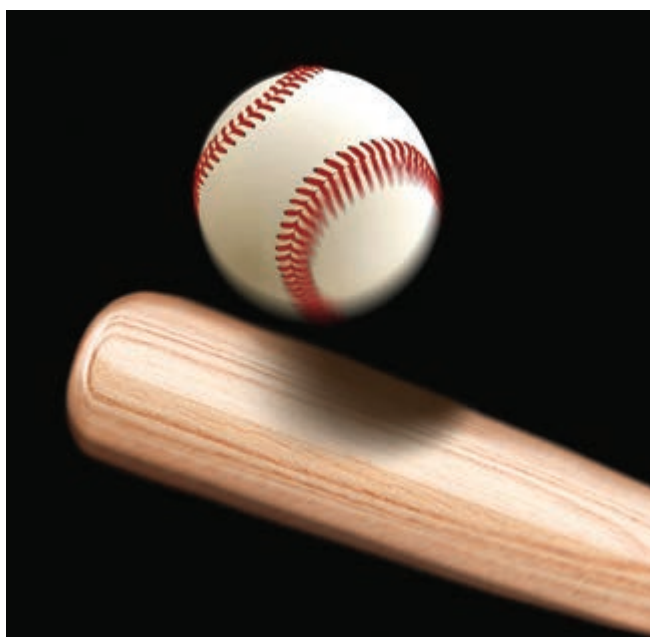
The message "When in doubt, sit it out" flashed on video boards throughout the 2014 World Series, and with good timing: a new analysis of Major League Baseball statistics shows that concussed players may not be fully recovered when they're cleared to return to the batting lineup.

In a study that looked at MLB players who suffered a concussion between 2007 and 2013, Rochester researchers found that during the first two weeks back, the concussed players' batting performances were significantly worse than another group of players who were rusty because of being away on leave during the same period.

Lead author Erin Wasserman, an epidemiology doctoral student, presented the data at the 142nd annual meeting of the American Public Health Association last fall.

Brain injuries are most often associated with contact sports, but they're prevalent in baseball, too. At the high school and college levels, baseball concussions are rising at a rate of about 14 percent a year, researchers say.

In the MLB study, players returning after a concussion had lower batting averages (.234 versus .264), lower slugging percentages (.359 versus .420), and lower on-base plus slugging percentages (.654 versus .747) compared to players returning



from bereavement or paternity leave.

"Although players who sustain a concussion may be symptom-free and cleared by MLB protocol to return to play, the residual effects of concussion on the complex motor skills required for batting may still be a problem," says principal investigator Jeffrey Bazarian, associate professor of emergency medicine and a national expert in sports head injuries.

When a batter's at the plate, the brain and its neural networks must be in top form to master hand-eye coordination, intense

visual acuity, fast reaction time, postural stability and balance, and swing control in just 400 milliseconds—the estimated time it takes most balls to pass from pitcher to batter, Bazarian says.

After a concussion, brain function can be impaired for weeks or months, resulting in such symptoms as slowed thinking or response speed, and poor concentration.

Understanding the impact of concussions on batting performance can help to inform decisions about when to return to the lineup, the study says.

—Leslie Orr

Infants' Scores Linked to Congenital Herpes

Babies with congenital infection of a herpes virus known as human herpesvirus-6 (HHV-6) are more likely to score lower on a 12-month mental development test, according to a new study published in the journal *Pediatrics*.

The study, led by Mary Caserta, professor of pediatrics and infectious disease, assessed 299 newborns over their first year of life. Scores on the test were similar for the infected babies to those of infants exposed to lead or cocaine in the womb. The differences were not large—all results fell within the normal range.

One of eight herpes viruses that infect humans, HHV-6 infects every human, usually in the first two years of life. But for a small portion of the population, the virus is integrated into the chromosomes, which causes a parent to transmit the virus to offspring still in the womb. About 1 percent of newborns have been infected with the virus congenitally.

Caserta developed the study with the late Caroline Hall, a longtime professor of pediatrics who spent her career studying HHV-6 and other viruses. Next, Caserta plans to study older children with learning or cognitive disabilities to check their infection rate.

—Sean Dobbin