### • *Being Curious Can Boost Your Memory*

*By Tanya Lewis, Staff Writer / October 03, 2014 10:28am ET*

Everyone knows it's easier to learn about a topic you're curious about. A new study reveals what's going on in the brain during that process, and that such curiosity may give a memory boost. When participants in the study were feeling curious, they were better at remembering information even about unrelated topics, and brain scans showed activity in areas linked to reward and memory.

The results, detailed yesterday (Oct. 2) in the journal Neuron, hint at ways to improve learning and memory in both healthy people and those with neurological disorders, the researchers said.

Gruber and his colleagues put people in a magnetic resonance imaging (MRI) scanner and showed them a series of trivia questions, asking them to rate their curiosity about the answers. Later, the participants were shown selected trivia questions, then a picture of a neutral face during a 14-second delay, followed by the answer. Afterward, the participants were given a surprise memory test of the faces, and then a memory test of the trivia answers.

Not surprisingly, the study researchers found that people remembered more information about the trivia when they were curious about the answers. But unexpectedly, when the participants were curious, they were also better at remembering the faces, an entirely unrelated task. Participants who were curious were also more likely than others to remember both the trivia information and unrelated faces a day later, the researchers found.

The brain scans showed that when people were curious they showed more activation of brain circuits in the nucleus accumbens, an area involved in reward. These same circuits, mediated by the neurochemical messenger dopamine, are involved in forms of external motivation, such as food, sex or drug addiction.

Finally, being curious while learning seemed to produce a spike of activity in the hippocampus, an area involved in forming new memories, and strengthened the link between memory and reward brain circuits.

The study's findings not only highlight the importance of curiosity for learning in healthy people, but could also give insight into neurological conditions. For example, as people age, their dopamine circuits tend to deteriorate, so understanding how curiosity affects these circuits could help scientists develop treatments for patients with memory disorders, the researchers said.

### • *How Do Doctors Test for Ebola?*

*By Tanya Lewis, Staff Writer | October 03, 2014 03:54pm ET*

Scientists working with Ebola must work in Biosafety Level 4 conditions, like those this CDC scientist is working under. Credit: CDC/ Dr. Scott Smith

Ebola is difficult to diagnose when a person is first infected because the early symptoms, such as fever, are also symptoms of other diseases, such as malaria and typhoid fever. "The symptoms are extremely nonspecific in the beginning — Ebola looks like almost anything," said Dr. Bruce Hirsch, an infectious-disease specialist at North Shore University Hospital in Manhasset, New York.

**Who could have it?**

The main question doctors consider is whether the person has been in one of the countries in West Africa experiencing the current Ebola outbreak (Guinea, Sierra Leone or Liberia) within the last 21 days, which is the incubation period of the virus. Or, whether that person has been exposed to someone who has been in one of those places, he added.

Earlier, a man in Texas became the first person to be diagnosed with Ebola in the United States, after traveling to Dallas from Liberia. The patient sought medical care but was initially sent home, before being admitted to a hospital in Dallas and testing positive for the virus. More recently, two healthcare workers, who cared for him, have also tested positive.

Ebola spreads via contact with the blood or bodily fluids of an infected person, objects contaminated with those fluids or contact with infected animals; it does not spread through the air (Ed. note: see BJM Commentary). Symptoms of the disease include a fever greater than101.5 degrees Fahrenheit (38.6 degrees Celsius), severe headache, muscle pain, diarrhea, vomiting, abdominal pain or unexplained hemorrhage, according to the Centers for Disease Control and Prevention (CDC). A person showing these symptoms and who has been in an area with Ebola within the past 21 days, should be put in isolation and tested for Ebola, the CDC says.

**Tests for Ebola**

A number of tests can be used to diagnose Ebola within a few days of the onset of symptoms, which can detect the virus' genetic material or the presence of antibodies against the pathogen.

The most accurate of these is likely the polymerase chain reaction (PCR) test, a technique that looks for genetic material from the virus and creates enough copies of it that it can be detected.

However, this test can be negative during the first three days an infected person has symptoms, said Dr. Sandro Cinti, an infectious-disease specialist at the University of Michigan Hospital System/Ann Arbor. The important thing is keeping the patient isolated until you can get to a diagnosis. Meanwhile, doctors will be running tests to rule out other diseases, such as malaria, which can be detected more quickly than Ebola, he said.

Another test for Ebola looks for antibodies produced by the body's immune system in response to the virus. Known as the antigen-capture enzyme-linked immunosorbent assay (ELISA), this test can take even longer than three days to give a positive result for an infected person, Cinti said. And antibodies can also be detected after a patient recovers, he added.

Once a patient is diagnosed with Ebola, scientists may attempt to isolate the virus — which is a type of filovirus — by culturing it with living cells and examine it using electron microscopy. Culturing the virus is very dangerous and is not a practical means of diagnosing infection, but may help researchers understand how the virus infects cells and test possible treatments.

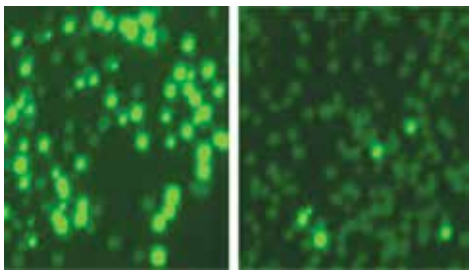
So, given the severity of an Ebola infection, why wouldn't you test everybody with the remotest chance of having the disease?

A huge number of people come to the United States from Africa with fevers, Cinti said, and testing all of them for Ebola would drain hospital resources and raise unnecessary panic. "We really have to be

clear and get good histories about exposure," he said. "It makes absolutely zero sense to test people who aren't from high-risk areas."

### • *'Programmable' antibiotic harnesses an enzyme to attack drug-resistant microbes*

*Date: October 5, 2014*
*Source: Rockefeller University*



*Rockefeller University researchers colonized mouse skin with a mix of bacterial cells, some resistant to the antibiotic kanamycin. They made the resistant cells glow (left) and treated the mix with an enzyme that targeted and killed off most resistant cells (right).*

Researchers at Rockefeller University and their collaborators are working on a smarter antibiotic. And in research to be published October 5 in Nature Biotechnology, the team describes a 'programmable' antibiotic technique that selectively targets the bad bugs, particularly those harboring antibiotic resistance genes, while leaving other, more innocent microbes alone.

"In experiments, we succeeded in instructing a bacterial enzyme, known as Cas9, to target a particular DNA sequence and cut it up," says lead researcher Luciano Marraffini, head of the Laboratory of Bacteriology. "This selective approach leaves the healthy microbial community intact, and our experiments suggest that by doing so you can keep resistance in check and so prevent certain types of secondary infections, eliminating two serious hazards associated with treatment by classical antibiotics."

The new approach could, for instance, reduce the risk of C. difficile, a severe infection of the colon, caused by the C.difficile bacterium, that is associated with prolonged courses of harsh antibiotics and is a growing public health concern.

The Cas9 enzyme is part of a defense system that bacteria use to protect themselves against viruses. The team co-opted this bacterial version of an immune system and turned it against some of the microbes

The researchers were able to direct Cas9 at targets of their choosing by engineering spacer sequences to match bacterial genes then inserting these sequences into a cell along with the Cas9 gene. The cells own machinery then turns on the system. Depending on the location of the target in a bacterial cell, Cas9 may kill the cell or it may eradicate the target gene. In some cases, a treatment may prevent a cell from acquiring resistance, they found.

In initial experiments, Bikard and colleagues targeted a strain of the common skin and respiratory bacteria Staphylococcus aureus that is resistant to the antibiotic kanamycin. Treatment by Cas9 programmed to target a part of the resistance gene killed most of the resistant Staph, but left behind the kanamycin-susceptible Staph.

Rockefeller University researchers colonized mouse skin with a mix of bacterial cells, some resistant to the antibiotic kanamycin. They made the resistant cells glow (left) and treated the mix with an enzyme that targeted and killed off most resistant cells (right).

Credit: Marraffini Lab and Fischetti Lab / Nature Biotechnolog

In spite of the promising results, the delivery system needs improvement. The researchers used bacteria-infecting viruses to inject the programmed Cas9 enzymes into the bacterial cells, but these viruses only attack specific types of cells. Scientists need to devise a less discriminating method of delivery, before the technology can be used to develop a new class of antibiotics, Marraffini says.

Journal Reference: David Bikard, Chad W Euler, Wenyan Jiang, Philip M Nussenzweig, Gregory W Goldberg, Xavier Duportet, Vincent A Fischetti, Luciano A Marraffini. Exploiting CRISPR-Cas nucleases to produce sequence-specific antimicrobials. Nature Biotechnology, 2014; DOI: 10.1038/nbt.3043

### • *The lab-grown penis: approaching a medical milestone*

*The Observer 4, oct, 2014*

After more than 20 years of research, a team of scientists are bioengineering penises, which may soon be transplanted safely on to patients. It is an extraordinary medical endeavour that has implications for a wide range of disorders.

Gathered around an enclosure at the Wake Forest Institute for Regenerative Medicine in North Carolina in 2008, Anthony Atala and his colleagues watched anxiously to see if two rabbits would have sex. The suspense was short-lived: within a minute of being put together, the male mounted the female and successfully mated. While it's not clear what the rabbits made of the moment, for Atala it was definitely special. It was proof that a concept he'd been working on since 1992 – that penises could be grown in a laboratory and transplanted to humans – was theoretically possible.

The male rabbit was one of 12 for which he had bioengineered a penis; all tried to mate; in eight there was proof of ejaculation; four went on to produce offspring.

The media's coverage of Atala's announcement a year later was understandably excited. Not just because of the novelty of a man growing penises in a laboratory, but because his work would fulfill a real need for men who have lost their penis through genital defects, traumatic injury, surgery for aggressive penile cancer, or even jilted lovers exacting revenge.

At present, the only treatment option for these men is to have a penis constructed with skin and muscle from their thigh or forearm. Sexual function can be restored with a penile prosthetic placed inside. Another option is a penis transplant from another individual, but this carries a risk of immunological rejection.

The chance of organ death can be lessened with anti-rejection drugs, but these drugs have serious side-effects. Transplants can also have a psychological impact.

Atala hopes his technique will mitigate both immunological and psychological issues because his penises would be engineered using a patient's own cells. "The phallus is actually much longer than you think," he explains. "It goes all the way behind the pelvis, so no matter the extent of the damage, there is a high probability that there are salvageable cells."

To some, engineering human organs sounds like science fiction, but for Atala it's an absolute necessity. As we live longer (and thus our organs fail more) the shortage of organs for donation will only get worse. If we can work out how to generate the organs people need in a reliable and effective way, the technology can improve a lot of people's lives. In 2006, Atala and his team announced the first successful bioengineered organ transplant, a bladder, which had been implanted into seven patients in 1999. Earlier this year he announced the successful follow-up of four women given bioengineered vaginas in 2005-2008. In 2004, they implanted the first bioengineered urethra into five boys. This technology will help in their work towards reconstructing the penis.

Atala and his colleagues are also working on 30 different organs and tissues including a kidney, which could be made using a 3D printer, and tissue for the liver, heart and lung.