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## How to Contain the Ebola Virus in the Hospital: Lessons From Nebraska

### *Nebraska Biocontainment Unit Provides Illustrated Instructions*

Laura A. Stokowski, RN, MS

#### **Can We Contain Ebola in Our Healthcare Facilities?**

Healthcare facilities throughout the United States are scrambling to put into place Ebola preparedness plans that don't involve responding to Ebola by "making it up as we go along." Nurses are demanding to know what these plans are, how they will be trained, and how they can depend on having the supplies, equipment, staffing, and resources needed to carry them out.

A significant barrier has been an apparent lack of agreement about what should be done to protect staff and other patients from Ebola. How much and what type of personal protective equipment (PPE) is warranted? Is more PPE better? How should training take place to ensure that staff are able to put on (don) and take off (doff) PPE safely? What type of supervision should be provided during donning and doffing of PPE? What level of supervision should be in place during patient care to ensure that breaches of infection control technique and potential contamination do not occur?

Many suggestions to enhance infection control procedures have been offered, but it is up to healthcare facilities to adopt such methods as buddy systems or on-site supervision of infection control technique. As the Ebola situation evolves, guidelines and recommendations could change in response to changing levels of risk. However, experts continually claim that by isolating patients with Ebola and using proper PPE and PPE technique, it should be possible to prevent the spread of Ebola. This has been demonstrated in West Africa, but when the first patient with Ebola diagnosed in the United States entered the healthcare system, at least two nurses became infected.

Those nurses are now being cared for in special biocontainment units where patients with Ebola, transferred from West Africa, have been successfully cared for without risk to healthcare workers. Could we learn from nurses right here in the United States who are taking care of patients with Ebola, and doing a remarkably effective job at containing the virus?

#### **Biocontainment Units for Patients With Ebola**

The United States is fortunate in having four specialized units capable of safely providing care for patients with contagious or deadly infectious diseases. These units are located at Emory University Hospital in Atlanta, Georgia; the National Institutes of Health (NIH) in Bethesda, Maryland; St. Patrick's Hospital in

Missoula, Montana; and the Biocontainment Patient Care Unit at Nebraska Medical Center in Omaha, Nebraska.

Although their approaches differ slightly, both Emory University and Nebraska Medical Center have cared for patients with Ebola during the current outbreak, and so far, no staff member from either facility has acquired Ebola virus from a patient. Dallas nurses Nina Pham and Amber Vinson, who have tested positive for Ebola, are now receiving care at NIH and Emory, respectively. Although the average hospital can't duplicate the facilities, resources, and highly specialized care possible in these biocontainment units, some of their standard operating procedures and rigorous training models could be useful lessons to those working to establish Ebola preparedness plans.

#### **The Nebraska Biocontainment Unit**

The Biocontainment Unit at Nebraska Medical Center was designed as a facility for the treatment of patients affected by bioterrorism or such highly contagious and dangerous infectious diseases as Ebola, SARS, or monkeypox. Although the unit has five rooms with two beds each, Lead Nurse Kate Boulter, RN, reports that owing to the amount of autoclaving required when caring for a patient with a viral hemorrhagic disease, they can only care for two to three such patients at a time.

The facility in Nebraska has a unique arrangement. There is a separate "clean" room for clean equipment and supplies, a "dirty" staging room for collecting waste, a room with a pass-through autoclave, and an on-site satellite lab for running basic lab studies. Inside the patient room is a staff computer with Vidyo (a HIPAA-approved continuous Skype videoconferencing connection between the staff in the room and the staff outside the room), and another computer with Vidyo that allows the patient to communicate with his or her family members (who are barred from visiting in the Biocontainment Unit).

These resources are enviable, but what is really special about the Biocontainment Unit is its staff. Boulter believes in leading by example. "I never ask the nurses to do anything that I wouldn't do myself," says Boulter, who proves this by personally transporting patients with Ebola from the airport to the hospital, and by suiting up and assisting with admitting patients to the unit. The unit's 21 staff nurses (who are all based elsewhere in the hospital) choose to be part of the Biocontainment team and participate in routine education and training, including regular simulation drills on the unit. The nurses themselves developed the protocols that are followed in the Biocontainment Unit, revising and tweaking them to maximize safety.

The Biocontainment Unit also has respiratory therapists and patient care technicians. A typical day shift requires six staff members, including at least three

nurses. Staff members fulfill different roles, all while suited up in full PPE. There is an autoclaver whose job is to autoclave all trash and laundry, a "doffer" who is always stationed outside the patient care area to assist staff (patient care providers and laboratory technicians) in doffing PPE, and a bedside nurse who remains in the room with the patient. Typically, nurses spend no more than four hours at a stretch in the patient's room, during which time they do not eat, drink, or use the restroom. If there is an emergency such as a code, other staff in full PPE will enter to assist, but as much as possible, actions are directed by the physician using the Vidyo conferencing system.

Whenever staff members in the patient's room make contact with the patient or items that the patient has used, they remove their outer gloves, wipe the middle-layer gloves with a bleach wipe, and then replace the outer gloves. "A lot of glove-changing goes on in that room," says Boulter. The doffer and the autoclaver perform the same process every time they touch a "dirty" item.

The attention to detail that prevents cross-contamination also extends to environmental cleanliness. Because environmental services personnel are not permitted in the biocontainment unit, the staff also cleans the unit and the patient rooms every night, using a checklist. Every surface is wiped with bleach and there are separate mop buckets for each area (nurse's station, hallway, patient room). New mop heads are used each night.

### **The Art of Donning and Doffing PPE**

If you are the nurse involved in the care of a patient with Ebola virus infection on the Biocontainment Unit at Nebraska Medical Center, you don't wear your own scrubs, socks, or shoes at work. You don't use your own elastic tie to pull back your hair. You don't even wear your own underwear.

Wait a minute - what level of isolation is hazmat underwear? Actually, it is just one detail of the entire package of protection provided for staff members working in the Biocontainment Unit. Supplying everything down to the underwear means that staff members don't have to take home any potentially contaminated items that might transmit Ebola (or any other infectious disease) to family members.

It all makes sense when you understand how seriously protection is taken in the Biocontainment Unit. The nurse enters the unit through a locker room where she exchanges street clothes for hospital-provided underclothing, scrubs, socks, and plastic Croc-type shoes. She then dons standard precaution-level "contact" isolation gear: isolation gown, gloves, and mask, all of which are worn by everyone who enters the Biocontainment Unit, even to sit at the desk and answer the phone. If the nurse is assigned to any patient care role, additional PPE is applied in a clean staging area before entering the patient's room, according to a specific "donning" protocol. A line on the floor before the entrance to the hallway

where the patient room is located reminds staff that no one crosses the line without donning full PPE (nor does anyone who is "dirty" cross the line in the other direction without following the doffing protocol.)

**Assisted by a second staff member (Figure), the nurse dons the following items of PPE:**

- *Surgical boot covers (knee-high)*
- *Surgical gown (impermeable, level 4, according to Association for the Advancement of Medical Instrumentation [[AAMI](#)])*
- *Hood (covering the hair, ears, neck, and shoulders, tucked underneath the gown)*
- *Three pairs of gloves: standard (under the cuffs of the gown), purple nitrile KC500 gloves (cuffs are taped to the gown using duct tape to prevent slippage), and another pair of standard gloves over the KC500 gloves*
- *N95 mask (1870 white trifold style)*
- *Optional eye protection*
- *Face shield*
- *An apron is applied in the room if procedures are to be performed that might generate splashing or droplets (removed immediately following the procedure)*

Tyvek suits (coveralls) and powered, air-purifying respirators are *not* worn routinely but are available if patient condition and care procedures warrant additional protection. Every staff member working in the patient room, the autoclave room, the on-site lab, or functioning as the "doffer" wears PPE as described above.

**The illustrated Nebraska Biocontainment Unit PPE Donning Protocol for Ebola Patients is available [here](#).**

**Figure. Alicia Parker, RN, assists Drew Molacek, RN, in donning PPE in the Nebraska Biocontainment Unit. Courtesy of the Biocontainment Unit at Nebraska Medical Center.**



Leaving the patient area is even more critical. No one simply walks out the door of the patient room, tearing off their PPE and tossing it into a red trash can. Leaving is a strictly controlled process that begins with alerting the doffer of the intent to leave, and waiting for the doffer to signal that it is safe to enter the "dirty staging area." In preparation, the doffer places a "doffing pad" on the floor that is

divided into two zones, and a trash can lined with an autoclave bag into which PPE will be discarded.

Before even leaving the room, the nurse first removes the top pair of gloves and wipes the outside of her purple gloves with bleach. She then opens the door and steps onto the doffing pad. The doffer peels the duct tape from the purple gloves, which are then removed using glove-in-glove technique. The nurse turns around, and the doffer unties her gown, gently flipping it forward for the nurse to remove it carefully by gathering it and turning it inside-out into a ball. Nothing contaminated is ever allowed to touch the nurse's skin. Boot covers are removed one at a time by the doffer, and as each cover is removed, the nurse steps onto zone 2 of the doffing pad. Before removing her face shield, the nurse removes the last pair of standard patient gloves, cleans her hands with hand sanitizer, and applies a new pair of gloves. The face shield is removed, and then the hood is untied and removed carefully, along with the N95 mask. The gloves are removed and the nurse sanitizes her hands again, and applies a clean mask and gloves. Finally, the doffer uses a bleach wipe to clean the top, sides, and bottom of each of the nurse's shoes, and as each shoe is cleaned, the nurse steps off of the doffing pad with the cleaned foot.

The nurse is not finished yet. She proceeds to the sink, removes her gloves, and washes her hands with soap and water before applying another pair of gloves. She then stands at "the line" until the shower is ready, and then she showers and gets dressed in clean scrubs. Everything but her scrubs and shoes go in the trash.

**The illustrated Nebraska Biocontainment Unit PPE Doffing Protocol for Ebola Patients is available [here](#).**

It is a lot to remember, and it seems as though the doffing procedure, especially, would take a long time, but it doesn't. Although it is never rushed, the staff members have practiced it so often and become so adept at each step, that the protocol is ingrained as a habit.

### **Caring for the Caregivers**

Boulter suggests that some of the lessons they have learned in the past 9 years could be useful to other hospitals, and not all of these lessons have to do with PPE. For one thing, Boulter believes in identifying the needs of nurses on the frontline of care and meeting them as much as possible, whether that means a place to rest when nurses are tired, food and drink when they take their breaks, or their preferred brand of shampoo or body wash for the shower. She does not ask nurses to spend 12 hours working in full PPE. Her staff is highly engaged in maintaining the skills and knowledge necessary to safely care for patients with infectious diseases, and the nurses take their own temperatures to monitor for possible Ebola

infection. The unit also has a dedicated behavioral specialist to provide support to staff, patients, and family members.

It is noteworthy that the PPE used in the Biocontainment Unit at Nebraska Medical Center is not rare or exotic; it is available at most hospitals in the United States. Their meticulous protocol for putting on and taking off this PPE could certainly be emulated, and to assist in this, the unit's photographic donning and doffing protocols are available [online](#). The unit is also making a video to illustrate these protocols. When it is finished, it will be available on the University of Nebraska [HEROES website](#).

[Nebraska Biocontainment Unit PPE Donning Protocol for Ebola Patients](#)

[Nebraska Biocontainment Unit PPE Doffing Protocol for Ebola Patients](#)

[University of Nebraska Medical Center: PPE Donning and Doffing \(Ebola Patients\)](#)

[http://www.eurekalert.org/pub\\_releases/2014-10/gsoa-hmf102014.php](http://www.eurekalert.org/pub_releases/2014-10/gsoa-hmf102014.php)

### **Heavy metal frost? A new look at a Venusian mystery**

#### ***Venus is hiding something beneath its brilliant shroud of clouds***

Boulder, CO, USA - Venus is hiding something beneath its brilliant shroud of clouds: a first order mystery about the planet that researchers may be a little closer to solving because of a new re-analysis of twenty-year-old spacecraft data.

Venus's surface can't be seen from orbit in visible light because of the planet's hot, dense, cloudy atmosphere. Instead, radar has been used by spacecraft to penetrate the clouds and map out the surface – both by reflecting radar off the surface to measure elevation and by looking at the radio emissions of the hot surface. The last spacecraft to map Venus in this way was Magellan, two decades ago. One of the Venusian surprises discovered at that time is that radio waves are reflected differently at different elevations on Venus. Also observed were a handful of radio dark spots at the highest elevations. Both enigmas have defied explanation. "There is general brightening upward trend in the highlands and then dark spots at the highest locations," explained Elise Harrington, an Earth sciences undergraduate at Simon Fraser University, in British Columbia, who revisited the Venus data during her internship at the Lunar and Planetary Institute, under the direction of Allan Treiman. Brightening, in this case, means the radio waves reflect well. Dark means the radio waves are not reflected. In other words, the higher you go on Venus, the more radio reflective the ground gets until it abruptly goes radio black.

"Like on Earth, the temperature changes with elevation," Harrington explained. And the cooler temperatures at altitude lead to ice and snow, which create a similar pattern of brightening for Earth – but in visible light. "Among the possibilities on Venus are a temperature dependent chemical weathering process or heavy metal compound precipitating from the air – a heavy metal frost."



Getting to the bottom of these mysteries has been very hard because Venus has not been revisited since Magellan and no better data is available. So Harrington and Trieman made do by re-purposing the old data. They used recently-available stereo radar elevation data (from Dr. R. Herrick, University of Alaska) rather than using the lower resolution radar altimetry. That increased their altimetry resolution from seeing patches 8 by 12 kilometers to just 600x600 meters. They also used Magellan's Synthetic Aperture Radar (SAR), with its 75x75-meter footprint, to look at radio reflectance, rather than the data on radio emissions from the surface, which had a coarser 15 by 23 kilometer resolution. They applied these to two areas in the Odva Regio highlands region of Venus where they confirmed the same pattern of radar reflections brightening with increasing elevation, as was found by previous researchers. The radar reflection was low at the lower 2,400 meter (7,900 foot) elevation, then rapidly brightens up to 4,500 meters (14,700 feet). But they also found a lot more of those strange black spots, with a precipitous drop in the reflections at 4,700 meters (15,400 feet). "The previous author saw a few dark spots," said Harrington. "But we see hundreds of them."

Years ago it was proposed that some sort of ferroelectric compound might be the cause of the brightening and the dark spots, but so far no specific compound has been identified which does the trick. Then again, with the surface of Venus being at almost 900 °F (500 °C) under more than 90 times the air pressure of Earth's atmosphere at sea level, with occasional showers of acid, it's not easy to test the properties of materials under Venusian conditions.

"No one knows what explains the sudden darkness," said Harrington, who will be presenting the work at the meeting of the Geological Society of America in Vancouver, B.C., on Monday, Oct. 20. "We think this might spur some more interest in Venus."

[http://www.eurekalert.org/pub\\_releases/2014-10/uu-csi102014.php](http://www.eurekalert.org/pub_releases/2014-10/uu-csi102014.php)

### **Cold sores increase the risk of dementia**

*Infection with herpes simplex virus increases the risk of Alzheimer's disease.* Researchers at Umeå University, Sweden, claim this in two studies in the journal *Alzheimer's & Dementia*.

"Our results clearly show that there is a link between infections of herpes simplex virus and the risk of developing Alzheimer's disease. This also means that we have new opportunities to develop treatment forms to stop the disease," says Hugo Lövhelm, associate professor at the Department of Community Medicine and Rehabilitation, Geriatric Medicine, Umeå University, who is one of the researchers behind the study.

Alzheimer's disease is the most common among the dementia diseases. In recent years research has increasingly indicated that there is a possible connection between infection with a common herpes virus, herpes simplex virus type 1, and Alzheimer's disease. A majority of the population carries this virus. After the first infection the body carries the virus throughout your lifetime, and it can reactivate now and then and cause typical mouth ulcer. The hypothesis which links the herpes virus and Alzheimer's disease is based on that a weakened immune system among the elderly creates opportunities for the virus to spread further to the brain. There this can in turn start the process which results in Alzheimer's disease. Hugo Lövhelm and Fredrik Elgh, professor at the Department of Virology, have now confirmed this link in two large epidemiological studies. In one study, which is based on the Betula project, a study on ageing, memory and dementia, the researchers show that a reactivated herpes infection doubled the risk of developing Alzheimer's disease. This study had 3,432 participants who were followed for 11.3 years on average. In another study, samples donated to the Medical Biobank at Umeå University from 360 people with Alzheimer's disease were examined and as many matched people who had not developed dementia. The samples were taken on average 9.6 years before diagnosis. This study showed an approximately doubled risk of developing Alzheimer's disease if the person was a carrier of the herpes virus.

"Something which makes this hypothesis very interesting is that now herpes infection can in principle be treated with antiviral agents. Therefore within a few years we hope to be able to start studies in which we will also try treating patients to prevent the development of Alzheimer's disease," says Hugo Lövhelm.

*Read the studies in Alzheimer's & Dementia*

*Reactivated herpes simplex infection increases the risk of Alzheimer's disease*

<http://www.ncbi.nlm.nih.gov/pubmed/25043910>

*Herpes simplex infection and the risk of Alzheimer's disease – A nested case-control study*

[http://www.alzheimersanddementia.com/article/S1552-5260\(14\)02770-8/abstract](http://www.alzheimersanddementia.com/article/S1552-5260(14)02770-8/abstract)

[http://www.eurekalert.org/pub\\_releases/2014-10/ctco-pmr101914.php](http://www.eurekalert.org/pub_releases/2014-10/ctco-pmr101914.php)

### **Paralyzed man recovers some function following transplantation of OECs and nerve bridge**

*'Complete spinal cord injury' recovery may have benefited from transplantation of olfactory ensheathing cells isolated from the patient's own olfactory bulb and a nerve bridge built between stumps of damaged spinal cord*

Putnam Valley, NY. - Treating patients with a complete spinal cord injury (SCI), the condition in which no motor or sensory function is preserved in the spinal segments below the level of the injury, has generally been unsuccessful. This is because no treatment methods have been able to regenerate the severed spinal

nerves across the injured area. Now, doctors in Poland and scientists from England may have restored some function and sensory sensation to a 38 year-old man who had sustained a traumatic transection (severing) of the spinal cord in the upper vertebral level Th9. By removing one of his olfactory bulbs, where the sense of smell resides, and transplanting his own olfactory ensheathing cells (OECs) and olfactory nerve fibroblasts (ONFs) into the damaged area along with a nerve "bridge" constructed between the two stumps of the damage spinal column, they have seen some voluntary limb function and sensation recovery over a 19 month follow-up.

The study will be published in a future issue of Cell Transplantation and is currently freely available on-line as an unedited early e-pub at:

[http://www.ingentaconnect.com/content/cog/ct/pre-prints/content-CT-1239\\_Tabakow\\_et\\_al](http://www.ingentaconnect.com/content/cog/ct/pre-prints/content-CT-1239_Tabakow_et_al).

The American Spinal Injury Association's (ASIA) international classification of spinal cord injury is widely used to document and classify sensory and motor impairments following SCI. Stages of impairment are based on neurological responses, touch and pinprick sensations, and the strength of the muscles that control ten key motions on both sides of the body.

Traumatic spinal cord injury is classified into five categories on the ASIA Impairment Scale. "A" indicates a "complete" spinal cord injury where no motor or sensory function is preserved in the sacral segments S4-S5. "C" indicates an "incomplete" spinal cord injury where motor function is preserved below the neurological level and fewer than half of the key muscles below the neurological level have a muscle grade of 3 or more.

"After OEC transplantation and the building of the nerve bridge, this patient improved from ASIA A to ASIA C," said Dr. Pawel Tabakow of the Department of Neurosurgery at the Wroclaw Medical University in Wroclaw, Poland. "Prior to the transplantation, we estimated that without this treatment, our patient's recovery chances were less than one percent. However, we observed a gradual recovery of both sensory and motor function that began four months after the surgery."

OECs are a type of cell that resides in both the peripheral and central nervous system. Together with ONFs, they make bundles of nerve fibers that run from the nasal mucosa to the olfactory bulb where the sense of smell is located. Prior studies with animals had suggested that OECs from the olfactory bulb had greater regeneration powers than OECs from the nasal mucosa. The technique of bridging the sectional spinal cord using autologous (derived from the patient) sural nerve grafts has been used in animal studies for three decades, but never in combination with OECs, commented the doctors.

"The OECs and the ONFs appeared to work together, but the mechanism between their interaction is still unclear," said Dr. Geoffrey Raisman, Professor at the Spinal Repair Unit, Department of Brain Repair and Rehabilitation, UCL Institute of Neurology, London, UK.

The doctors noted that further laboratory studies would be needed to better understand the interactive properties between the human OECs and ONFs within the nerve bridge.

"Our results in treating the first patient with a complete spinal cord injury with transplanted bulbar OECs and ONFs and the reconstruction of the spinal cord gap with nerve implants are very encouraging," concluded the medical team.

"However, our results need to be confirmed in a larger group of patients with a similar injury. In the meantime, we are investigating surgical techniques for more minimally invasive access to the olfactory bulb."

*Citation: Tabakow, P.; Raisman, G.; Fortuna, W.; Czyz, M.; Huber, J.; Li, D.; Szweczyk, P.; Okurowski, S.; Miedzybrodzki, R.; Czapiga, B.; Salomon, B.; Halon, A.; Li, Y.; Lipiec, J.; Kulczyk, A.; Jarmundowicz, W. Functional regeneration of supraspinal connections in a patient with transected spinal cord following transplantation of bulbar olfactory ensheathing cells with peripheral nerve bridging. Cell Transplant. Appeared or available on-line: October 21, 2014.*

<http://bit.ly/1wkDYtM>

## Goliath Encounter: Puppy-Sized Spider Surprises Scientist in Rainforest

*Colossal arachnid is the world's largest spider*

by Tanya Lewis, Staff Writer

Piotr Naskrecki was taking a nighttime walk in a rainforest in Guyana, when he heard rustling as if something were creeping underfoot. When he turned on his flashlight, he expected to see a small mammal, such as a possum or a rat.

"When I turned on the light, I couldn't quite understand what I was seeing," said Naskrecki, an entomologist and photographer at Harvard University's Museum of Comparative Zoology. A moment later, he realized he was looking not at a brown, furry mammal, but an enormous, puppy-size spider.



*The South American Goliath birdeater (Theraphosa blondi) is the world's largest spider, according to Guinness World Records. Its legs can reach up to one foot (30 centimeters) and it can weight up to 6 oz. (170 grams). Piotr Naskrecki*

Known as the South American Goliath birdeater (*Theraphosa blondi*), the colossal arachnid is the world's largest spider, according to Guinness World Records. Its leg span can reach up to a foot (30 centimeters), or about the size of "a child's forearm," with a body the size of "a large fist," Naskrecki told Live Science. And the spider can weigh more than 6 oz. (170 grams) - about as much as a young puppy, the scientist wrote on his blog.

Some sources say the giant huntsman spider, which has a larger leg span, is bigger than the birdeater. But the huntsman is much more delicate than the hefty birdeater - comparing the two would be "like comparing a giraffe to an elephant," Naskrecki said.

The birdeater's enormous size is evident from the sounds it makes. "Its feet have hardened tips and claws that produce a very distinct, clicking sound, not unlike that of a horse's hooves hitting the ground," he wrote, but "not as loud."

#### **Prickly hairs and 3/4-inch fangs**

When Naskrecki approached the imposing creature in the rainforest, it would rub its hind legs against its abdomen. At first, the scientist thought the behavior was "cute," he said, but then he realized the spider was sending out a cloud of hairs with microscopic barbs on them. When these hairs get in the eyes or other mucous membranes, they are "extremely painful and itchy," and can stay there for days, he said.

But its prickly hairs aren't the birdeater's only line of defense; it also sports a pair of 0.79-inch-long (2 centimeters) fangs, which can sometimes reach up to 1.5 inches (3.8 cm). Although the spider's bite is venomous, it's not deadly to humans. But it would still be extremely painful, "like driving a nail through your hand," Naskrecki said.

And the eight-legged beast has a third defense mechanism up its hairy sleeve. The hairs on the front of the spider's body have tiny hooks and barbs that make a hissing sound when they rub against each other, "sort of like pulling Velcro apart," Naskrecki said.

Yet despite all that, the spider doesn't pose a threat to humans. Even if it bites you, "a chicken can probably do more damage," Naskrecki said.

#### **Bird eater or mostly harmless?**

Despite its name, the birdeater doesn't usually eat birds, although it is certainly capable of killing small mammals. "They will essentially attack anything that they encounter," Naskrecki said.

The spider hunts in leaf litter on the ground at night, so the chances of it encountering a bird are very small, he said. However, if it found a nest, it could easily kill the parents and the chicks, he said, adding that the spider species has also been known to puncture and drink bird eggs.

The spider will eat frogs and insects, but its main prey is actually earthworms, which come out at night when it's humid. "Earthworms are very nutritious," Naskrecki said.

Birdeaters are not endangered, but they are shy. "I've been working in the tropics in South America for many, many years, and in the last 10 to 15 years, I only ran across the spider three times," Naskrecki.

After catching the specimen he found in Guyana, which was female, Naskrecki took her back to his lab to study. She's now deposited in a museum.

*Update: Oct. 21*

*In response to a flood of questions about what happened to the spider and why it was killed, Naskrecki wrote another post on his blog. In it, he explains that the animal was euthanized, preserved, carefully labeled, and deposited in a collection at the University of Guyana, "where to this day it serves as an important teaching tool."*

*Collection and preservation of physical specimens "is an integral, irreplaceable element of biological sciences," Naskrecki wrote. He added that the Goliath birdeater is "a very common species, not protected or endangered, and collecting of a single individual poses absolutely no threat to its survival." In fact, you can buy the spiders in pet stores and online.*

*"There is absolutely no evidence that any scientist has ever driven a species to extinction," Naskrecki said. Rather, species go extinct due to the destruction of their habitat or competition from alien species introduced by humans, he said. "And this loss of species is happening on an unimaginable scale - by some estimates 16,000 species quietly go extinct every year, some even before scientists have a chance to describe and name them," he said.*

[http://www.eurekalert.org/pub\\_releases/2014-10/uosd-scp102014.php](http://www.eurekalert.org/pub_releases/2014-10/uosd-scp102014.php)

### **Scientists create possible precursor to life**

#### ***How did life originate? And can scientists create life?***

These questions not only occupy the minds of scientists interested in the origin of life, but also researchers working with technology of the future. If we can create artificial living systems, we may not only understand the origin of life - we can also revolutionize the future of technology.

Protocells are the simplest, most primitive living systems, you can think of. The oldest ancestor of life on Earth was a protocell, and when we see, what it eventually managed to evolve into, we understand why science is so fascinated with protocells. If science can create an artificial protocell, we get a very basic ingredient for creating more advanced artificial life.

However, creating an artificial protocell is far from simple, and so far no one has managed to do that. One of the challenges is to create the information strings that can be inherited by cell offspring, including protocells. Such information strings are like modern DNA or RNA strings, and they are needed to control cell metabolism and provide the cell with instructions about how to divide.

#### **Essential for life**



If one daughter cell after a division has a slightly altered information (maybe it provides a slightly faster metabolism), they may be more fit to survive. Therefore it may be selected and an evolution has started.

Now researchers from the Center for Fundamental Living Technology (FLINT), Department of Physics, Chemistry and Pharmacy, University of Southern Denmark, describe in the journal *Europhysics Letters*, how they, in a virtual computer experiment, have discovered information strings with peculiar properties.

Professor and head of FLINT, Steen Rasmussen, says: "Finding mechanisms to create information strings are essential for researchers working with artificial life."

Steen Rasmussen and his colleagues know they face two problems:

Firstly long molecular strings are decomposed in water. This means that long information strings "break" quickly in water and turn into many short strings. Thus it is very difficult to maintain a population of long strings over time.

Secondly, it is difficult to make these molecules replicate without the use of modern enzymes, whereas it is easier to make a so-called ligation. A ligation is to connect any combination of two shorter strings into a longer string, assisted by another matching longer string. Ligation is the mechanism used by the SDU-researchers.

"In our computer simulation - our virtual molecular laboratory - information strings began to replicate quickly and efficiently as expected. However, we were struck to see that the system quickly developed an equal number of short and long information strings and further that a strong pattern selection on the strings had occurred. We could see that only very specific information patterns on the strings were to be seen in the surviving strings. We were puzzled: How could such a coordinated selection of strings occur, when we knew that we had not programmed it. The explanation had to be found in the way the strings interacted with each other", explains Steen Rasmussen.

#### **It is like society**

According to Steen Rasmussen, a so-called self-organizing autocatalytic network was created in the virtual pot, into which he and his colleagues poured the ingredients for information strings.

An autocatalytic network is a network of molecules, which catalyze each other's production. Each molecule can be formed by at least one chemical reaction in the network, and each reaction can be catalyzed by at least one other molecule in the network. This process will create a network that exhibits a primitive form of metabolism and an information system that replicates itself from generation to generation.

"An autocatalytic network works like a community; each molecule is a citizen who interacts with other citizens and together they help create a society", explains Steen Rasmussen.

This autocatalytic set quickly evolved into a state where strings of all lengths existed in equal concentrations, which is not what is usually found. Further, the selected strings had strikingly similar patterns, which is also unusual.

"We might have discovered a process similar to the processes that initially sparked the first life. We of course don't know if life actually was created this way - but it could have been one of the steps. Perhaps a similar process created sufficiently high concentrations of longer information strings when the first protocell was created", explains Steen Rasmussen.

#### **Basis for new technology**

The mechanisms underlying the formation and selection of effective information strings are not only interesting for the researchers who are working to create protocells. They also have value to researchers working with tomorrow's technology, like they do at the FLINT Center.

"We seek ways to develop technology that's based on living and life-like processes. If we succeed, we will have a world where technological devices can repair themselves, develop new properties and be re-used. For example a computer made of biological materials poses very different - and less environmentally stressful - requirements for production and disposal", says Steen Rasmussen.

Ref: <http://epljournal.edpsciences.org/articles/epl/abs/2014/14/epl16388/epl16388.html>  
<http://bit.ly/12qbwds>

### **The White House Just Asked Scientists to Stop Trying to Make Diseases More Deadly**

*New funding is being suspended, and anyone who's already been paid to do such work is being asked to stop.*

By Colin Schultz

In a few notable instances in the past couple of months, disease research and control specialists in the U.S. have slipped up. The National Institute of Health lost some vials of smallpox. Two CDC labs almost dosed their own workers with anthrax and avian flu. The CDC has come under attack for letting one of Dallas' potential Ebola patients get on an airplane and another on a cruise ship (even though that worked out in the end).

In the shadow of all this, the White House has decided that maaaaybe it's time to just take a little breather on the already murky scientific field of "trying to make diseases worse than normal."

On Friday, the Office of Science and Technology Policy officially barred government funding for scientists who are conducting research aimed at making diseases more deadly or more transmissible, says Nature.

That line of scientific research, known by the delightfully dry term “gain-of-function research,” is already one that makes a lot of people nervous. But, the thinking goes, if scientists know how a disease might morph, then maybe they can get out ahead of it.

Previously, the government was funding work to make diseases such as the flu, SARS or MERS more potent, says Nature, but all that's to come to an end.

Anyone who's already been paid to do such work is being asked to stop.

<http://nyti.ms/1tjlUyW>

### **Genetic Variant May Shield Latinas From Breast Cancer**

*A genetic variant that is particularly common in some Hispanic women with indigenous American ancestry appears to drastically lower the risk of breast cancer, a new study found.*

By Anahad O'Connor

About one in five Latinas in the United States carry one copy of the variant, and roughly 1 percent carry two. The function of the gene is not entirely clear. But the authors of the study, which was led by a team at the University of California, San Francisco, and funded by the National Cancer Institute, said women who carry the variant have breast tissue that appears less dense on mammograms - a factor that is known to play a role in breast cancer risk. They suspect that the genetic variant may affect the production of estrogen receptors.

“This is a really important study,” said Marc Hurlbert, executive director of the Avon Foundation Breast Cancer Crusade, who was not involved in the study. “If we can understand how this is protective, it might help us to develop better treatments for those who do get breast cancer.”

The findings may also explain why Latinas have lower rates of breast cancer than other Americans. According to federal data, Hispanics have less than a 10 percent lifetime risk of breast cancer, compared with about 13 percent for non-Hispanic whites and 11 percent for blacks.

Certain behavioral factors have been thought to account for at least part of this reduced risk. Latinas, for example, are less likely to use postmenopausal hormones, and they tend to have more children and give birth at younger ages, said Dr. Elad Ziv, a professor of medicine at the university in San Francisco and an author of the new study, which was published in Nature Communications.

Both factors may decrease breast cancer risk.

But Dr. Ziv and his colleagues suspected that genetic factors might also be at work. So they scanned and compared the DNA of breast cancer patients and

control subjects in various populations, carrying out a so-called genome-wide association study that can link genetic variations to disease. Altogether the study analyzed DNA from more than 3,000 women with breast cancer and about 8,200 women without the disease.

Many genome-wide association studies have looked for associations with breast cancer in women of European descent. But this was the first such study to include large numbers of Latinas, who in this case hailed mostly from California, Colombia and Mexico, said the lead author of the study, Laura Fejerman of the Institute for Human Genetics in San Francisco.

The researchers zeroed in on chromosome 6 and discovered the protective variant, which is known as a single nucleotide polymorphism, or SNP (pronounced “snip”). They also discovered that its frequency tracked with indigenous ancestry. It occurred with about 15 percent frequency in Mexico, 10 percent in Colombia and 5 percent in Puerto Rico. But its frequency was below 1 percent in whites and blacks, and other studies have shown that it occurs in about 2 percent of Chinese people.

“My expectation would be that if you go to a highly indigenous region in Latin America, the frequency of the variant would be between 15 and 20 percent,” Dr. Fejerman said. “But in places with very low indigenous concentration - places with high European ancestry - you might not even see it.”

Women who carried just one copy of the variant were about 40 percent less likely to have breast cancer, while those with two copies had double that level of protection. Their risk was particularly lower for the type of breast cancer known as estrogen-receptor negative, a more aggressive form of the disease.

Dr. Otis W. Brawley, the chief medical officer at the American Cancer Society, said the study “is very good science” but cautioned that the genetic variant was not a silver bullet against breast cancer.

“I’m confident that this finding is going to hold, that most women who have this genetic variant are at lower risk of breast cancer,” he said. “But keep in mind that some women with this variant still get breast cancer. It might be because they have this variant and something else that cancels it out.”

<http://bit.ly/1tORCER>

### **King Tut Re-Creation Presents a Shocking Image**

*In the flesh, King Tut had a club foot, a pronounced overbite and girlish hips*

Oct 20, 2014 05:20 PM ET // by Rossella Lorenzi

Tutankhamun’s beautiful golden mask, the embodiment of a man secure in his power, has been flattering the pharaoh for many centuries, according to the most detailed image yet of the teenage king’s face and body. In the flesh, King Tut had a club foot, a pronounced overbite and girlish hips, says a “virtual autopsy” built



using more than 2,000 computerized tomography (CT) scans of the pharaoh's body.

Built for the BBC documentary, "Tutankhamun: the Truth Uncovered," the shocking 3-D computer model could shed new light on the death of the boy pharaoh at the age of 19.

Previous theories suggested King Tut may have died as a result of a chariot accident, but the virtual reconstruction showed a different scenario.

"It was important to look at his ability to ride on a chariot and we concluded it would not be possible for him, especially with his partially clubbed foot, as he was unable to stand unaided," Albert Zink, head of the Institute for Mummies and Icemen in Italy, told the U.K. daily The Independent.

According to Ashraf Selim, an Egyptian radiologist, King Tut "also developed Kohler's disease or death of the bones, during adolescence, which would have been incredibly painful."



***A virtual reconstruction depicts King Tut at the time of death. STV***

Indeed, about 130 walking sticks found in King Tut's treasure-packed tomb would support the theory that the boy pharaoh had to rely on canes to get around.

Zink believes the pharaoh's early death was most likely caused from his weakened state - a result of genetic impairments inherited from his parents, who were siblings.

Indeed, in 2010 an international genetic study produced a five-generation pedigree of Tutankhamun's immediate lineage. In the study, the mummy known as KV55 - most likely the "heretic" Akhenaten - and KV35YL, also known as the Younger Lady, were identified as siblings, as well as King Tut's parents.

The study confirmed the frail king was afflicted by malaria and suffered a badly broken leg, above his knee, just before he died.

"It is difficult to say whether malaria may have been a serious factor in the cause of death," Zink said.

The boy pharaoh has been puzzling scientists ever since his mummy and treasure-packed tomb were discovered on Nov. 22, 1922, in the Valley of the Kings by British archaeologist Howard Carter.

Only a few facts about his life are known. Tut.ankh.Amun, "the living image of Amun," ascended the throne in 1332 B.C., at the age of 9, and reigned until his death at 19.

As the last male in the family, his death ended the 18th dynasty - probably the greatest of the Egyptian royal families - and gave way to military rulers.

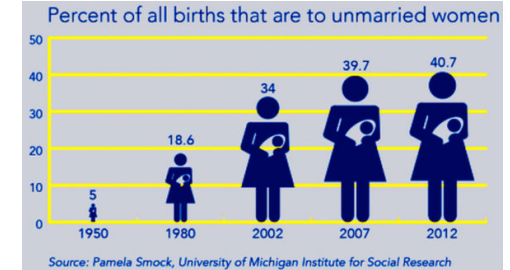
<http://phys.org/news/2014-10-current-state-american-family.html>

## Current state of the American family

***Most young Americans plan to get married someday, but more than 40 percent of births now occur outside marriage, and the American family itself has become far more diverse and varied.***

October 21st, 2014 by Susan Rosegrant

"I wouldn't say the Ozzie and Harriet family is headed towards extinction, but it's really a much much smaller slice of American life," said William Frey, a demographer at the Brookings Institution and researcher at the University of Michigan Institute for Social Research, who adds that the nation is still catching up to the new reality.



The new American family is not nearly as white as it used to be. In fact, white babies may already be in the minority. In addition, mixed-race couples have become far more common, and more gay couples have started families.

Unmarried households headed by same-sex couples increased 80 percent in the 2010 Census from a decade earlier to almost 650,000, and an estimated 25 percent of those households are raising children. Nor is marriage a given. Ready birth control and changed sexual mores have removed the stigma attached to living together - and even having kids - outside of marriage.

"People weren't opposed to cohabitation because folks were cooking together or doing laundry together," said ISR sociologist Pamela Smock. "They were opposed to it because people were having sex outside of marriage. Once premarital sex became something people approved of, cohabitation started to escalate."

Today about two-thirds of young adults live with a partner at some point, and three-quarters of first marriages are preceded by cohabitation, Smock says. In part because of cohabitation, the median age at which women and men marry for the first time has been creeping up - now at 25.8 for women and 28.3 for men.

As people take longer to get married, they're also waiting longer to have kids. Teen pregnancy rates have plummeted - dropping 40 percent from 1990 to 2008 - and women in their early 20s are becoming pregnant at the lowest rate in more than 30 years. The group having more babies: women over 30, and, particularly, women 40-44.

As couples shake things up, the landscape for children has changed. Forty percent of young adults have lived with cohabiting parents. Fewer than half of young adults reach age 18 in a family headed by their married biological parents. And

more than half experience a change in their family structure, such as a mother divorcing or changing partners.

What does all this mean for kids? Research shows that family instability is challenging for children. ISR sociologist Paula Fomby found that nearly one in five children today lives with a half- or step-sibling at age 4, and doing so raises by 14 percent the chance that the child will act out when they start school. And kids who live with both a step-parent and step- or half-siblings show an almost 30 percent increase in aggressive behavior on entering school.

Fomby is quick to note that parents aren't to blame for subjecting their kids to harmful churn.

"Families end up in complicated relationships largely because of macroeconomic forces that are well beyond their control," she said. "There are disincentives to get education as the cost of education goes up. There are diminished labor force opportunities in a lot of low-income neighborhoods, so it's hard to find a partner who is stably employed."

A slight bright spot: Kids with close ties to a grandparent, family friend or others outside the household will likely weather changes more easily. "Residential stability, school stability... these are all places that are familiar when other things might be changing at home," Fomby said.

More information: *The New American Family*: <http://home.isr.umich.edu/sampler/new-american-family>

[http://www.eurekalert.org/pub\\_releases/2014-10/p-mpm101714.php](http://www.eurekalert.org/pub_releases/2014-10/p-mpm101714.php)

**Most published medical research is false; Here's how to improve**  
*In 2005, in [a landmark paper viewed well over a million times](#), John Ioannidis explained in PLOS Medicine why most published research findings are false.*

To coincide with PLOS Medicine's 10th anniversary [he responds to the challenge of this situation](#) by suggesting how the research enterprise could be improved. Research, including medical research, is subject to a range of biases which mean that misleading or useless work is sometimes pursued and published while work of value is ignored. The risks and rewards of academic careers, the structures and habits of peer reviewed journals, and the way universities and research institutions are set up and governed all have profound effects on what research scientists undertake, how they choose to do it and, ultimately, how patients are treated. Perverse incentives can lead scientists to waste time producing and publishing results which are wrong or useless. Understanding these incentives and altering them provides a potential way for drastically re-shaping research to improve in medical knowledge.

In a provocative and personal essay, designed to spur readers into thinking about how research careers could be redesigned in order to encourage better work,

Ioannidis suggests practical ways in which our current situation could be improved. He describes how successful practices from some branches of science could be distributed to others which have performed badly, and suggests ways in which academic structures could provide greater benefits from the work of researchers, administrators, publishers and the research funding which supports them all.

"The achievements of science are amazing yet the majority of research effort is currently wasted," asserts Ioannidis. He calls for testing interventions to improve the structure of scientific research, and doing so with the rigor normally reserved for testing drugs or hypotheses.

[http://www.eurekalert.org/pub\\_releases/2014-10/e-fym102114.php](http://www.eurekalert.org/pub_releases/2014-10/e-fym102114.php)

### **Flu vaccine may hold key to preventing heart disease**

*A new study in Vaccine explains how flu vaccines prevent heart attacks*

Amsterdam – Flu vaccines are known to have a protective effect against heart disease, reducing the risk of a heart attack. For the first time, this research, published in *Vaccine*, reveals the molecular mechanism that underpins this phenomenon. The scientists behind the study say it could be harnessed to prevent heart disease directly.

Heart disease is the leading cause of death worldwide. People can reduce their risk of heart disease by eating healthily, exercising and stopping smoking. However, to date there is no vaccine against heart disease.

Previous clinical findings show that people that receive the seasonal flu vaccine also benefit from its protective effect against heart disease; the risk of having a heart attack in the year following vaccination is 50% lower than people who did not receive the vaccination. The exact mechanism underlying this protective effect remained unknown.

This new study for the first time reveals this mechanism, showing that the flu vaccine stimulates the immune system to produce antibodies that switch on certain processes in cells. These processes lead to the production of molecules that protect the heart. The researchers say that based on the results it may be possible to develop a new vaccine against heart disease.

"Even though the protective effect of the flu vaccine against heart disease has been known for some time, there is very little research out there looking at what causes it. Our proposed mechanism could potentially be harnessed in a vaccine against heart disease, and we plan to investigate this further," said Dr. Veljkovic, Institute Vinca, Belgrade, the lead author of the new study.

The researchers identified a protein called the bradykinin 2 receptor (BKB2R), which is involved in cellular processes that protect the heart. Some of the antibodies the body produces after flu vaccination switch this protein on, therefore

protecting against heart disease. The researchers analysed 14 flu viruses used in vaccines, and identified four that could be investigated for use in potential heart disease vaccines.

"The rate of administering flu vaccinations is disappointingly low, even in developed countries," added Dr. Veljkovic "We hope that our results will encourage more people to get vaccinated before the flu season starts."

*This article is "Influenza vaccine as prevention of cardiovascular diseases: Possible molecular mechanism", by Veljko Veljkovic, Sanja Glisic, Nevena Veljkovic, Tijana Bojic, Ursula Dietrich, Vladimir R. Perovic, Alfonso Colombatti (doi: 10.1016/j.vaccine.2014.07.007). The article appears in Vaccine, published by Elsevier. <http://www.sciencedirect.com/science/article/pii/S0264410X14009335>*

[http://www.eurekalert.org/pub\\_releases/2014-10/gsoa-kfs102114.php](http://www.eurekalert.org/pub_releases/2014-10/gsoa-kfs102114.php)

### Kung fu stegosaur

***Stegosaurus might be portrayed as lumbering plant eaters, but they were lethal fighters when necessary***

Boulder, CO, USA - Stegosaurus might be portrayed as lumbering plant eaters, but they were lethal fighters when necessary, according to paleontologists who have uncovered new evidence of a casualty of stegosaurian combat. The evidence is a fatal stab wound in the pubis bone of a predatory allosaur. The wound – in the conical shape of a stegosaur tail spike – would have required great dexterity to inflict and shows clear signs of having cut short the allosaur's life.

"A massive infection ate away a baseball-sized sector of the bone," reports Houston Museum of Natural Science paleontologist Robert Bakker and his colleagues, who present a poster on the discovery on Tuesday at the meeting of the Geological Society of America in Vancouver, B.C. "Probably this infection spread upwards into the soft tissue attached here, the thigh muscles and adjacent intestines and reproductive organs." The lack of any signs of healing strongly suggests the allosaur died from the infection.

Similar wounds are seen in rodeo cowboys or horses when they are gored by longhorns, Bakker said. And since large herbivores – like longhorn cattle, rhinos and buffalo – today defend themselves with horns, it's reasonable to assume spiky herbivorous dinos did the same. A big difference is that stegosaurus wielded their weapon on their tails rather than their heads. Skeletal evidence from fossil stegosaurus suggests their tails were more dextrous than most dinosaur tails.

"They have no locking joints, even in the tail," Bakker explained. "Most dinosaur tails get stiffer towards the end." But stegosaurus had massive muscles at the base of the tails, flexibility and fine muscle control all the way to the tail tip. "The joints of a stegosaur tail look like a monkey's tail. They were built for 3-dimensional combat."

In order to deliver the mortal wound to the allosaur, a stegosaur would have had to sweep its tail under the allosaur and twist the tail tip, because normally the spikes point outward and backward. That would have been well within the ability of a stegosaur, Bakker said.

The fighting style and skill of stegosaurus should come as no surprise to anyone familiar with the dinosaur battle scene in the 1940 Disney animated film Fantasia, said Bakker. That segment of the movie shows a beefed up allosaur attacking a stegosaur. The stegosaur delivers a number of well aimed tail blows at the predator, but loses the fight. The Fantasia stegosaur tail dexterity appears to be accurate, he said. But he questions the stegosaur's loss in the end. "I think the stegosaur threw the fight," he said. On the other hand, he points out stegosaurus had among the smallest brains for its body size of any large animal, ever.

*Stegosaurian Martial Arts: A Jurassic Carnivore Stabbed by a Tail Spike, Evidence for Dynamic Interactions between a Live Herbivore and a Live Predator*

*Paleontology: New Discoveries in Vertebrate Trace and Body Fossils (Posters)*

Abstract: <https://gsa.confex.com/gsa/2014AM/webprogram/Paper247355.html>

[http://www.eurekalert.org/pub\\_releases/2014-10/uob-uoy102114.php](http://www.eurekalert.org/pub_releases/2014-10/uob-uoy102114.php)

### Unsteady on your feet? Little touches could make all the difference

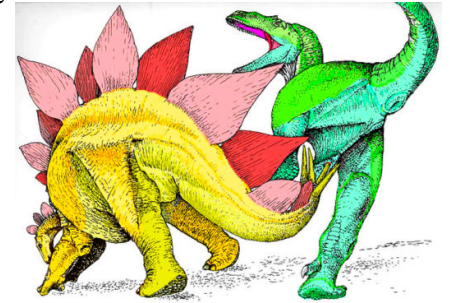
***How even the lightest fingertip touch can help people to maintain their balance***

When a toddler takes their first steps we observe an uncertain sway in their walking. Being unsteady on our feet is something we can experience throughout life – and a new study has shown how even the lightest fingertip touch can help people to maintain their balance.

The research, led by the University of Birmingham, explains how neural and mechanical mechanisms synchronize our sway with another person.

Dr Raymond Reynolds explained, "There's something very human, very instinctive, that makes us reach out and grab something or someone when we're unsure of our balance and experience sway. We know this. But being able to significantly reduce that sway with even the gentlest touch tells us a lot about how our body relates to the people around us."

The team looked at pairs of volunteers in a range of tests to understand how visual and mechanical interactions between them would affect their stability.





Participants stood on force platforms while undertaking a range of tests; with no physical contact, a shoulder grasp and a light touch. For each level of contact, the visual interactions also were varied to study both with closed eyes, both with open eyes, and with one participant closed/one participant open.

As expected, the volunteers experienced a 37% reduction in sway when grasping each others' shoulders. Even a non-forceful touch with the fingertip accounted for an 18% reduction in sway, and it is the underlying mechanisms behind this that the team have described for the first time.

Dr Reynolds continued, "Grabbing the shoulder of someone to reduce sway can be explained entirely by the mechanical linkage between the two. But this light touch of the finger is down to a sensory weighting phenomenon by which we balance ourselves."

The phenomenon in question describes how each person essentially estimates how 'upright' they are, based on a weighted combination of sensory feedback from themselves (eg the inner ear, the sense of force underfoot, and vision) and feedback based upon the motion of their partner.

Dr Reynolds added, "When Person A has their eyes open, and Person B has their eyes closed, and they apply the slightest fingertip contact we see Person B experience a reduction in sway. Surprisingly, Person A also experiences a reduction in sway – it's quite literally a case of the blind leading the sighted."

The study, published today in *Interface*, also pointed toward an unexpected finding; that we are able to obtain this benefit from someone with equal or even greater instability than ourselves.

Dr Callum Osler, from the University of Derby, said, "It's a fascinating twist, and somewhat counter-intuitive. Of course there is a threshold – we wouldn't be able to reduce our sway via contact with someone on the verge of falling over. But to a point we can become more stable through contact with someone experiencing more sway than ourselves."

It is hoped that the findings could be beneficial for rehabilitation or for vulnerable populations by develop the smarter walking aids of the future.

[http://www.eurekalert.org/pub\\_releases/2014-10/au-aaa102114.php](http://www.eurekalert.org/pub_releases/2014-10/au-aaa102114.php)

### **Analgesics and anti-inflammatory drugs may have an impact on depression**

*Analgesics and anti-inflammatory drugs used against muscle pain and arthritis may have a beneficial effect on depression symptoms*

Ordinary over the counter painkillers and anti-inflammatory drugs purchased from pharmacies may also be effective in the treatment of people suffering of depression. This is shown by the largest ever meta-analysis that has just been

published by a research group from Aarhus University in the American scientific journal *JAMA Psychiatry*. The meta-analysis is based on 14 international studies with a total 6,262 patients who either suffered from depression or had individual symptoms of depression.

Up to 15 per cent of the Danish population can expect to suffer from depression at some point in their lives. The World Health Organisation (WHO) estimates that depression is one of the top five reasons for loss of quality of life and also life years. Thus, it is a very serious condition, one where researchers all over the world are constantly trying to find more effective treatments.

In recent years research has demonstrated a correlation between depression and physical illnesses, such as painful conditions or infections in the individual patient. "The meta-analysis supports this correlation and also demonstrates that anti-inflammatory medication in combination with antidepressants can have an effect on the treatment of depression. When combined they give an important result which, in the long term, strengthens the possibility of being able to provide the individual patient with more personalized treatment options," says MD-student Ole Köhler, who is first author of the scientific article and a member of the research group from Aarhus University.

The crucial new aspect of the meta-analysis is that it is the first time researchers can be so certain of the effect of treatment with anti-inflammatory drugs.

"However, these effects must always be weighed against the possible side effects of the anti-inflammatory drugs. We still need to clarify which patients will benefit from the medicine and the dose-sizes required," says Ole Köhler.

"The biggest problem with depression is that we do not know the causes that trigger the condition in the individual patient. Some studies suggest that the choice of antidepressant medication can be guided by a blood sample that measures whether there is an inflammatory condition in the body.

Other studies show that the same blood samples could be used as a guideline on whether a depressive patient can be treated with anti-inflammatory drugs that works better when there is inflammation present simultaneously with the depression.

These findings must, however, be verified before they can be implemented in clinical practice," says Ole Köhler.

He emphasises that it is not possible to conclude on the basis of the meta-analysis that an inflammatory state can be the sole explanation for a depression.

"The analysis should be seen as a significant milestone in a research context and this could be a landmark for what future research projects and treatment need to focus on," says Ole Köhler.

[http://www.eurekalert.org/pub\\_releases/2014-10/ucd-aei102014.php](http://www.eurekalert.org/pub_releases/2014-10/ucd-aei102014.php)

## Ancient Europeans intolerant to lactose for 5,000 years after they adopted agriculture

*Major technological transitions were also associated with major changes in genetics*

By analysing DNA extracted from the petrous bones of skulls of ancient Europeans, scientists have identified that these peoples remained intolerant to lactose (natural sugar in the milk of mammals) for 5,000 years after they adopted agricultural practices and 4,000 years after the onset of cheese-making among Central European Neolithic farmers.

The findings published online in the scientific journal Nature Communications (21 Oct) also suggest that major technological transitions in Central Europe between the Neolithic, Bronze Age and Iron Age were also associated with major changes in the genetics of these populations.

For the study, the international team of scientists examined nuclear ancient DNA extracted from thirteen individuals from burials from archaeological sites located in the Great Hungarian Plain, an area known to have been at the crossroads of major cultural transformations that shaped European prehistory.

The skeletons sampled date from 5,700 BC (Early Neolithic) to 800 BC (Iron Age).

It took several years of experimentation with different bones of varying density and DNA preservation for the scientists to discover that the inner ear region of the petrous bone in the skull, which is the hardest bone and well protected from damage, is ideal for ancient DNA analysis in humans and any other mammals.

According to Professor Ron Pinhasi from the UCD Earth Institute and UCD School of Archaeology, University College Dublin, the joint senior author on the paper, "the high percentage DNA yield from the petrous bones exceeded those from other bones by up to 183-fold.

This gave us anywhere between 12% and almost 90% human DNA in our samples compared to somewhere between 0% and 20% obtained from teeth, fingers and rib bones".

For the first time, these exceptionally high percentage DNA yields from ancient remains made it possible for scientists to systematically analyse a series of skeletons from the same region and check for known genetic markers including lactose intolerance.

"Our findings show progression towards lighter skin pigmentation as hunter and gatherers and non-local farmers intermarried, but surprisingly no presence of increased lactose persistence or tolerance to lactose" adds Professor Pinhasi.

"This means that these ancient Europeans would have had domesticated animals like cows, goats and sheep, but they would not yet have genetically developed a tolerance for drinking large quantities of milk from mammals," he says. According to Professor Dan Bradley from the Smurfit Institute of Genetics, Trinity College Dublin, co-senior author on the paper, "our results also imply that the great changes in prehistoric technology including the adoption of farming, followed by the first use of the hard metals, bronze and then iron, were each associated with the substantial influx of new people. We can no longer believe these fundamental innovations were simply absorbed by existing populations in a sort of cultural osmosis."

<http://www.medscape.com/viewarticle/833279>

### Combating Depression With CAM

*A woman is experiencing her first episode of mild clinical depression*

Désirée A. Lie, MD, MSEd

#### Case Presentation

Mrs Singh is a 45-year-old Asian Indian woman with two adult children. She is experiencing her first episode of mild clinical depression, following a divorce and transition into a new job as an administrator. She complains of 2 months of low mood; hyperphagia, with weight gain of 10 lb; difficulty falling asleep; and trouble concentrating at work.

There is no family history of depression, suicide, or other psychiatric morbidity. The patient is well supported by her siblings and parents, who live nearby. She enjoys cooking native Indian food for herself and her friends and family. She has no suicidal ideation and does not drink.

Mrs Singh takes a statin for hypercholesterolemia, but no other medications. She accepts her diagnosis of depression but is reluctant to take selective serotonin reuptake inhibitors (SSRIs) because of their potential side effects. Instead, she would like to try "something natural and nutrition- or hormone-based."

She asks you about a number of products but you inform her that the following product has credible evidence for efficacy:

- Acupuncture*
- DHEA*
- Saffron*
- Gingko*

#### Treating Depression With CAM

Depression is considered a major contributor to disability worldwide, with a prevalence of 9% among the US adult population. Women are twice as likely as men to have depression, and one in six adults report one episode of depression in their lifetime.<sup>[1]</sup>

Among the different types of depression, major depression is a clinical diagnosis associated with 2 weeks or more of such symptoms as anhedonia, lethargy, fatigue, depressed mood, reduced appetite, abnormal sleep patterns, impaired cognition, and low or increased appetite. Other manifestations or types of depression include postpartum depression, seasonal affective disorder (SAD), premenstrual dysphoric disorder, and dysthymia.

A combination of genetic predisposition; environmental triggers; hormonal influences; and, in particular, neurotransmitter imbalance involving serotonergic transmitters is now believed to underlie depressive episodes and diagnosis. Screening for depression is considered a vital part of assessment of any patient presenting with depressive symptoms, serious medical illness, or major life events. A range of screening tools is used in the clinical setting and research, including the Beck Depression Inventory, the Hamilton Depression Rating Scale (6- or 17-item), and the Center for Epidemiologic Studies Depression Scale.

Survey and telephone studies of the general population have found that over 50% of those with depression and anxiety reported using complementary and alternative medicine (CAM) therapies within the previous 12 months.<sup>[2]</sup> Even inpatient psychiatric patients reported use of herbal medicines for mental health-related symptoms within the past 12 months. This finding is not altogether surprising, given the adverse effects and expense of antidepressant therapies and the desire of patients to seek and maintain wellness.

SSRIs are considered first-line pharmacotherapy options for the treatment of depression followed by other options, such as norepinephrine reuptake inhibitors, tricyclic antidepressants, and monoamine oxidase inhibitors. Psychotherapy and cognitive-behavioral therapy have been documented as helpful primary or adjunctive therapy.

Among the CAM modalities, St John's wort has long been shown to have short-term benefit in patients with mild to moderate depression, performing as well as tricyclic antidepressants but not as well as SSRIs.<sup>[3]</sup> Bright-light therapy has also been shown to benefit those with SAD, and recent evidence suggests a benefit for a subset of patients with nonseasonal affective disorder.<sup>[4-6]</sup>

Conversely, among CAM therapies, inadequate evidence is available to support the use of 5-hydroxytryptophan, acupuncture, chromium, ginkgo, lavender, L-carnitine, Bach flower remedies, aromatherapy, homeopathy, and healing touch.<sup>[2,3,7]</sup>

Still being actively investigated for their efficacy in the treatment of depression are the nutritional product saffron and the hormone dehydroepiandrosterone (DHEA). Saffron is an extract of the dried stigma of *Crocus sativus L.*; it has long been used as a spice and coloring agent in cooking, especially in Iran and the

Indian subcontinent. Its active constituents, safranal and crocin, have been studied in animal models for their anxiolytic effects.<sup>[8,9]</sup>

### **All About Saffron**

As a medicinal product, saffron stigma extract may be sold in 15-mg capsules, each containing 0.13-0.15 mg of safranal and 1.65-1.75 mg of crocin,<sup>[3]</sup> but standardization of saffron products is not guaranteed and it is unclear what the optimal dosages are.

Saffron is not on the US Food and Drug Administration's "Generally Recognized as Safe" list. The quality of saffron produced in different parts of the world may be low or variable. Because it can cause platelet inhibition, saffron should not be used in persons with coagulation disorders. It can also lower blood pressure.

Randomized clinical trials of saffron have been conducted largely in Iran because it is the world's largest producer of saffron. Here's what they have found:

- In a double-blind, placebo-controlled, randomized trial of 40 adults, researchers reported a significant improvement in depression scores on the Hamilton scale in patients taking saffron 30 mg/day compared with placebo.<sup>[10]</sup>
- A trial comparing saffron (15 mg twice daily) with fluoxetine (10 mg twice daily) found that the two were similarly effective in treating depression.<sup>[11]</sup> In addition, for both treatments, the remission rate for depression was 25% at 6 weeks. A similar 6-week, double-blind, randomized trial comparing the same treatments found similar efficacy and observed side effects.<sup>[12]</sup> A study of people with depression after percutaneous coronary intervention showed that the antidepressant effects of saffron were similar to those of a 40-mg/day dose of fluoxetine.<sup>[13]</sup>
- In an evidence-based forum,<sup>[14]</sup> saffron (30 mg/day) was considered superior to placebo and equivalent to 20-mg/day fluoxetine and imipramine over 6 weeks of treatment for mild to moderate depression. Those conclusions were based on four small randomized clinical trials and one larger clinical trial involving almost 200 patients.
- In a systematic review including six clinical studies conducted between 2004 and 2008,<sup>[15]</sup> researchers found adequate evidence for the benefits of saffron for treating depression and a favorable safety profile for recommending its long-term use. (They also noted the high price of saffron stigma derivatives, and the potential for harvesting and studying the less expensive saffron petal.<sup>[11]</sup>) A more recent systematic review,<sup>[16]</sup> based on five randomized controlled trials, reached similar conclusions about saffron's benefits.

### **The Dish on DHEA**

DHEA is a hormone secreted by the adrenal gland. The decline in DHEA with aging has been linked to depression, osteoporosis, and immune disorders, and the



hormone is considered safe for use in individuals with documented low levels or insufficiency. Masculinization symptoms may occur in women.

Effects of the long-term use of DHEA are uncertain. It is considered potentially unsafe for individuals with diabetes and cardiovascular disease, and it may interact with antidepressants, cytochrome P450-modifying agents, immunosuppressants, and antihypertensive agents. Long-term use in patients with or at risk for hormonal cancers (such as breast, ovarian, hepatic, or prostate) is not recommended.<sup>[3]</sup>

As is the case for saffron, standardization of over-the-counter DHEA products is not guaranteed. In depression, a range of dosages from 5 to 500 mg daily for up to 8 weeks has been studied, with titration weekly in increments.

In 1999, researchers first reported on the potential benefits of DHEA for depression in a small-scale clinical trial.<sup>[17]</sup> For midlife-onset major and minor depression, 6 weeks of monotherapy with DHEA (90 mg/day for 3 weeks, then 450 mg/day for 3 weeks) was associated with significantly improved scores on the Hamilton Depression Rating Scale and the Center for Epidemiologic Studies Depression Scale in both men and women.<sup>[18]</sup> Of particular interest, sexual functioning scores improved over the 6 weeks.

A 2006 study found that among outpatients with depression treated with venlafaxine, pre- and post-treatment plasma levels of DHEA correlated with improved Hamilton scores after treatment in those who achieved remission (responders).<sup>[19]</sup> The findings suggest that DHEA insufficiency may be linked to depression among patients with remission.

### Considering Light Therapy

For patients with depression who wish to avoid pharmacotherapy, light therapy may be an adjuvant worth considering.<sup>[20,21]</sup> Bright-light therapy has been shown to be an effective adjuvant to antidepressant therapy, even among people with nonseasonal affective disorder.<sup>[5]</sup>

Among the patients who may benefit from light therapy are those with hypersomnia or hyperphagia with carbohydrate craving. The therapy may also help people with circadian disturbances. Those with early-morning awakenings may be phase-advanced and benefit from evening light sessions, whereas those with difficulty falling asleep may be phase-delayed and benefit from morning sessions. Minor side effects have been reported for adjunctive light therapy, such as restlessness, sleep disturbance, and decreased appetite.<sup>[22]</sup>

### Case Resolution

For Mrs Singh, other potential causes for her symptoms should be considered, including hypothyroidism and perimenopause. Once a diagnosis of depression is confirmed, and because she would prefer a nonpharmacologic agent for her mild

depression, saffron at a dosage of 30 mg/day may be an option to consider for the first 6 weeks. She should be advised that the duration of all trials conducted so far is short (6-8 weeks) and that if saffron does not work for her, she might still wish to consider an antidepressant.

Although DHEA is a hormonal alternative, the evidence for its efficacy is less robust. Mrs Singh may not be among the subset of responders to DHEA. DHEA deficiency, however, is a potential rationale for offering this product.

Mrs Singh may also consider light therapy to enhance the effects of either CAM therapy, especially because her symptoms may reflect circadian disturbance. She should be reassessed within 1 month of her trial of CAM therapy to ensure that her symptoms have not worsened.

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<http://phys.org/news/2014-10-poll-reveals-americans.html>

### **New poll reveals what Americans fear most**

***Chapman University has initiated the first comprehensive nationwide study on what strikes fear in Americans in the first of what is a planned annual study.***

According to the Chapman poll, the number one fear in America today is walking alone at night.

The Chapman Survey on American Fears included 1,500 participants from across the nation and all walks of life. Underscoring Chapman's growth and emergence in the sciences, the research team leading this effort pared the information down into four basic categories: personal fears, crime, natural disasters and fear factors. The survey shows that the top five things Americans fear the most are:

- 1) ***Walking alone at night***
- 2) ***Becoming the victim of identity theft***
- 3) ***Safety on the internet***
- 4) ***Being the victim of a mass/random shooting***
- 5) ***Public speaking***

"What initially lead us into this line of research was our desire to capture this information on a year-over-year basis so we can draw comparisons with what items are increasing in fear as well as decreasing," said Dr. Christopher Bader, who led the team effort. "We learned through this initial survey that we had to

phrase the questions according to fears vs. concerns to capture the information correctly, so that is how we present it," Bader continued.

The top five things Americans worry or are concerned about are:

- 1) ***Having identity stolen on the internet***
- 2) ***Corporate surveillance of internet activity***
- 3) ***Running out of money in the future***
- 4) ***Government surveillance of internet activity***
- 5) ***Becoming ill/sick***

"The sky is falling (and a serial killer is chasing me)"

Turning to the crime section of the Chapman Survey on American Fears, the team discovered findings that not only surprised them, but also those who work in fields pertaining to crime.

Chapman University has initiated the first comprehensive nationwide study on what strikes fear in Americans in the first of what is a planned annual study. The Chapman Survey on American Fears included 1,500 participants from across the nation and all walks of life. The research team leading this effort pared the information down into four basic categories: personal fears, crime, natural disasters and fear factors. Credit: Chapman University

"What we found when we asked a series of questions pertaining to fears of various crimes is that a majority of Americans not only fear crimes such as, child abduction, gang violence, sexual assaults and others; but they also believe these crimes (and others) have increased over the past 20 years," said Dr. Edward Day who led this portion of the research and analysis. "When we looked at statistical data from police and FBI records, it showed crime has actually decreased in America in the past 20 years. Criminologists often get angry responses when we try to tell people the crime rate has gone down."

Despite evidence to the contrary, Americans do not feel like the United States is becoming a safer place. The Chapman Survey on American Fears asked how they think prevalence of several crimes today compare with 20 years ago. In all cases, the clear majority of respondents were pessimistic; and in all cases Americans believe crime has at least remained steady. Crimes specifically asked about were: child abduction, gang violence, human trafficking, mass riots, pedophilia, school shootings, serial killing and sexual assault.

### **"Fear of Disaster – Little Action to Prepare"**

Chapman's growth in global climate change research and extreme events led another portion of The Chapman Survey on American Fears into the area of natural disasters and people's preparedness. The findings showed that despite widespread fear, the vast majority of those surveyed do not have emergency kits—even in regions hardest hit by natural disasters.

The top five most feared natural disasters by Americans are:

1. *Tornado/hurricane*
2. *Earthquakes*
3. *Floods*
4. *Pandemic or Major Epidemic*
5. *Power Outage*

Despite these fears, only 25 percent of Americans have a disaster preparedness kit that includes food, water, clothing and medical supplies.

"Our research indicated that Americans are aware, but better communication strategies are needed to encourage the nearly 75 percent who are unprepared for catastrophe," said Dr. Ann Gordon, who led this portion of the survey. "We are conducting follow-up studies to examine why so many Americans remain unprepared despite lessons learned from recent natural disasters," Gordon continued. "And, we are also taking a closer look at 'preppers'—a community that takes preparedness to the extreme."

Dr. Gordon's work includes maps of America that breaks down the fears of natural disasters by region, which can be seen at <http://www.chapman.edu/fearsurvey>

### "Fear Factors"

The remainder of The Chapman Survey on American Fears looks at fear factors. "Through a complex series of analyses, we were able to determine what types of people tend to fear certain things, and what personal characteristics tend to be associated with most types of fear," said Dr. Christopher Bader, who performed the analysis.

Factors Bader and his team looked at included: age, gender, race, work status, education, income, region of the country, urban vs. rural, political preference, religion, TV viewing, and gun ownership. Through their analysis two key factors emerged: having a lower level of education and also high frequency of television viewing were the most consistent predictors of fear.

<http://scitechdaily.com/hearing-restored-noise-deafened-mice/>

### Hearing Restored in Noise-Deafened Mice

*Using advanced tools to boost the production of a key protein in the ears of mice, a team of scientists has restored the hearing of mice partly deafened by noise.*

By demonstrating the importance of the protein, called NT3, in maintaining communication between the ears and brain, these new findings pave the way for research in humans that could improve treatment of hearing loss caused by noise exposure and normal aging.

In a new paper in the online journal eLife, the team from the University of Michigan Medical School's Kresge Hearing Research Institute and Harvard

University report the results of their work to understand NT3's role in the inner ear, and the impact of increased NT3 production on hearing after a noise exposure. Their work also illustrates the key role of cells that have traditionally been seen as the "supporting actors" of the ear-brain connection. Called supporting cells, they form a physical base for the hearing system's "stars": the hair cells in the ear that interact directly with the nerves that carry sound signals to the brain. This new research identifies the critical role of these supporting cells along with the NT3 molecules that they produce.

NT3 is crucial to the body's ability to form and maintain connections between hair cells and nerve cells, the researchers demonstrate. This special type of connection, called a ribbon synapse, allows extra-rapid communication of signals that travel back and forth across tiny gaps between the two types of cells.

"It has become apparent that hearing loss due to damaged ribbon synapses is a very common and challenging problem, whether it's due to noise or normal aging," says Gabriel Corfas, Ph.D., who led the team and directs the U-M institute. "We began this work 15 years ago to answer very basic questions about the inner ear, and now we have been able to restore hearing after partial deafening with noise, a common problem for people. It's very exciting."

Using a special genetic technique, the researchers made it possible for some mice to produce additional NT3 in cells of specific areas of the inner ear after they were exposed to noise loud enough to reduce hearing. Mice with extra NT3 regained their ability to hear much better than the control mice.

Now, says Corfas, his team will explore the role of NT3 in human ears, and seek drugs that might boost NT3 action or production. While the use of such drugs in humans could be several years away, the new discovery gives them a specific target to pursue.

Corfas, a professor and associate chair in the U-M Department of Otolaryngology, worked on the research with first author Guoqiang Wan, Ph.D., Maria E. Gómez-Casati, Ph.D., and others in his former institution, Harvard. Some of the authors now work with Corfas in his new U-M lab.

They set out to find out how ribbon synapses – which are found only in the ear and eye – form, and what molecules are important to their formation and maintenance.

Anyone who has experienced problems making out the voice of the person next to them in a crowded room has felt the effects of reduced ribbon synapses. So has anyone who has experienced temporary reduction in hearing after going to a loud concert. The damage caused by noise – over a lifetime or just one evening – reduces the ability of hair cells to talk to the brain via ribbon synapse connections with nerve cells.



### Targeted genetics made discovery possible

After determining that inner ear supporting cells supply NT3, the team turned to a technique called conditional gene recombination to see what would happen if they boosted NT3 production by the supporting cells. The approach allows scientists to activate genes in specific cells, by giving a dose of a drug that triggers the cell to “read” extra copies of a gene that had been inserted into them. For this research, the scientists activated the extra NT3 genes only into the inner ear’s supporting cells.

The genes didn’t turn on until the scientists wanted them to – either before or after they exposed the mice to loud noises. The scientists turned on the NT3 genes by giving a dose of the drug tamoxifen, which triggered the supporting cells to make more of the protein. Before and after this step, they tested the mice’s hearing using an approach called auditory brainstem response or ABR – the same test used on humans.

The result: the mice with extra NT3 regained their hearing over a period of two weeks, and were able to hear much better than mice without the extra NT3 production. The scientists also did the same with another nerve cell growth factor, or neurotrophin, called BDNF, but did not see the same effect on hearing.

### Next steps

Now that NT3’s role in making and maintaining ribbon synapses has become clear, Corfas says the next challenge is to study it in human ears, and to look for drugs that can work like NT3 does. Corfas has some drug candidates in mind, and hopes to partner with industry to look for others.

Boosting NT3 production through gene therapy in humans could also be an option, he says, but a drug-based approach would be simpler and could be administered as long as it takes to restore hearing.

Corfas notes that the mice in the study were not completely deafened, so it’s not yet known if boosting NT3 activity could restore hearing that has been entirely lost. He also notes that the research may have implications for other diseases in which nerve cell connections are lost – called neurodegenerative diseases. “This brings supporting cells into the spotlight, and starts to show how much they contribute to plasticity, development and maintenance of neural connections,” he says.

In addition to Corfas, Wan and Gómez-Casati, who now works in Argentina, the research was performed by Angelica R. Gigliello, and M. Charles Liberman, Ph.D. director of the Eaton-Peabody Laboratories of the Massachusetts Eye and Ear Infirmary. The research was supported by the National Institute on Deafness and Other Communication Disorders (DC004820, DC005209) and by the Eunice Kennedy Shriver National Institute of Child Health and Human Development

(HD18655), both part of the National Institutes of Health, and by the Hearing Health Foundation.

Guoqiang Wan, et al., “Neurotrophin-3 regulates ribbon synapse density in the cochlea and induces synapse regeneration after acoustic trauma,” *eLife*, 2014; DOI:10.7554/eLife.03564

<http://www.astrobio.net/topic/origins/extreme-life/lichen-orbit/>

### Lichen in Orbit

***A new study shows that a large percentage of hardy lichens exposed to space conditions for one and a half years remain viable after returning to Earth.***

By [Aaron L. Gronstal](#) - Oct 22, 2014

The lichen [Xanthoria elegans](#) was part of the lichen and fungi experiment (LIFE) on the International Space Station (ISS). The lichen had been exposed before on previous experiments such as [BIOPAN](#), but never for such a long period of time. LIFE was attached to the exterior of the ISS for 1.5 years, exposing the organisms inside to the stresses of low Earth orbit, including ultraviolet irradiation, cosmic radiation and vacuum conditions. A subset of the lichen samples were also exposed to simulated Mars conditions by adding an analog [Mars atmosphere](#) and solar radiation filters to the experimental chambers. After their journey in space and return to the Earth surface, an impressive 71% of the lichen remained viable. The study can help [astrobiologists](#) understand the mechanisms that living organisms might use to survive on planets other than Earth. These mechanisms provide clues about how life may have originated and evolved in the conditions present on locations like ancient Mars.

The research can also provide insight into a process known as [lithopanspermia](#) – the transfer of life from one celestial body to another inside rocks. For more information on this aspect of the LIFE experiment, see the [video below from European Space Agency \(ESA\)](#).

[http://www.eurekalert.org/pub\\_releases/2014-10/uobc-rtt102214.php](http://www.eurekalert.org/pub_releases/2014-10/uobc-rtt102214.php)

### Rapid test to diagnose severe sepsis

***A new test, developed by University of British Columbia researchers, could help physicians predict within an hour if a patient will develop severe sepsis so they can begin treatment immediately.***

Sepsis, a syndrome caused by infection, leads to organ failure and is responsible for up to five million deaths annually. There are 18 million cases of sepsis worldwide every year. The discovery could cut back on the lengthy diagnostic time usually required to confirm if a patient is suffering from sepsis and increase the odds that they will respond to treatment.

"We identified a gene signature that is associated with the eventual diagnosis of sepsis and subsequent organ failure," says Bob Hancock, a professor in UBC's Dept. of Microbiology and Immunology who co-authored this study with John

Boyd, a physician at St Paul's Hospital and an assistant professor at UBC. "We can test for this genetic signature as soon as the patient arrives in the emergency ward." A typical diagnosis can take 24 to 48 hours but with this new test, physicians could start treating patients almost immediately.

The new test for the genetic signature, published recently in the journal EBioMedicine, would take as little as one hour and identified 96 per cent of patients who were at the very early stages of sepsis.

"With sepsis, every hour counts," says Hancock. "The treatment involves aggressive antibiotics but the most potent drugs can't be administered until a diagnosis is confirmed because of the risk of antibiotic resistant bacteria."

The findings also reveal a potential misunderstanding about the disease. Until now sepsis has been treated as an inflammatory disease but more than 30 clinical trials of anti-inflammatory drugs for sepsis have failed. The gene signature identified by Hancock and his colleagues relates to a special type of immune suppression called cellular reprogramming and suggests that treating inflammation in sepsis is a bad idea.

Paper: <http://www.sciencedirect.com/science/article/pii/S235239641400005X>

[http://www.eurekalert.org/pub\\_releases/2014-10/wuso-hsc102014.php](http://www.eurekalert.org/pub_releases/2014-10/wuso-hsc102014.php)

### **Human skin cells reprogrammed directly into brain cells**

*Scientists have described a way to convert human skin cells directly into a specific type of brain cell affected by Huntington's disease*

Scientists have described a way to convert human skin cells directly into a specific type of brain cell affected by Huntington's disease, an ultimately fatal neurodegenerative disorder. Unlike other techniques that turn one cell type into another, this new process does not pass through a stem cell phase, avoiding the production of multiple cell types, the study's authors report.

The researchers, at Washington University School of Medicine in St. Louis, demonstrated that these converted cells survived at least six months after injection into the brains of mice and behaved similarly to native cells in the brain.

"Not only did these transplanted cells survive in the mouse brain, they showed functional properties similar to those of native cells," said senior author Andrew S. Yoo, PhD, assistant professor of developmental biology. "These cells are known to extend projections into certain brain regions. And we found the human transplanted cells also connected to these distant targets in the mouse brain. That's a landmark point about this paper."

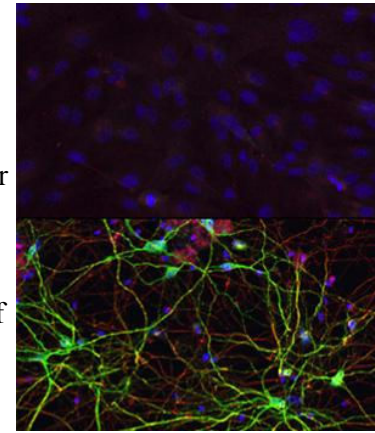
The work appears Oct. 22 in the journal Neuron.

The investigators produced a specific type of brain cell called medium spiny neurons, which are important for controlling movement. They are the primary cells affected in Huntington's disease, an inherited genetic disorder that causes

involuntary muscle movements and cognitive decline usually beginning in middle-adulthood. Patients with the condition live about 20 years following the onset of symptoms, which steadily worsen over time.

The research involved adult human skin cells, rather than more commonly studied mouse cells or even human cells at an earlier stage of development. In regard to potential future therapies, the ability to convert adult human cells presents the possibility of using a patient's own skin cells, which are easily accessible and won't be rejected by the immune system.

*Human skin cells (top) can be converted into medium spiny neurons (bottom) with exposure to the right combination of microRNAs and transcription factors, according to work by Andrew Yoo and his research team. Yoo lab*



To reprogram these cells, Yoo and his colleagues put the skin cells in an environment that closely mimics the environment of brain cells. They knew from past work that exposure to two small molecules of RNA, a close chemical cousin of DNA, could turn skin cells into a mix of different types of neurons. In a skin cell, the DNA instructions for how to be a brain cell, or any other type of cell, is neatly packed away, unused. In past research published in Nature, Yoo and his colleagues showed that exposure to two microRNAs called miR-9 and miR-124 altered the machinery that governs packaging of DNA. Though the investigators still are unraveling the details of this complex process, these microRNAs appear to be opening up the tightly packaged sections of DNA important for brain cells, allowing expression of genes governing development and function of neurons.

Knowing exposure to these microRNAs alone could change skin cells into a mix of neurons, the researchers then started to fine tune the chemical signals, exposing the cells to additional molecules called transcription factors that they knew were present in the part of the brain where medium spiny neurons are common.

"We think that the microRNAs are really doing the heavy lifting," said co-first author Matheus B. Victor, a graduate student in neuroscience. "They are priming the skin cells to become neurons. The transcription factors we add then guide the skin cells to become a specific subtype, in this case medium spiny neurons. We think we could produce different types of neurons by switching out different transcription factors."

Yoo also explained that the microRNAs, but not the transcription factors, are important components for the general reprogramming of human skin cells directly to neurons. His team, including co-first author Michelle C. Richner, senior research technician, showed that when the skin cells were exposed to the transcription factors alone, without the microRNAs, the conversion into neurons wasn't successful.

The researchers performed extensive tests to demonstrate that these newly converted brain cells did indeed look and behave like native medium spiny neurons. The converted cells expressed genes specific to native human medium spiny neurons and did not express genes for other types of neurons. When transplanted into the mouse brain, the converted cells showed morphological and functional properties similar to native neurons.

To study the cellular properties associated with the disease, the investigators now are taking skin cells from patients with Huntington's disease and reprogramming them into medium spiny neurons using the approach described in the new paper. They also plan to inject healthy reprogrammed human cells into mice with a model of Huntington's disease to see if this has any effect on the symptoms.

*This work was supported by the National Science Foundation Graduate Research Fellowship (DGE-1143954), the fellowship from Cognitive, Computational and Systems Neuroscience Pathway (T32NS023547), and grants from the National Institutes of Health (NIH) (MH078823), including from the National Institute of General Medical Sciences (R01 GM104991) and the National Heart Lung and Blood Institute (T32 HL007275), the NIH Director's Innovator Award (DP2) and awards from the Mallinckrodt Jr. Foundation, Ellison Medical Foundation, and Presidential Early Career Award for Scientists and Engineers. Victor MB, Richner M, Hermanstynne TO, Ransdell JL, Sobieski C, Deng PY, Klyachko VA, Nerbonne JM, Yoo AS. Generation of human striatal neurons by microRNA-dependent direct conversion of fibroblasts. Neuron. Oct. 22, 2014.*

[http://www.eurekalert.org/pub\\_releases/2014-10/uotm-iy0102214.php](http://www.eurekalert.org/pub_releases/2014-10/uotm-iy0102214.php)

### **If you're over 60, drink up: Alcohol associated with better memory**

***For people 60 and older who do not have dementia, light alcohol consumption during late life is associated with higher episodic memory***

Researchers from the University of Texas Medical Branch at Galveston, University of Kentucky, and University of Maryland found that for people 60 and older who do not have dementia, light alcohol consumption during late life is associated with higher episodic memory - the ability to recall memories of events. Moderate alcohol consumption was also linked with a larger volume in the hippocampus, a brain region critical for episodic memory. The relationship between light alcohol consumption and episodic memory goes away if hippocampal volume is factored in, providing new evidence that hippocampal

functioning is the critical factor in these improvements. These findings were detailed in the American Journal of Alzheimer's Disease and Other Dementias. This study used data from more than 660 patients in the Framingham Heart Study Offspring Cohort. These patients completed surveys on their alcohol consumption and demographics, a battery of neuropsychological assessments, the presence or absence of the genetic Alzheimer's disease risk factor APOE e4 and MRIs of their brains. The researchers found that light and moderate alcohol consumption in older people is associated with higher episodic memory and is linked with larger hippocampal brain volume. Amount of alcohol consumption had no impact on executive function or overall mental ability.

Findings from animal studies suggest that moderate alcohol consumption may contribute to preserved hippocampal volume by promoting generation of new nerve cells in the hippocampus. In addition, exposing the brain to moderate amounts of alcohol may increase the release of brain chemicals involved with cognitive, or information processing, functions.

"There were no significant differences in cognitive functioning and regional brain volumes during late life according to reported midlife alcohol consumption status," said lead author Brian Downer, UTMB Sealy Center on Aging postdoctoral fellow. "This may be due to the fact that adults who are able to continue consuming alcohol into old age are healthier, and therefore have higher cognition and larger regional brain volumes, than people who had to decrease their alcohol consumption due to unfavorable health outcomes."

Although the potential benefits of light to moderate alcohol consumption to cognitive learning and memory later in life have been consistently reported, extended periods of abusing alcohol, often defined as having five or more alcoholic beverages during a single drinking occasion is known to be harmful to the brain.

*Other members of this research team include Yang Jiang and David Fardo from the University of Kentucky and Faika Zanjani from the University of Maryland.*

<http://www.wired.com/2014/10/ebolanoia/>

### **Ebolanoia: The Only Thing We Have to Fear is Ebola Fear Itself Given our nationwide reaction, you might think we have had as many cases as West Africa**

• By [Marvyn McKenna](#)

It is almost a month now since Thomas Eric Duncan appeared at the emergency room of Texas Health Presbyterian Hospital, was sent home after evaluation, and returned two days later with symptoms of Ebola. On Monday, his family and the health workers who treated him at the hospital were released from quarantine, with none having fallen ill.



But if you've been paying any attention to the Ebola news, you'll know that the story is far from over, with one nurse who took care of him in Dallas now hospitalized at NIH (and upgraded to good condition Tuesday) and the other at Emory University, where the aid workers who fell ill in Africa also received treatment and recovered. Duncan remains the only person who came to the US with Ebola but not already identified and under medical care.

Given our nationwide reaction, though, you might think we have had as many cases as West Africa.

Brief recap: The Africa count so far is 9,216 cases [as of last Friday](#), including 4,555 deaths. The disease continues to circulate in Guinea, Sierra Leone and especially Liberia. Nigeria and Senegal's outbreaks [have been contained](#). In the United States, five people who were already diagnosed have been brought back for treatment; Duncan entered the country not knowing he had been infected in Liberia; and the two nurses who treated him were infected here.

Like anyone who keeps an eye the news, I'd noticed — well, call it a continuing rumble of concern, especially once it emerged that the second nurse, Amber Vinson, had flown from Dallas to Cleveland and back while beginning to spike a fever. The rumble got louder [a week ago when the CDC announced](#) that it wanted to track down everyone who had shared the return flight with Vinson (and later, the outbound flight too). On Friday, it broke out into a full-on howl: A teacher from Maine who had visited Dallas — but did not go to the Dallas hospital and did not take either of the flights the nurse took — was [placed on leave by her school district](#), just in case.

This seemed such a ridiculous over-reaction (as a Mainer by marriage: thanks for nothing, Maine) that I figured it would be a one-time thing. But no: Since Friday, there has been at least one instance a day of fear-based nuttiness, so many that I started stashing them [at my Tumblr](#). Just a few examples:

- *A North Carolina school district forced an assistant principal to [stay home for 21 days](#) because she visited South Africa*
- *[Several universities cancelled](#) talks by people from Africa or those who had visited lately*
- *A Congressional candidate called for a [citywide “no touching” edict](#) in Dallas*
- *People who happened to take the same cruise as an uninfected lab worker for the Texas hospital were [denied jobs](#) and told to [stay home from school](#)*
- *Mississippi parents [pulled their children from school](#) because the principal had attended a family funeral in a part of Africa where there is no Ebola*
- *An airline [locked a vomiting passenger](#) in a bathroom, and a [subway station was closed](#) on a claim of a “hemorrhaging Liberian woman” who turned out to be Haitian, and vomiting.*

- *A GOP Congressman [predicted that terrorists](#) would use Ebola as a weapon, by allowing themselves to be infected in Africa and then smuggling themselves across the Mexican border.*

(There are [more](#).)

Individually, these reactions deserve a laugh and an eye-roll: It is embarrassing to admit that some people can't read a map (South Africa is 3,000 miles from the Ebola zone), and disturbing to realize how quickly fears of infection balloon into Flying While Black. Collectively, though, they are a real concern. Keeping people home, denying them jobs, closing down transit, shuttering schools to bleach-bomb them — all of these are enormously costly, and for no benefit.

At Politico, Tara Haelle has more on how some media outlets have [inflated Ebola fears](#), and at the *Bulletin of the Atomic Scientists*, David Ropeik delves into the [implications of the fear response](#).

The Ebola epidemic in Africa looks likely to continue for months more. Despite calls for closing the borders and for cancelling [flights that don't exist](#), the possibility remains that another traveler such as Duncan [may make it](#) to the United States, either covertly or innocently as Duncan seems to have done. (At the time he traveled, he was not showing symptoms, not aware that he was infected, and may not have known that the probable source of his infection, a woman giving birth, was an Ebola victim.) Politically and economically, the country can't really afford a second wave of panic like this first one. Let's try to keep Ebolania under control.

<http://nyti.ms/LuYu5fM>

**Man's Genome From 45,000 Years Ago Is Reconstructed**  
*In 2012, Dr. Paabo and his colleagues took samples from this thigh bone to search for DNA. To their surprise, it held a number of genetic fragments.*

Carl Zimmer

Scientists have reconstructed the genome of a man who lived 45,000 years ago, by far the oldest genetic record ever obtained from modern humans. The research, published on Wednesday in the journal *Nature*, provided new clues to the expansion of modern humans from Africa about 60,000 years ago, when they moved into Europe and Asia.

And the genome, extracted from a fossil thighbone found in Siberia, added strong support to a provocative hypothesis: Early humans interbred with Neanderthals. “It's irreplaceable evidence of what once existed that we can't reconstruct from what people are now,” said John Hawks, a paleoanthropologist at the University of Wisconsin who was not involved in the study. “It speaks to us with information about a time that's lost to us.”

The discoveries were made by a team of scientists led by Svante Paabo, a geneticist at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. Over the past three decades, Dr. Paabo and his colleagues have developed tools for plucking out fragments of DNA from fossils and reading their sequences.

Early on, the scientists were able only to retrieve tiny snippets of ancient genes. But gradually, they have invented better methods for joining the overlapping fragments together, assembling larger pieces of ancient genomes that have helped shed light on the evolution of humans and their relatives.

In December, they published the entirety of a Neanderthal genome extracted from a single toe bone. Comparing Neanderthal to human genomes, Dr. Paabo and his colleagues found that we share a common ancestor, which they estimated lived about 600,000 years ago.

Recently, Dr. Paabo and his colleagues got an opportunity to test their new methods on an exceptional human bone.

In 2008, a fossil collector named Nikolai V. Peristov was traveling along the Irtysh River in Siberia, searching for mammoth tusks in the muddy banks. Near a settlement called Ust'-Ishim, he noticed a thighbone in the water. Mr. Peristov fished it out and brought it to scientists at the Russian Academy of Sciences.

The Russian researchers identified the bone as a modern human, not a Neanderthal. To determine its age, they sent samples to the University of Oxford. Scientists there measured the breakdown of radioactive carbon and determined the bone was about 45,000 years old — making it the oldest modern human fossil ever found outside of Africa and the Near East.

In 2012, Dr. Paabo and his colleagues took samples from the bone to search for DNA. To their surprise, it held a number of genetic fragments.

“This is an amazing and shocking and unique sample,” said David Reich, a geneticist at Harvard Medical School and co-author of the new study.

The researchers used the DNA fragments to create a high-resolution copy of the man’s complete genome. A Y chromosome revealed that the thighbone belonged to a man.

The scientists then compared the genome of the so-called Ust'-Ishim man to those of ancient and living people. They found that his DNA was more like that of non-Africans than that of Africans.

But the Ust'-Ishim man was no more closely related to ancient Europeans than he was to East Asians.

He was part of an earlier lineage, the scientists concluded — a group that eventually gave rise to all non-African humans.

Homo sapiens, our own species, appeared in Africa around 200,000 years ago. Previous studies, both on genes and on fossils, have suggested that they then expanded through the Near East to the rest of the Old World.

The Ust'-Ishim man’s genome suggests he belonged to a group of people who lived after the African exodus, but before the split between Europeans and Asians. Dr. Paabo and his colleagues also found that the Ust'-Ishim man had pieces of Neanderthal DNA in his genome, just as living non-Africans do. But his Neanderthal DNA had some important differences.

Fossils indicate that Neanderthals spread across Europe and Asia before becoming extinct an estimated 40,000 years ago. Today, the Neanderthal DNA in each living non-African human is broken up into short segments sprinkled throughout the genome. Dr. Paabo and his colleagues have hypothesized that this arrangement is a result of how cells divide.

During the development of eggs and sperm, each pair of chromosomes swaps pieces of their DNA. Over the generations, long stretches of DNA get broken into smaller ones, like a deck of cards repeatedly shuffled.

Over thousands of generations, the Neanderthal DNA became more fragmented. Dr. Paabo and his colleagues predicted, however, that Neanderthal DNA in the Ust'-Ishim man’s genome would form longer stretches.

And that’s exactly what they found. “It was very satisfying to see that,” Dr. Paabo said.

By comparing the Ust'-Ishim man’s long stretches of Neanderthal DNA with shorter stretches in living humans, Dr. Paabo and his colleagues estimated the rate at which they had fragmented. They used that information to determine how long ago Neanderthals and humans interbred.

Previous studies, based only on living humans, had yielded an estimate of 37,000 to 86,000 years. Dr. Paabo and his colleagues have now narrowed down that estimate drastically: Humans and Neanderthals interbred 50,000 to 60,000 years ago, according to the new data.

The findings raised questions about research suggesting that humans in India and the Near East dated back as far as 100,000 years ago. Some scientists believe that humans expanded out of Africa in a series of waves.

But Christopher Stringer, a paleoanthropologist at the Natural History Museum, said that the new study offered compelling evidence that living non-Africans descended from a group of people who moved out of Africa about 60,000 years ago.

Any humans that expanded out of Africa before then probably died out, Mr. Stringer said.

*Journal reference: Nature, DOI: 10.1038/nature13810*

<http://bbc.in/1zy03YM>

## Mystery of dinosaur with giant arms solved

*A dinosaur mystery that has baffled palaeontologists for 50 years has finally been solved.*

By Rebecca Morelle Science Correspondent, BBC News

In the 1960s, researchers unearthed two gigantic dinosaur arms. For decades, scientists have speculated about what kind of beast they belonged to.

Now, the rest of the dinosaur's body has been unearthed, and researchers say that the creature is even more bizarre than they had thought. They say it was huge, with a beak, a humped back and giant, hoofed feet. The study is published in the journal Nature.

Lead researcher Yuong-Nam Lee, from South Korea's Institute of Geoscience and Mineral Resources (Kigam), said: "It turned out to be one of the weirdest dinosaurs, it's weird beyond our imagination."

*Researchers say the beast has a very strange combination of features*

### Slow mover

For half a century, all that was known about this dinosaur was that it had enormous forearms, measuring 2.4m-long (8ft) and tipped with three giant claws. Reconstruction of Deinocheirus mirificus Researchers say the beast has a very strange combination of features

Its name Deinocheirus mirificus means unusual, horrible hands. In various reconstructions, it has been imagined as anything from a T. rex-type predator grasping at prey with its claws, to a giant, sloth-like climber, using its arms to dangle from trees. But the discovery of two nearly complete skeletons in Mongolia have finally laid this speculation to rest.

The international research team says the beast was very large, measuring about 11m (36ft) long and weighing six tonnes. It had an elongated head with a duck-like beak, and a large humped sail on its back.

Its legs were short and stumpy, but its feet were very large with hooves, which would have prevented it from sinking into the boggy wetlands where it lived.

The researchers think that the beast was probably a very slow mover. The contents of its stomach suggest that it ate plants and fish.

Dr Yuong-Nam Lee said: "We did not know their function before, but the long forearms with giant claws may have been used for digging and gathering herbaceous plants in freshwater habitats."



Commenting on the research Prof John Hutchinson, a palaeontologist from the UK's Royal Veterinary College, said: "Many dinosaur fans have seen pictures of the 8ft-long arms and hands, and they really are amazing and wonderful. People were really wondering what the rest of this animal looked like.

"Now we know, and it's just so freaking weird - we never would have expected this animal to look so bizarre.

"It really is shocking to see how many weird features it has. It changes our view of what kind of forms dinosaurs can even take."

<http://bit.ly/1zy17vI>

## Fecal Transplanters Fish Out Key Ingredient

*The bacterium Clostridium scindens, a member of the gut's microbiome, appears to ward off the hospital-acquired infection C. difficile. Christopher Intagliata reports*

By [Christopher Intagliata](#)

[Download MP3](#)

These days, antibiotics are no silver bullet. In fact, if you get them in the hospital, you may end up with an additional infection. Like the bug *Clostridium difficile*, or *C. diff*—which infects more than 300,000 Americans a year and kills some 14,000. *C. diff* flourishes in the post-antibiotic, microbe-free landscape of your gut. But there is a way to stop it—a fecal transplant. That cocktail of microbes from a healthy person's gut can rein in a *C. diff* outbreak. The question is not: Eewww? It's: What are the transplant's active ingredients?

Well, one of them appears to be a bacterium called *Clostridium scindens*. Because in past studies, people and mice that harbored *C. scindens* were protected against a full-blown *C. diff* infection. So researchers dosed mice with the good guy, *C. scindens*, after a bout of antibiotics. And the treatment did indeed ward off *C. diff*, compared to a cocktail of other microbes, or nothing at all.

*C. scindens* makes a living by breaking down bile, the researchers say, and it's those secondary products that seem to inhibit *C. diff*. The findings are in the journal *Nature*. [Charlie G. Buffie et al: [Precision microbiome reconstitution restores bile acid mediated resistance to Clostridium difficile](#)]

This work could lead to more targeted probiotic treatments. But study author Eric Pamer of Memorial Sloan Kettering Cancer Center says it's worth remembering that when it comes to microbes, the sum is often greater than its parts. "In some ways I would say this is far more complex than an orchestra, in that there are many more interdependencies, and many of which we just don't understand yet, but that are starting to be illuminated by ongoing work." Now, at least, we know one of the featured performers.

<http://bit.ly/1tr67hA>

## Monster Mushrooms Could Hold Key to New Meds

*For some, a mushroom's a nice topper for salads and sauces, for others a psychotropic walk on the wild side.*

Oct 23, 2014 07:00 AM ET // by Paul Heltzel

But for American mycologist Paul Stamets the long-living, sometimes huge, beehive-shaped mushroom called an Agarikon represents the future of treating diseases such as tuberculosis, cowpox, bird and swine flu.

Agarikon is hard to find and grows only on trees in old-growth forests in North America and Europe. The Agarikon may be the longest-living shroom on Earth and is sometimes referred to as the quinine conk because of its bitter taste (no relation to actual quinine.)



***Paul Stamets, an American mycologist (mushroom researcher), holds an Agarikon mushroom (Laricifomes officinalis).*** Dusty Yao-Stamets/Wikipedia Commons

Agarikon mushrooms are most promising in the treatment of drug-resistant tuberculosis. The mushrooms were used to treat TB by Ancient Greeks and by some indigenous peoples in North America. Today in the lab, researchers say, compounds extracted from Agarikon mushroom show encouraging early results in fighting tuberculosis bacteria.

You can see Stamets go on the hunt for Agarikon mushrooms [in the video below](#).

[http://www.eurekalert.org/pub\\_releases/2014-10/ksu-bbf102314.php](http://www.eurekalert.org/pub_releases/2014-10/ksu-bbf102314.php)

## Beetroot beneficial for athletes and heart failure patients, research finds

***Football teams are claiming it improves their athletic performance, and according to new research from Kansas State University, it also benefits heart failure patients.***

MANHATTAN, Kansas - The special ingredient: beetroot.

Recently, the Auburn University football team revealed its pregame ritual of taking beetroot concentrate, or beet juice, before each game. The juice may have contributed to the team's recent winning season - and one exercise physiologist who has been studying the supplement for several years says that may be the case. "Our research, published in the journal *Physiology* in 2013, has shown that the nitrate found in beetroot concentrate increases blood flow to skeletal muscles during exercise," said David Poole, professor of exercise kinesiology and anatomy

and physiology at Kansas State University. The journal *Physiology* is widely regarded as the world's premiere physiology journal.

The researchers' latest study, "Microvascular oxygen pressures in muscles comprised of different fiber types: Impact of dietary nitrate supplementation," was published in the *Journal of Nitric Oxide, Biology and Chemistry*.

This work provides the basis for how beetroot juice may benefit football players by preferentially increasing blood flow to fast-twitch muscle fibers - the ones used for explosive running. This work was performed by Poole; Scott Ferguson, doctoral student in anatomy and physiology; and Timothy Musch, professor of exercise kinesiology and anatomy and physiology, all at Kansas State University. In addition to improving athletic performance, the research also found that beetroot juice can improve the quality of life for heart failure patients.

"Remember, for every one football player in the United States, there are many thousands of heart failure patients that would benefit from this therapy," Poole said.

"It's a big deal because even if you can only increase oxygen delivery by 10 percent, that can be the difference between a patient being wheelchair-bound versus getting up and walking around and interacting with his or her family."

The benefits of beetroot come from the nitrate found within it. The amount of nitrate in one 70-milliliter bottle of beetroot juice is about the same amount found in 100 grams of spinach.

"When consumed, nitrate is reduced in the mouth by bacteria into nitrite," Ferguson said. "The nitrite is swallowed again and then reduced to nitric oxide, which is a potent vasodilator.

The nitric oxide dilates the blood vessels, similar to turning on a water faucet, and allows blood to go where it needs to go."

The beetroot juice consumption resulted in a 38 percent higher blood flow to the skeletal muscles during exercise and was preferential to the less-oxygenated, fast-twitch muscles.

"Heart failure is a disease where oxygen delivery to particular tissues, especially working skeletal muscles, is impaired, decreasing the capacity to move the arms or legs and be physically active," Poole said. "The best therapy for these patients is getting up and moving around. However, that is often difficult. Increasing the oxygen delivery to these muscles through beetroot can provide a therapeutic avenue to improve the quality of life for these patients."

Clinical trials are currently underway.

*The researchers are collaborating with Andrew Jones, professor of applied physiology at the University of Exeter in the United Kingdom. The research is funded by the National Institutes of Health.*



[http://www.eurekalert.org/pub\\_releases/2014-10/tl-tli102214.php](http://www.eurekalert.org/pub_releases/2014-10/tl-tli102214.php)

## **Study predicts that current international commitments will not contain Ebola outbreak in Montserrado, Liberia**

### ***Number of Ebola treatment center beds and other measures needed to control Ebola substantially exceeds the total pledged by the international community***

New modeling research, published in The Lancet Infectious Diseases journal, has found that the number of Ebola treatment center beds and other measures needed to control the epidemic in Montserrado County, Liberia substantially exceeds the total pledged by the international community to date.

The research shows that, without expanded control efforts, up to 170996 total reported and unreported Ebola cases, and 90122 deaths are projected in Montserrado by 15 December, 2014. The study estimates that of these, 42669 cases and 27175 deaths will have been reported by that time.

However, rapid scale-up of control measures starting on 31 October, including 4800 additional hospital beds, a fivefold increase in the speed with which cases are detected (for example, through contact tracing), and allocating protective kits for home care, could prevent as many as 97940 cases by 15 December.

Further delays in expanding these interventions would greatly limit their effectiveness. For example, if delayed to 15 November, at best just over half as many (53957) cases would be averted.

"Our predictions highlight the rapidly closing window of opportunity for controlling the outbreak, and averting a catastrophic toll of new Ebola cases and deaths in the coming months" <sup>[3]</sup>, warns Alison Galvani, senior author and Professor of Epidemiology at the Yale School of Public Health, USA.

Professor Galvani and colleagues used mathematical modelling to evaluate the ability of control interventions (ie, new treatment centres to isolate and treat Ebola patients, case finding through contact tracing, and protective kits to help household-based isolation of infected individuals) to control the Ebola outbreak in Montserrado during various time periods.

The researchers estimate that the reproductive number (R0, the average number of infections caused by a single infected individual) in Montserrado is 2.49. They predict that the addition of 4800 treatment beds, alongside increasing case detection fivefold in November, could prevent 77312 cases by 15 December, 2014. Additionally, a complementary strategy of allocating protective kits could bring the number of deaths averted up to 97940 cases in total.

Had all three interventions been implemented two weeks earlier, before 15 October, 2014, they would have been expected to prevent up to 137432 total reported and unreported cases.

According to Professor Galvani, "While the window of opportunity for timely control of the Ebola outbreak has passed, the risk of catastrophic devastation both in West Africa and beyond has only just begun. While vaccines to prevent Ebola remain unavailable, our study urges a rapid and immediate scaling-up of all currently available non-pharmaceutical intervention strategies to minimize the occurrence of new cases and deaths" <sup>[3]</sup>.

Writing in a linked Comment, Professor David Fisman and Ashleigh Tuite, from the University of Toronto's Dalla Lana School of Public Health in Canada, explain why the study's predictions are useful: "The growth of this epidemic fits so well with mathematical epidemiological ideas that it seems torn from the pages of a textbook. And thus, even as the current Ebola epidemic wastes lives, devastates economies, and causes widespread fear, it follows a seemingly well behaved epidemiological process, readily understood through the use of mathematical modelling".

They add that, "The urgency of timely intervention in the Ebola epidemic cannot be overstated. The reason is one of simple mathematics: if R0 in this region is around 2.5, as Lewnard and colleagues estimate, incidence in every successive epidemic generation will increase by 150%...Researchers have asserted that the epidemic is proceeding in virus time, with a response on bureaucrat time. From a global perspective, controlling the Ebola epidemic in west Africa is not only a humanitarian duty but also a matter of crude self-interest. [This study] shows that intervention will only be meaningful if it is timely, and so far it has not been."

#### **NOTES TO EDITORS:**

*The study is funded by the US National Institutes of Health.*

<sup>[1]</sup> *Ebola-infected travellers from this region, home to Monrovia, Liberia's capital city, have already caused an outbreak of at least 19 cases in Nigeria.*

<sup>[2]</sup> *On September 16, 2014, the USA announced the construction of 17 new Ebola Treatment Centres to isolate and treat 1700 patients. As of 15 October, 2014, Liberia reports that only six out of 28 planned Ebola Treatment Centres are operational, providing 620 out of 2930 planned beds*

<http://apps.who.int/iris/bitstream/10665/136508/1/roadmapsitre15Oct2014.pdf?ua=1>

<http://phys.org/news/2014-10-colossal-volcanic-eruption-japan.html>

## **Colossal volcanic eruption could destroy Japan, study says**

***Japan could be nearly destroyed by a massive volcanic eruption over the next century, putting almost all of the country's 127 million-strong population at risk, according to a new study***

"It is not an overstatement to say that a colossal volcanic eruption would leave Japan extinct as a country," Kobe University earth sciences professor Yoshiyuki Tatsumi and associate professor Keiko Suzuki said in a study publicly released on Wednesday.

The experts said they analysed the scale and frequency of volcanic eruptions in the archipelago nation over the past 120,000 years and calculated that the odds of a devastating eruption at about one percent over the next 100 years.

The chance of a major earthquake striking the city of Kobe within 30 years was estimated at about one percent just a day before a 7.2-magnitude quake destroyed the Japanese port city in 1995, killing 6,400 people and injuring nearly 4,400 others, the study noted. "Therefore, it would be no surprise if such a colossal eruption occurs at any moment," it added.

The new research comes weeks after Japan's Mount Ontake erupted without warning - killing 57 people and leaving at least six others missing in the country's deadliest volcanic eruption in almost 90 years. The Kobe University researchers said their study was critical because Japan is home to about seven percent of the volcanoes that have erupted over the past 10,000 years.

A disaster on the southernmost main island of Kyushu, which has been struck by seven massive eruptions over the past 120,000 years, would see an area with seven million people buried by flows of lava and molten rock in just two hours, they said.

Volcanic ash would also be carried by westerly winds toward the main island of Honshu, making almost all of the country "unliveable" as it strangled infrastructure, including key transport systems, they said. It would be "hopeless" trying to save about 120 million living in major cities and towns across Honshu, the study said.

This prediction was based on geological findings from the eruption of a gigantic crater, 23 kilometres (14 miles) across, in southern Kyushu about 28,000 years ago. The study called for new technology to accurately grasp the state of "magma reservoirs" which are spread across the earth's crust in layers a few kilometres deep.

<http://bit.ly/1Df3gjk>

### Sea Coral Makes Excellent Human Bone Grafts

*Coral's porous structure, with some chemical tweaks, is the perfect place for new bone and tissue to grow*

By [Marissa Fessenden](#)

Back in [the late 1980s](#), bone grafts were fairly traumatic. To repair fractures or amend bone loss, at least two surgeries were required to transplant bone from one part of the body to another. But while scuba diving in the South Pacific, a Pennsylvania State University professor had an idea for how eliminate one of those surgeries and avoid the dangers of an extra procedure.

The professor, Eugene White, looked past the [fantastic, vivid colors](#) of the marine life surrounding him and to the structure supporting this abundance. He realized

that coral's porous structure—which channels nutrients and aids communication [throughout the colony](#)—resembles the spongy structure of bones. Coral, he thought, would make great bone grafts.

But White and his nephew Rodney, a medical student at the time, soon realized that the coral wasn't perfect. Bone grafts knit together with existing bone and eventually dissolve away; some of the coral grafts failed to biodegrade and instead left behind enough coral bits for bacteria to grow, [reports Meaghan Agnew](#) for *Modern Farmer*.

Recently, though, researchers from Swansea University in Wales figured out how to convert some of the coral's calcium carbonate to a more bone-like material called coralline hydroxyapatite/calcium carbonate, [according to BBC.com](#). This solved the biodegrading problem.

Now all the pieces are in place for coral farming, [writes Agnew](#):

OkCoral, an Israeli company founded by Assaf Shaham, farms corals specifically for bone grafting (his carbonate extractions go for a cool \$250 a vial). CoreBone, another company based in Israel, is growing coral on a special bioactive mineral diet to make it especially suitable to grafting.

Perhaps this growing demand for coral to help humans could persuade more to care about the looming extinction of reefs. Bone grafts aren't the only medicine that can come from coral. Reefs are the rainforests of the sea; they've already provided treatments for [asthma and cancer](#) and many more compounds could yet be discovered.

<http://www.bbc.com/news/health-29751880>

### Surgeons transplant heart that had stopped beating

*Surgeons in Australia say they have performed the first heart transplant using a "dead heart".*

By James Gallagher Health editor, BBC News website

Donor hearts from adults usually come from people who are confirmed as brain dead but with a heart still beating. A team at St Vincent's Hospital in Sydney revived and then transplanted hearts that had stopped beating for up to 20 minutes. The first patient who received a heart said she felt a decade younger and was now a "different person". Hearts are the only organ that is not used after the heart has stopped beating - known as donation after circulatory death. Beating hearts are normally taken from brain-dead people, kept on ice for around four hours and then transplanted to patients.

### 'Significant development'

The novel technique used in Sydney involved taking a heart that had stopped beating and reviving it in a machine known as a "heart-in-a-box". The heart is

kept warm, the heartbeat is restored and a nourishing fluid helps reduce damage to the heart muscle.

The first person to have the surgery was Michelle Gribilas, 57, who was suffering from congenital heart failure. She had the surgery more than two months ago. "Now I'm a different person altogether," she said. "I feel like I'm 40 years old - I'm very lucky." There have since been a further two successful operations. Prof Peter MacDonald, head of St Vincent's heart transplant unit, said: "This breakthrough represents a major inroad to reducing the shortage of donor organs." It is thought the heart-in-a-box, which is being tested at sites around the world, could save up to 30% more lives by increasing the number of available organs. The breakthrough has been welcomed around the world.

The British Heart Foundation described it as a "significant development". Maureen Talbot, a senior cardiac nurse at the charity, told the BBC: "It is wonderful to see these people recovering so well from heart transplantation when, without this development, they may still be waiting for a donor heart."

#### **Liver warming**

Similar methods of warming and nourishing organs before transplant have been used to improve the quality of lung and liver transplants.

James Neuberger, the associate medical director at the UK's NHS Blood and Transplant service, said: "Machine perfusion is an opportunity to improve the number and quality of organs available for transplant. "We look forward to more work being carried out to determine the impact of this technology on increasing the number of organs that can safely be used for transplant and on improving the quality of those organs. "It is too early to predict how many lives could be saved through transplantation each year if this technology were to be adopted as standard transplant practice in the future."

<http://www.bbc.com/news/health-29756301>

#### **Millions of Ebola vaccine doses by end of 2015, WHO says**

*Millions of doses of experimental Ebola vaccines will be produced by the end of 2015, the World Health Organization has announced.*

By James Gallagher Health editor, BBC News website

It said "several hundred thousand" would be produced in the first half of the year. And vaccines could be offered to health workers on the frontline in West Africa as soon as December 2014. However, the WHO cautioned that vaccines would not be a "magic bullet" for ending the outbreak. There is no proven cure or vaccine for Ebola.

In response to the largest epidemic of the disease in history, the WHO is accelerating the process of vaccine development. It normally takes years to

produce and test a vaccine, but drug manufacturers are now working on a scale of weeks.

In other developments

*Dozens of people are being monitored in Mali after the country confirmed its first case of Ebola*

*Both nurses who were infected with Ebola in Dallas, Texas are now clear of the virus.*

*Health officials in New York are seeking people who came into contact with a doctor who tested positive after returning from Guinea*

*European Union leaders agreed to increase their financial help on fighting Ebola in West Africa from some 600m euros (\$758m; £743m) to one billion*

#### **Correct dose**

Two experimental vaccines, produced by GlaxoSmithKline (GSK) and the Public Health Agency of Canada, are already in safety trials. The GSK vaccine is being tested in Mali, the UK and the US. Research on the Canadian vaccine is also under way in the US with further trials expected to start in Europe and Africa soon. The results are expected in December. After that, trials will move to countries affected by Ebola, probably starting with Liberia. That will allow researchers to assess how effective the vaccine is and what dose is needed to provide protection. Healthcare workers, who place themselves at risk when treating patients, will take part in the first trials in West Africa.

The WHO says we should have the first hints of how effective these experimental vaccines are by April. There are no plans for mass vaccination before June 2015 but the WHO has not ruled it out. The WHO says vaccines are likely to be key to ending the outbreak, even if cases fall in the next few months.

#### **'Prudent to prepare'**

Dr Marie Paule Kieny, a WHO assistant director-general, said: "While we hope that the massive response, which has been put in place will have an impact on the epidemic, it is still prudent to prepare to have as much vaccine available as possible if they are proven effective. "If the massive effort in response is not sufficient, then vaccine would be a very important tool. "And even if the epidemic would be already receding by the time we have vaccine available, the modelling seems to say vaccine may still have an impact on controlling the epidemic."

The vaccine plan was the culmination of a day of talks at the WHO in Geneva. As well as the two vaccines already in trials, there are a further five in the pipeline which could yet play a role in the outbreak. The World Bank and the charity Medecins Sans Frontieres will help finance the vaccine.

Dr Marta Tufet, from the Wellcome Trust and part of the talks in Geneva, told the BBC News website: "I think we've made some major steps forward, it's been a

very significant meeting. "The key news is that money doesn't seem to be an issue, everyone's supporting this and it's a case of making sure we're prepared.

"The standard method of public health control will win in the end, but a vaccine could have a very strong impact on the current epidemic."

There are also suggestions that an "indemnity fund" could be set up in case people have a serious adverse reaction to a vaccine being rushed through.

But until a vaccine is found to prevent the virus from spreading, treating and isolating sufferers will remain the key strategy for containing the outbreak.

### **Big risk**

Jonathan Ball, a professor of virology at the University of Nottingham, commented: "This is a big risk because we simply don't know if the vaccines will work. "But clearly, given the scale of problem in Africa, a problem that has arisen through international apathy, we are having to prepare for the worse."

He added that it would be difficult to deliver the vaccine - which needs to be stored at very low temperatures - would be a major challenge in Africa.

Dr Benjamin Neuman, from the University of Reading, told the BBC: "I very much hope that the current outbreak will be over before the first vaccines ship, but even so, a vaccine will be important to long-term plans to prevent an Ebola outbreak on this scale from ever happening again."

He said there were many "similarly frightening and incurable viruses" across Europe and the Americas but they were contained by infrastructure.

He said that for all the talk of vaccines: "The closest thing to a magic bullet that stops all diseases is still a hospital."

[http://www.eurekalert.org/pub\\_releases/2014-10/sfdm-vgf102414.php](http://www.eurekalert.org/pub_releases/2014-10/sfdm-vgf102414.php)

### **Volunteer guidelines for clinicians in the ebola epidemic**

#### ***Safety and protocol measures for humanitarian volunteers***

Rockville, MD –Disaster Medicine and Public Health Preparedness Journal has released a novel, informative article that speaks to volunteers within the Ebola epidemic. The article, contributed by a consortium of Boston-based hospitals, is entitled Sign Me Up: Rules of the Road for Humanitarian Volunteers during the Ebola Outbreak. The authors paint an honest picture of volunteer circumstances, and ask those considering volunteering to not make the decision lightly. They insist that the "global healthcare community must and will rise to serve."

The World Health Organization has advocated for having more volunteers on the ground to aid the outbreak. The article by the Boston consortium reiterates this, though pushes for having thoroughly trained and prepared volunteers. The authors imply that is best to have trained emergency response clinicians, instead of medical students and trainees on the ground. Experience reigns king in an event as such, and patients will surely benefit most with the aid of experienced physicians.

The article provides guidelines that volunteer organizations as well as individual volunteers must emphasize and implicate to achieve volunteer well-being and safety.

The authors recognize that volunteers serve at great personal risk, to provide clinical care to others. The authors also find it important to acknowledge that the chance of medical evacuation is low, despite the cases widely reported by the media. With the provided guidelines in mind and necessitated, the risk has potential to decline.

The authors ask volunteers to consider the following:

***Time commitment (more than 2 weeks)***

***Personal and organization health insurance, medical evacuation insurance, disability and life insurance***

***Family circumstances***

***Organization and individual emergency response experience***

***Personal, mental and professional readiness***

***Comprehensive pre-deployment training***

***Proper personal protection equipment (PPE, often provided by organization) and medical supplies***

***Return-to-work considerations***

***Organization contingency plans for evacuation or ill/injured staff***

[http://www.eurekalert.org/pub\\_releases/2014-10/nuos-sob102214.php](http://www.eurekalert.org/pub_releases/2014-10/nuos-sob102214.php)

### **Shutting off blood supply to an extremity to protect the heart**

#### ***Preparing the body for an upcoming challenge***

In a study just published in the International Journal of Cardiology, researchers from the K.G. Jebsen Center for Exercise in Medicine – Cardiac Exercise Research Group (CERG) at the Norwegian University of Science and Technology (NTNU) and the Department of Cardiothoracic Surgery at the St. Olavs Hospital in Trondheim, Norway have shown that shutting off the blood supply to an arm or leg before cardiac surgery protects the heart during the operation.

The research group wanted to see how the muscle of the left chamber of the heart was affected by a technique, called RIPC (remote ischemic preconditioning), during cardiac surgery. RIPC works by shutting off the blood supply to an arm or a leg before heart surgery. The goal is to reduce risk during cardiac surgery in the future.

The technique is not new, but its effects have never before been tested directly on the left chamber of the heart.

"During heart surgery we have to stop the blood supply to the heart to be able to operate on it. After some time without fresh blood, the heart will reduce its ability



to produce energy because it doesn't get oxygen. When we shut off the blood flow to another large muscle, such as an arm or a leg, the body prepares for an upcoming challenge by mobilizing its defense system", says the first author of the study, Katrine Hordnes Slagsvold, a PhD candidate at NTNU and medical doctor at St. Olav's Hospital.

The researchers investigated cardiac tissue from 60 patients who had coronary bypass surgery at St. Olavs Hospital in Trondheim. The patients were randomized to either undergo RIPC, or to a control group. Patients who were treated with RIPC underwent brief periods without blood supply to the arm before surgery, by inflating a blood pressure cuff for five minutes three times.

"The heart muscle of the patients who had restricted blood flow to their arm before surgery was able to maintain the same level of energy production during the whole operation, while heart muscle from the other patients' hearts was not. This may be important because heart tissue is dependent on energy to survive, as well as to repair injuries the cells may have endured during surgery," Slagsvold says.

The researchers also found that a protein called Akt was activated after RIPC, and believe that activation of this protein may be key in inducing the protective effect on the heart.

[http://www.eurekalert.org/pub\\_releases/2014-10/uab-eer102414.php](http://www.eurekalert.org/pub_releases/2014-10/uab-eer102414.php)

### **Ebola's evolutionary roots are more ancient than previously thought, study finds**

*The family of viruses housing Ebola and Marburg is ancient, and the two viruses last shared a common ancestor millions of years ago, scientists say*

BUFFALO, N.Y. - A new study is helping to rewrite Ebola's family history.

The research shows that filoviruses — a family to which Ebola and its similarly lethal relative, Marburg, belong — are at least 16-23 million years old.

Filoviruses likely existed in the Miocene Epoch, and at that time, the evolutionary lines leading to Ebola and Marburg had already diverged, the study concludes.

The research was published in the journal PeerJ in September. It adds to scientists' developing knowledge about known filoviruses, which experts once believed came into being some 10,000 years ago, coinciding with the rise of agriculture.

The new study pushes back the family's age to the time when great apes arose.

"Filoviruses are far more ancient than previously thought," says lead researcher Derek Taylor, PhD, a University at Buffalo professor of biological sciences.

"These things have been interacting with mammals for a long time, several million years."

According to the PeerJ article, knowing more about Ebola and Marburg's comparative evolution could "affect design of vaccines and programs that identify emerging pathogens."

The research does not address the age of the modern-day Ebolavirus. Instead, it shows that Ebola and Marburg are each members of ancient evolutionary lines, and that these two viruses last shared a common ancestor sometime prior to 16-23 million years ago.

Clues in 'fossil genes'

Taylor and co-author Jeremy Bruenn, PhD, UB professor of biological sciences, research viral "fossil genes" — chunks of genetic material that animals and other organisms acquire from viruses during infection.

In the new study, the authors report finding remnants of filovirus-like genes in various rodents. One fossil gene, called VP35, appeared in the same spot in the genomes of four different rodent species: two hamsters and two voles. This meant the material was likely acquired in or before the Miocene Epoch, prior to when these rodents evolved into distinct species some 16-23 million years ago.

In other words: It appears that the known filovirus family is at least as old as the common ancestor of hamsters and voles.

"These rodents have billions of base pairs in their genomes, so the odds of a viral gene inserting itself at the same position in different species at different times are very small," Taylor says. "It's likely that the insertion was present in the common ancestor of these rodents."

The genetic material in the VP35 fossil was more closely related to Ebola than to Marburg, indicating that the lines leading to these viruses had already begun diverging from each other in the Miocene.

The new study builds on Taylor's previous work with Bruenn and other biologists, which used viral fossil genes to estimate that the entire family of filoviruses was more than 10 million years old. However, those studies used fossil genes only distantly related to Ebola and Marburg, which prevented the researchers from drawing conclusions about the age of these two viral lines.

The current PeerJ publication fills this viral "fossil gap," enabling the scientists to explore Ebola's historical relationship with Marburg.

Possible relevance to disease prevention

The first Ebola outbreak in humans occurred in 1976, and scientists still know little about the virus' history. The same dearth of information applies to Marburg, which was recognized in humans in 1967 and implicated in the death of a Ugandan health worker this month.

Understanding the virus' ancient past could aid in disease prevention, Taylor says. He notes that if a researcher were trying to create a single vaccine effective

against both Ebola and Marburg, it could be helpful to know that their evolutionary lineages diverged so long ago.

Knowing more about filoviruses in general could provide insight into which host species might serve as "reservoirs" that harbor undiscovered pathogens related to Ebola and Marburg, Taylor says.

"When they first started looking for reservoirs for Ebola, they were crashing through the rainforest, looking at everything — mammals, insects, other organisms," Taylor says. "The more we know about the evolution of filovirus-host interactions, the more we can learn about who the players might be in the system."

*Collaborators* Taylor and Bruenn's co-authors on the PeerJ study include UB students Matthew Ballinger, Laura Hanzly and Jack Zhan, all in the UB Department of Biological Sciences.

[http://www.eurekalert.org/pub\\_releases/2014-10/uoc--ivs\\_1102414.php](http://www.eurekalert.org/pub_releases/2014-10/uoc--ivs_1102414.php)

### **Icelandic volcano sits on massive magma hot spot**

*Bárðarbunga volcano lies directly above the hottest portion of the North Atlantic mantle plume*

Spectacular eruptions at Bárðarbunga volcano in central Iceland have been spewing lava continuously since Aug. 31. Massive amounts of erupting lava are connected to the destruction of supercontinents and dramatic changes in climate and ecosystems.

New research from UC Davis and Aarhus University in Denmark shows that high mantle temperatures miles beneath the Earth's surface are essential for generating such large amounts of magma. In fact, the scientists found that the Bárðarbunga volcano lies directly above the hottest portion of the North Atlantic mantle plume. The study, published online Oct. 5 and appearing in the November issue of Nature Geoscience, comes from Charles Leshner, professor of Earth and Planetary Science at UC Davis and a visiting professor at Aarhus University, and his former PhD student, Eric Brown, now a post-doctoral scholar at Aarhus University.

"From time to time the Earth's mantle belches out huge quantities of magma on a scale unlike anything witnessed in historic times," Leshner said. "These events provide unique windows into the internal working of our planet."

Such fiery events have produced large igneous provinces throughout Earth's history. They are often attributed to upwelling of hot, deeply sourced mantle material, or "mantle plumes."

Recent models have dismissed the role of mantle plumes in the formation of large igneous provinces, ascribing their origin instead to chemical anomalies in the shallow mantle.

Based on the volcanic record in and around Iceland over the last 56 million years and numerical modeling, Brown and Leshner show that high mantle temperatures

are essential for generating the large magma volumes that gave rise to the North Atlantic large igneous provinces bordering Greenland and northern Europe. Their findings further substantiate the critical role of mantle plumes in forming large igneous provinces.

"Our work offers new tools to constrain the physical and chemical conditions in the mantle responsible for large igneous provinces," Brown said. "There's little doubt that the mantle is composed of different types of chemical compounds, but this is not the dominant factor. Rather, locally high mantle temperatures are the key ingredient."

*The research was supported by grants from the US National Science Foundation and by the Niels Bohr Professorship funded by Danish National Research Foundation.*

*Read the full study at <http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo2264.html>.*

<http://bit.ly/1rJV3GW>

### **Ebola Efforts Helped By Flu Shots**

*Should ebola continue to crop up in the U.S., having fewer people coming to emergency rooms with the similar symptoms of flu will help the public health system respond. Steve Mirsky reports.*

[Download MP3](#)

"There are only 101 reasons why something as simple as a [flu shot](#) makes all the sense in the world right now." [David Relman](#) is a [Stanford University infectious disease expert](#). Want to help [fight Ebola](#)? Get a flu shot.

"Come this winter, the last thing the public health system needs is a whole bunch—meaning hundreds of thousands—of people who have fever with an ill-defined and undifferentiated illness, who could have prevented those febrile illnesses by simply taking a flu shot. Because should Ebola show up more in this country, every emergency room and clinic is going have to be mindful of what does it mean to see someone with a fever and muscle aches and headache and even diarrhea. It would be a wonderful thing to be able to take influenza off the table and not have to worry about that in the midst of everything else."

<http://phys.org/news/2014-10-auto-safety-agency.html>

### **US official: Auto safety agency under review**

*Transportation officials are reviewing the "safety culture" of the U.S. agency that oversees auto recalls, a senior Obama administration official said Friday*

**October 24th, 2014 by Joan Lowy in Technology**

The National Highway Traffic Safety Administration has been criticized by lawmakers and safety advocates for not acting aggressively enough regarding millions of vehicles with defective air bags or faulty ignition switches.

A special Transportation Department team is examining whether "we have the dial set correctly on risk management and our safety posture in general"

throughout the department, especially at the safety administration, said the official, who asked that he not be named as a condition of briefing reporters. The safety agency is part of the Transportation Department.

Announcements related to the review are expected in the coming weeks, the official said. The White House is also expected to nominate an administrator to run the troubled agency within the next two weeks, he said. The previous administrator, David Strickland, left the agency in December just before the recall controversies erupted.

Further action also is possible involving air bag inflators made by Japan-based Takata Corp., the official said. The inflators can rupture, ejecting shrapnel in a crash. Safety advocates say the problem has caused four deaths and multiple injuries. So far automakers have recalled about 12 million vehicles worldwide due to the problem, but recalls in the U.S. have been limited to vehicles registered in regions with high humidity. Millions more vehicles could be affected if the air bag recalls are extended nationwide, according to safety advocates.

No firm cause of the problem has been identified. Takata and the safety administration are investigating the impact of prolonged absolute humidity, which is a measure of the moisture content in the air, on chemicals that propel the air bags in a crash. They're looking into whether moisture in the air can cause the chemicals to explode with too much force, causing metal parts to fracture.

On Wednesday, the safety administration warned the owners of an additional 3.1 million vehicles to get their air bags checks repaired because of the potential danger to drivers and passengers. The agency has previously issued a warning covering 4.7 million cars and SUVs.

"The investigation is not over," the official said. "What has happened this week is an initial round of actions, but I wouldn't assume there wouldn't be future actions related to it."

At least 29 people have died and 27 people have been seriously injured in crashes involving General Motors cars with defective ignition switches, according to attorney Kenneth Feinberg, who was hired by GM to compensate victims. He is examining 184 death claims and 1,333 injury claims that have been filed since August.

The defective switches can unexpectedly move to the "accessory" or "off" positions, shutting down the engine and knocking out power steering and brakes. With engines shut off, people can lose control of their cars and crash. If that happens, the air bags won't inflate.

GM has admitted knowing about the problem for more than a decade in small cars such as the Chevrolet Cobalt. Yet it didn't begin recalling the 2.6 million small cars until February.

The safety administration received a police report and numerous consumer complaints about the switches over the years, but didn't recognize the seriousness of the problem. Agency officials blamed GM for withholding key information from the government.

<http://nyti.ms/IrvikeP>

### **Turkey: MERS Virus Case Is Reported**

*The potentially fatal MERS virus that originated in Saudi Arabia two years ago has spread to Turkey for the first time, the World Health Organization said Friday.*

By RICK GLADSTONE OCT. 24, 2014

In a report on its website, the organization attributed the spread to a 42-year-old Turkish citizen who had been working in the Saudi city of Jidda; he fell ill there last month and flew two weeks ago to the Turkish city of Hatay, where he was hospitalized and died within days. The organization said medical investigators confirmed that the man had suffered from MERS, or Middle East Respiratory Syndrome, and they were checking others in Turkey and Saudi Arabia who had been in contact with him during his symptomatic phase. Saudi Arabia has been under enormous pressure to control the disease, which can incubate in camels and other livestock. The Saudi authorities have been faulted for having allowed MERS to proliferate, particularly in Jidda, Riyadh, the Saudi capital, and the holy city of Mecca, where pilgrims from the entire world converge for the annual hajj. Pilgrims are known to have spread the disease to Iran, Jordan and Algeria. The W.H.O. said that as of Friday, it had tallied 883 MERS cases worldwide, including at least 319 deaths. Most cases are in Saudi Arabia.

<http://nyti.ms/1zyXF3s>

### **To Improve a Memory, Consider Chocolate**

*Science edged closer on Sunday to showing that an antioxidant in chocolate appears to improve some memory skills that people lose with age.*

By PAM BELLUCK OCT. 26, 2014

Science edged closer on Sunday to showing that an antioxidant in chocolate appears to improve some memory skills that people lose with age.

In a small study in the journal Nature Neuroscience, healthy people, ages 50 to 69, who drank a mixture high in antioxidants called cocoa flavanols for three months performed better on a memory test than people who drank a low-flavanol mixture. On average, the improvement of high-flavanol drinkers meant they performed like people two to three decades younger on the study's memory task, said [Dr. Scott A. Small](#), a neurologist at Columbia University Medical Center and the study's senior author. They performed about 25 percent better than the low-flavanol group.



“An exciting result,” said Craig Stark, a neurobiologist at the University of California, Irvine, who was not involved in the research. “It’s an initial study, and I sort of view this as the opening salvo.”

He added, “And look, it’s chocolate. Who’s going to complain about chocolate?” The findings support recent research linking flavanols, especially [epicatechin](#), to improved blood circulation, heart health and memory in mice, snails and humans. But experts said the new study, although involving only 37 participants and partly funded by [Mars Inc.](#), the chocolate company, goes further and was a well-controlled, randomized trial led by experienced researchers.



*Cocoa flavanol extracted from fresh cocoa beans. Credit Mars, Incorporated*

Besides improvements on the memory test — a pattern recognition test involving the kind of skill used in remembering where you parked the car or recalling the face of someone you just met — researchers found increased function in an area of the brain’s hippocampus called the dentate gyrus, which has been linked to this type of memory.

“Boy, this is really interesting to see it in three months,” said Dr. Steven DeKosky, a neurologist and visiting professor at the University of Pittsburgh. “They got this really remarkable increase in a place in the brain that we know is related to age-related memory change.”

There was no increased activity in another hippocampal region, the [entorhinal cortex](#), which is impaired early in [Alzheimer’s disease](#). That reinforces the idea that age-related memory decline is different and suggests that flavanols might not help [Alzheimer’s](#), even though they might delay normal [memory loss](#).

But unless you are stocking up for [Halloween](#), do not rush to buy Milky Way or Snickers bars. To consume the high-flavanol group’s daily dose of epicatechin, 138 milligrams, would take eating at least 300 grams of dark chocolate a day — about seven average-sized bars. Or possibly about 100 grams of baking chocolate or unsweetened cocoa powder, but concentrations vary widely depending on the processing. Milk chocolate has most epicatechin processed out of it.

“You would have to eat a large amount of chocolate,” along with its fat and calories, said Hagen Schroeter, director of fundamental health and nutrition research for [Mars](#), which funds many flavanol studies and approached Dr. Small for this one. (“I nearly threw them out,” said Dr. Small, who added that he later concluded that the company employed serious scientists who would not bias the

research.) Mars financed about half the study; other funders were the National Institutes of Health and two research foundations.

“Candy bars don’t even have a lot of chocolate in them,” Dr. Schroeter said. And “most chocolate uses a process called dutching and alkalization. That’s like poison for flavanol.”

Mars already sells a supplement, CocoaVia, which it says promotes healthy circulation, including for the heart and brain. It contains 20 to 25 milligrams of epicatechin per packet of powder or capsule serving, Dr. Schroeter said; 30 packets cost \$34.95. Epicatechin is also in foods like tea and apples, although may be less absorbable.

The Columbia study had important limitations. For example, the only daily dietary requirements were either 900 milligrams of flavanols with 138 milligrams of epicatechin or 10 milligrams of flavanols with less than two milligrams of epicatechin, so participants could have eaten other things that played a role. And while researchers also had half of the healthy but sedentary participants in each group [exercise](#) four days a week, surprisingly, the [exercise](#) had no effects on memory or brain effects.

Dr. Small, whose research previously found that exercise helped hippocampal function in younger people, suggested maybe more vigorous exercise is needed to affect older brains.

“It’s a very clever, interesting study, but there are some caveats,” said [Dr. Kenneth S. Kosik](#), a neuroscientist at the University of California, Santa Barbara. “People are going to say, ‘It looks like I can have a lot of candy bars and not exercise.’ So it needs replication on a much larger scale.”

More extensive research is planned. As for why flavanols would help memory, one theory is that they improve brain blood flow; another, favored by Dr. Small, is that they cause dendrites, message-receiving branches of neurons, to grow.

“Everybody’s cautious about antioxidants, but this is a horse of a different color, a really elegant study,” Dr. DeKosky said.

Asked if he would eat more chocolate, he said, “Yeah, but the bar for me to do that is darn low.”

[http://www.eurekalert.org/pub\\_releases/2014-10/bcfg-ibf102214.php](http://www.eurekalert.org/pub_releases/2014-10/bcfg-ibf102214.php)

### **It's better for memory to make mistakes while learning**

*... but only if the guesses are 'close-but-no-cigar'*

Toronto, Canada – Making mistakes while learning can benefit memory and lead to the correct answer, but only if the guesses are close-but-no-cigar, according to new research findings from Baycrest Health Sciences.

"Making random guesses does not appear to benefit later memory for the right answer, but near-miss guesses act as stepping stones for retrieval of the correct

information – and this benefit is seen in younger and older adults," says lead investigator Andrée-Ann Cyr, a graduate student with Baycrest's Rotman Research Institute and the Department of Psychology at the University of Toronto. Cyr's paper is posted online today in the *Journal of Experimental Psychology: Learning, Memory, and Cognition* (ahead of print publication). The study expands upon a previous paper she published in *Psychology and Aging* in 2012 that found that learning information the hard way by making mistakes (as opposed to just being told the correct answer) may be the best boot camp for older brains. That paper raised eyebrows since the scientific literature has traditionally recommended that older adults avoid making mistakes – unlike their younger peers who actually benefit from them. But recent evidence from Cyr and other researchers is challenging this perspective and prompting professional educators and cognitive rehabilitation clinicians to take note. Cyr's latest research provides evidence that trial-and-error learning can benefit memory in both young and old when errors are meaningfully related to the right answer, and can actually harm memory when they are not.

In their latest study, 65 healthy younger adults (average age 22) and 64 healthy older adults (average age 72) learned target words (e.g., rose) based either on the semantic category it belongs to (e.g., a flower) or its word stem (e.g., a word that begins with the letters 'ro'). For half of the words, participants were given the answer right away (e.g., "the answer is rose") and for the other half, they were asked to guess at it before seeing the answer (e.g., a flower: "Is it tulip?" or ro\_\_ : "is it rope?").

On a later memory test, participants were shown the categories or word stems and had to come up with the right answer. The researchers wanted to know if participants would be better at remembering rose if they had made wrong guesses prior to studying it rather than seeing it right away. They found that this was only true if participants learned based on the categories (e.g., a flower). Guessing actually made memory worse when words were learned based on word stems (e.g., ro\_\_). This was the case for both younger and older adults. Cyr and her colleagues suggest this is because our memory organizes information based on how it is conceptually rather than lexically related to other information. For example, when you think of the word pear, your mind is more likely to jump to another fruit, such as apple, than to a word that looks similar, such as peer. Wrong guesses only add value when they have something meaningful in common with right answers. The guess tulip may be wrong, but it is still conceptually close to the right answer rose (both are flowers).

By guessing first as opposed to just reading the answer, one is thinking harder about the information and making useful connections that can help memory.

Indeed, younger and older participants were more likely to remember the answer if they also remembered their wrong guesses, suggesting that these acted as stepping stones. By contrast, when guesses only have letters in common with answers, they clutter memory because one cannot link them meaningfully. The word rope is nowhere close to rose in our memory. In these situations, where your guesses are likely to be out in left field, it is best to bypass mistakes altogether. "The fact that this pattern was found for older adults as well shows that aging does not influence how we learn from mistakes," says Cyr.

"These results have profound clinical and practical implications. They turn traditional views of best practices in memory rehabilitation for healthy seniors on their head by demonstrating that making the right kind of errors can be beneficial. They also provide great hope for lifelong learning and guidance for how seniors should study," says Dr. Nicole Anderson, senior scientist with Baycrest's Rotman Research Institute and senior author on the study.

*The study was funded by the Canadian Institutes of Health Research.*