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What we know (and don't know) about a rare virus infecting kids across the US

A rare virus - enterovirus D68, also known as EV-D68 - is infecting children across the country and sending them to hospitals with severe respiratory infections and breathing problems.

Updated by Julia Belluz on September 14, 2014, 7:08 p.m. ET

Though the virus doesn't appear to be deadly, the Centers for Disease Control and Prevention (CDC) are warning doctors and parents to be on the lookout.

"This is a very unusual situation," said Dr. Greg Storch, director of infectious diseases at St. Louis Children's Hospital in Missouri. "We don't fully know what to expect." Here's what we know and what we don't know so far.

What we know

Missouri and Illinois appear to be the first states affected by enterovirus D68. According to the CDC, hospital officials at Children's Mercy Hospital in Kansas City, Missouri and University of Chicago Medicine Comer Children's Hospital in Illinois notified the CDC in August about an increase in enterovirus cases that they were seeing. The CDC did further testing of specimens that were sent their way from the two hospitals and found that 19 of 22 from Kansas City and 11 of 14 from Chicago tested positive for EV-D68.

In total, more than 100 children in seven states have tested positive for EV-D68 as of September 12, 2014. These include New York, Colorado, Illinois, Iowa, Kansas, Kentucky and Missouri. ***- This infection shows no sign of slowing down.*** According to CDC, up to a dozen states may have potential cases and investigations are underway.

All the cases involve young kids of both sexes, many of whom had a history of asthma or wheezing. Of the 19 confirmed cases from Kansas City, 10 were male, and their ages ranged from 6 weeks to 16 years, with a median of 4 years. Nearly 70 percent of patients had a previous history of asthma or wheezing. Of the Chicago group, nine of the 11 patients were female, and ages ranged from 20 months to 15 years with a median of 5 years. Nearly three-quarters had a history of asthma or wheezing.

The kids stricken with EV-D68 had difficulty breathing and a good number of them experienced wheezing. They also had low blood-oxygen levels. Fevers were less common. In Kansas City, about five children (or a quarter) had fevers, while in Chicago, only two (or 18 percent) had fevers.

According to the CDC, mild symptoms of EV-D68 can include fever, runny nose, sneezing, cough, and muscle aches. But again, the kids who got sick in Missouri and Illinois had symptoms that included difficulty breathing and wheezing. These patients were treated in pediatric intensive care units at the hospitals. Some needed help breathing with ventilation machines.

No one has died from the virus this year, though the CDC says they can't be sure if the virus has ever been deadly since it's not a disease they usually track.

There's not much you can do to treat it. There are no vaccines or antiviral treatments for EV-D68. The main kind of care is just supportive, so paying attention to symptoms and making sure people get proper fluids and help breathing, if necessary. Again, it doesn't appear to be deadly and the CDC's Dr. Anne Schuchat said she believes it typically runs its course in a week.

Dr. Pritish Tosh, an infectious diseases physician-researcher at the Mayo Clinic, added: "When dealing with respiratory illnesses in young people, they can be severe and result in hospitalizations and the requirement of intensive care. And it looks as though this strain of the virus is causing infections in children severe enough to get them admitted to the hospital."

Enteroviruses generally are very common. They usually turn up as "summer colds." There are more than 100 different strains, and they affect between 10 and 15 million people in the US per year. They can cause everything from encephalitis to viral meningitis.

Enteroviruses are typically spread through the fecal-oral pathway. That means pathogens in one person's feces infect another person by getting into their mouth, usually by touching the face and mouth with dirty hands.

This particular strain (EV-D68) spreads like the common cold through respiratory secretions, such as coughing, sneezing, or touching an infected surface. It was first identified in California in 1962. Compared to other strains of the enterovirus, it has been rare in the US. The CDC said that during 2009-2013, they got 79 reports of EV-D68 and it has been the cause of small clusters of sickness but never a widespread outbreak like the one that seems to have taken hold in the Midwest.

It's usually associated with respiratory illness - like a really intense cold - though the full spectrum of sickness that this strain can bring on is unclear. "We don't know as much about it as we do about some of the common respiratory viruses," said the CDC's Dr. Schuchat.

EV-D68 is detected using molecular techniques at several labs across the US and it's not monitored nationally. According to the CDC, enterovirus infections including EV-D68, are not required to be reported. "But laboratory detections of enterovirus and parechovirus types are reported voluntarily to the National Enterovirus Surveillance System, which is managed by CDC. Participating laboratories are encouraged to report monthly summaries of virus type, specimen type, and collection date."

The CDC says health care providers should be on the lookout for EV-D68 as a possible cause of serious and unexplained severe respiratory illness.

Parents should only worry if their kids are having difficulty breathing. If your child is having trouble breathing, see a doctor.

You can prevent spread through good hygiene. Wash your hands and make sure you have good cough etiquette.

What we don't know.

We don't know why this strain has turned up in these geographic locations. Again, EV-D68 is thought to be rare so why it's turning up now in clusters across the Midwest, West, and South, and landing kids in hospitals, is unclear.

Whether it has ever killed people. Since it's not a reportable disease, the CDC said it "does not know how many infections and deaths from EV-D68 occur each year in the United States."

Public health officials are not sure about all the symptoms this strain of the virus can cause, since it's uncommon. That means EV-D68 may cause other types of illness beyond just respiratory complications, but we just don't know yet.

Exactly who is most at risk. The CDC said, "In general, infants, children, and teenagers are most likely to get infected with enteroviruses and become ill. That's because they do not yet have immunity (protection) from previous exposures to these viruses. We believe this is also true for EV-D68." Kids with asthma seem to be more affected.

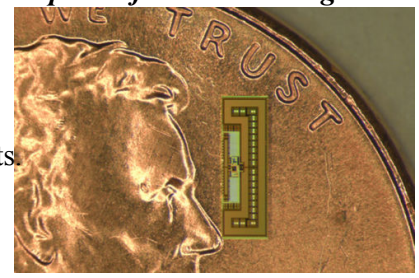
The total case count. The CDC says it's investigating potential cases but could not confirm that total number affected.

http://www.wired.com/2014/09/ant-size-radio/

This Ant-Sized Radio Is Powered by the Messages It Receives

This chip is an all-inclusive radio that harvests power from the messages it receives.

By Nick Stockton



In the most ambitious minds, the Internet of Things would deliver a running catalog of data from the complete taxonomy of physical objects. Passing these digital tally marks along will be a huge wireless challenge, and the solution may come from a tiny radio that costs pennies to make and draws power from the information it receives.

This chip is an all-inclusive radio that harvests power from the messages it receives. **Ali Niknejad/UC Berkeley**

Engineers from UC Berkeley and Stanford University have printed an ant-sized radio onto a silicon chip (paywall). Small radios already exist (Wal-Mart uses them to track inventory), but most transmit and receive at lower frequencies. They can send lots of information at a time, but only at the expense of larger antennas. That adds to the cost and development time because the antenna and radio chip must be made separately, bonded together, and then tested.

The Berkeley/Stanford team went the opposite direction, by amping up their data rate to 24 GHz for receiving and 60 GHz for transmitting (most micro-radios top out at around 900 MHz and 2.4 GHz, respectively). “One of the benefits of going to high frequencies is that the wavelengths get smaller and you can put the antennas on the chip itself,” said Ali Niknejad, a co-developer of the radio and director of UC Berkeley’s Wireless Research Center. This also reduces the amount of energy the radio needs to transmit, so much so that it can charge itself by scavenging energy from the signals it receives. Moving to the higher frequency also lets the little radios send data at extremely fast rates (3-4 times faster than your phone), compensating for the lower volume of data it can send at a time.

The downside of using such a high frequency is that the radios have a short range - only about 20 inches. This means you’d need a bunch of them in close proximity, passing along information like a tiny, wireless bucket brigade. “This particular tiny radio is meant for a mesh network that have a bunch of devices that synch up and eventually make it to the access point,” said Niknejad. If the radios live up to their promise in the real world, buying them in bulk should be no problem: Because they are printed on silicon, they are ridiculously cheap to manufacture. Coming up with tiny, cost-effective radios has huge implications, and not just so your refrigerator can text you when your lettuce starts going bad. Niknejad says he is currently working on a DARPA proposal to integrate these chip radios into larger chipsets, so the government can make sure the technology they buy hasn’t been tampered with. Another example would be embedded chips in retail items. Instead of seeing a cashier, you’d simply walk out of the store with your cart full of items, which would ping a central database and subtract the cost from your bank account before you reach your car.

http://www.eurekalert.org/pub_releases/2014-09/nu-ngc091214.php

New glaucoma culprit is found

Gatekeeper cells are stiffer in human eyes with glaucoma, increasing pressure

Glaucoma, a leading cause of irreversible blindness, is associated with elevated pressure in the eye. This elevated pressure essentially is due to a plumbing problem. Fluid builds up in the eye, increasing pressure and eventually damaging the optic nerve.

For nearly 150 years, researchers have been trying to understand what causes the blockage that prevents the eye from draining properly.

In a unique study of human ocular cells, a multi-institution research team led by a biomedical engineer at Northwestern University has found a new culprit.

Glaucoma appears to be a consequence of mechanical dysfunction of endothelial cells - a thin layer of cells that is the final barrier to fluid entering Schlemm's canal, from which fluid then drains from the eye.

The researchers found that these endothelial cells from eyes with glaucoma are stiffer than cells from healthy eyes. This stiffness limits the cells' ability to deform and allow a fluid called aqueous humor to cross the endothelium and drain into Schlemm's canal. This increased flow resistance is responsible for the elevated pressure associated with glaucoma.

The findings were published this week in the online early edition of the journal Proceedings of the National Academy of Sciences (PNAS).

"There is no cure for glaucoma, which affects more than two million Americans," said Mark Johnson, the senior author of the study. "Our work shows that cells of this endothelial layer act as mechanical gates. Therapeutic strategies that alter the stiffness of these cells potentially could lead to a cure for this debilitating disease."

Johnson is a professor of biomedical engineering and mechanical engineering at Northwestern's McCormick School of Engineering and Applied Science and a professor of ophthalmology at Northwestern University Feinberg School of Medicine.

Both Schlemm's canal and the clear aqueous humor it drains from the eyeball are vital to the eye's health and function.

The aqueous humor nourishes the eye and maintains its proper pressure. Aqueous humor from the eye's anterior chamber (located between the iris and cornea) collects in the canal from which it then flows into the vascular system.

If the endothelial cells lining Schlemm's canal are too stiff, it is difficult for them to form pores that allow the aqueous humor to pass through this thin layer and drain into the canal. Pressure then increases in the eye and eventually causes damage to the optic nerve at the back of the eye.

"The work appears to be one of the first times that the methods of mechanobiology - the study of the mechanical characteristics of cells - have been used to show that dysfunctional cell mechanics lies at the heart of a disease process," Johnson said.

The title of the paper is "Altered mechanobiology of Schlemm's canal endothelial cells in glaucoma." Johnson's co-authors on the study are from Imperial College London, the Harvard School of Public Health, Duke University, the Universität Regensburg in Germany, Georgia Institute of Technology and Emory University.

http://www.eurekalert.org/pub_releases/2014-09/uosc-urd091214.php

USC researchers discover the healing power of 'rib-tickling'

Unlike salamanders, mammals can't regenerate lost limbs, but they can repair large sections of their ribs.

In a new study in the Journal of Bone and Mineral Research, a team directed by USC Stem Cell researcher Francesca Mariani takes a closer look at rib regeneration in both humans and mice.

The first author of the paper, USC medical student Marissa K. Srour, was a USC undergraduate when she started the project, which earned a 2011 USC Discovery Scholar Prize. Each year, 10 graduating seniors win these coveted prizes, which recognize exceptional new scholarship.

Using CT imaging, Srour, Mariani and their colleague Janice Lee from the University of California, San Francisco, monitored the healing of a human rib that had been partially removed by a surgeon. The eight centimeters of missing bone and one centimeter of missing cartilage did partially repair after six months.

To better understand this repair process, they surgically removed sections of rib cartilage - ranging from three to five millimeters - from a related mammal, mice. When they removed both rib cartilage and its surrounding sheath of tissue - called the "perichondrium," the missing sections failed to repair even after nine months. However, when they removed rib cartilage but left its perichondrium, the missing sections entirely repaired within one to two months.

They also found that a perichondrium retains the ability to produce cartilage even when disconnected from the rib and displaced into nearby muscle tissue - further suggesting that the perichondrium contains progenitor or stem cells.

"We believe that the development of this model in the mouse is important for making progress in the field of skeletal repair, where an acute clinical need is present for ameliorating skeletal injury, chronic osteoarthritis and the severe problems associated with reconstructive surgery," said Mariani, assistant professor of Cell and Neurobiology and principal investigator in the Eli and Edythe Broad Center for Regenerative Medicine and Stem Cell Research at USC. "At the early stages in our understanding, the mouse provides us with an exceptional ability to make progress, and we are excited about the potential for using cells derived from the rib perichondrium or using rib perichondrium-like cells for regenerative therapy."

Additional co-authors include: Jennifer L. Fogel, Kent T. Yamaguchi, Aaron P. Montgomery, Audrey K. Izuhara, Aaron L. Misakian, Stephanie Lam and Daniel L. Lakeland from USC; and Mark M. Urata from Children's Hospital Los Angeles.

Funding came from an Oral and Maxillofacial Surgery Foundation Research Award; the Baxter Medical Scholar Research Fellowship; USC undergraduate fellowships; the Provost,

Dean Joan M. Schaeffer, and Rose Hills fellowships; a California Institute of Regenerative Medicine (CIRM) training fellowship; CIRM BRIDGES fellowships through California State University, Fullerton, and Pasadena City College; and the James H. Zumberge Research and Innovation Fund.

The lab also received support for this study and future work from a new National Institutes of Health (NIH) Exploratory/Developmental Research Grant Award (R21AR064462) - given to high-risk, high-reward studies that break new ground or embark in novel directions. The lab earned this prestigious $450,000 grant from the NIH's National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS).

The Mariani Lab will also continue its pioneering research through a second new grant from the Merck Investigator Studies Program as well as through a USC Regenerative Medicine Initiative Award with colleagues Gage Crump and Jay Lieberman.

As Mariani explained, "These grants will allow us to address several key questions: Which cells are involved in mediating the repair? How big of a piece of rib can we take out and still see repair? And can we use cells from the rib to get repair in another part of the skeleton? By answering these questions, we are accelerating the discovery of new regenerative therapies for the patients who need them the most."

http://www.eurekalert.org/pub_releases/2014-09/ws-mri091214.php

Milestone reached in work to build replacement kidneys in the lab

Regenerative medicine researchers at Wake Forest Baptist Medical Center have addressed a major challenge in the quest to build replacement kidneys in the lab.

Working with human-sized pig kidneys, the scientists developed the most successful method to date to keep blood vessels in the new organs open and flowing with blood. The work is reported in journal Technology.

"Until now, lab-built kidneys have been rodent-sized and have functioned for only one or two hours after transplantation because blood clots developed," said Anthony Atala, M.D., director and professor at the Wake Forest Institute for Regenerative Medicine and a senior author on the study. "In our proof-of-concept study, the vessels in a human-sized pig kidney remained open during a four-hour testing period. We are now conducting a longer-term study to determine how long flow can be maintained."

If proven successful, the new method to more effectively coat the vessels with cells (endothelial) that keep blood flowing smoothly, could potentially be applied to other complex organs that scientists are working to engineer, including the liver and pancreas.

The current research is part of a long-term project to use pig kidneys to make support structures known as "scaffolds" that could potentially be used to build replacement kidneys for human patients with end-stage renal disease. Scientists first remove all animal cells from the organ - leaving only the organ structure or "skeleton." A patient's own cells would then be placed in the scaffold, making an organ that the patient theoretically would not reject.

The cell removal process leaves behind an intact network of blood vessels that can potentially supply the new organ with oxygen. However, scientists working to repopulate kidney scaffolds with cells have had problems coating the vessels and severe clotting has generally occurred within a few hours after transplantation.

The Wake Forest Baptist scientists took a two-pronged approach to address this problem. First, they evaluated four different methods of introducing new cells into the main vessels of the kidney scaffold. They found that a combination of infusing cells with a syringe, followed by a period of pumping cells through the vessels at increasing flow rates, was most effective.

Next, the research team coated the scaffold's vessels with an antibody designed to make them more "sticky" and to bind endothelial cells. Laboratory and imaging studies - as well as tests of blood flow in the lab - showed that cell coverage of the vessels was sufficient to support blood flow through the entire kidney scaffold.

The final test of the dual-approach was implanting the scaffolds in pigs weighing 90 to 110 pounds. During a four-hour testing period, the vessels remained open.

"Our cell seeding method, combined with the antibody, improves the attachment of cells to the vessel wall and prevents the cells from being detached when blood flow is initiated," said In Kap Ko, Ph.D., lead author and instructor in regenerative medicine at Wake Forest Baptist.

The scientists said a long-term examination is necessary to sufficiently conclude that blood clotting is prevented when endothelial cells are attached to the vessels. If the new method is proven successful in the long-term, the research brings them an important step closer to the day when replacement kidneys can be built in the lab.

"The results are a promising indicator that it is possible to produce a fully functional vascular system that can deliver nutrients and oxygen to engineered kidneys, as well as other engineered organs," said Ko.

Using pig kidneys as scaffolds for human patients has several advantages, including that the organs are similar in size and that pig heart valves - removed of cells - have safety been used in patients for more than three decades.

This study was supported, in part, by Telemedicine and Advanced Technology Research Center at the U.S. Army Medical Research and Materiel Command. Co-researchers were Mehran Abolbashari, M.D., Jennifer Huling, B.S., Cheil Kim, M.D., Ph.D., Sayed-Hadi Mirmalek-Sani, Ph.D., Mahmoudreza Moradi, M.D., Giuseppe Orlando, M.D., John D. Jackson, Ph.D., Tamer Aboushwareb, M.D., Shay Soker, Ph.D., and Anthony Atala, M.D., all with Wake Forest Baptist.

Corresponding author for this study in Technology is James J. Yoo, jyoo@wakehealth.edu. The study can be found at http://www.worldscientific.com/doi/abs/10.1142/S2339547814500228.

http://www.eurekalert.org/pub_releases/2014-09/iocr-gtc091214.php

Genetic testing can identify men at 6-fold increased risk of prostate cancer

Scientists can now explain one-third of the inherited risk of prostate cancer, after a major international study identified 23 new genetic variants associated with increased risk of the disease

Scientists can now explain a third of the inherited risk of prostate cancer, after a major international study identified 23 new genetic variants associated with increased risk of the disease.

The study brings the total number of common genetic variants linked to prostate cancer to 100, and testing for them can identify 1% of men with a risk of the disease almost six times as high as the population average.

Scientists at The Institute of Cancer Research, London, and in Cambridge, UK, and California led a huge search for new genetic variants including almost 90,000 men and for the first time combining populations with European, African, Japanese and Latino ancestry.

The research, published today (Sunday) in Nature Genetics, was funded in equal amounts by Cancer Research UK, Prostate Cancer UK, the EU and the National Institutes for Health in the US.

Researchers found that assessing the top 100 variants identified 10% of men with a risk almost three times as high as the population average, and said that this was high enough to investigate whether targeted genetic screening was merited. They plan to lead a new clinical trial to test whether genetic screening can be effective.

In European men, scientists had previously found 77 genetic variants which were known to increase the risk of prostate cancer.

In the new research, scientists from The Institute of Cancer Research (ICR), University of Cambridge and the University of Southern California in the US examined the genetic information of 87,040 men from all over the world.

They combined genetic population studies of 43,303 men with prostate cancer and 43,737 controls from European, African, Japanese or Latino heritage to improve statistical power and increase their chances of identifying new variants.

From this combined population, they identified 16 new genetic markers linked to prostate cancer risk in European men - one of them associated with increased risk of early-onset disease - and seven in men of mixed heritage.

The study means that scientists can now explain 33% of the inherited origins of prostate cancer in European men. A new clinical trial called BARCODE, which aims to genetically screen 5,000 men for prostate cancer, will investigate if these genetic markers can improve on other tests for the disease.

They are investigating whether genetic testing could help diagnose more men at risk of developing dangerous forms of prostate cancer that need urgent treatment – something that the current PSA test is unable to tell us.

The new study shows that for European men assessed for the 100 common variants, the 10% at highest risk are 2.9 times more likely than the average person to develop prostate cancer, while the top 1% are 5.7 times more likely to develop the disease.

Professor Ros Eeles, Professor of Oncogenetics at The Institute of Cancer Research, London, and Honorary Consultant in Clinical Oncology at The Royal Marsden NHS Foundation Trust, said: "Our study tells us more about the effect of the genetic hand that men are dealt on their risk of prostate cancer. We know that there are a few major genes that are rare and significantly affect prostate cancer risk, but what we are now learning is that there are many other common genetic variants that individually have only a small effect on risk, but collectively can be very important. To use the playing cards analogy again, sometimes multiple low cards can combine to form a high risk score.

"We can now explain a third of the inherited risk of prostate cancer, and will shortly be conducting a clinical trial to find out whether testing for genetic variants in men can successfully pick up the disease early, and help direct targeted interventions for patients."

Professor Malcolm Mason, prostate cancer expert for Cancer Research UK, said: "This important research continues a quest to unravel the complex picture of the genetic factors that increase a man's risk of prostate cancer.

"Building on previous research this study gives a more complete list of these factors, bringing us closer to knowing who may need screening for prostate cancer and which men may benefit from early treatment. More work needs to be done, but identifying these genetic factors will allow us to better understand the disease and maybe even develop new treatments."

Dr Matthew Hobbs, Deputy Director of Research at Prostate Cancer UK said: "There's no doubt that genetic testing for prostate cancer is an exciting area of research. The results of this study could take us a step closer to targeted screening by allowing us to identify those most at risk of the disease based on the genes that they possess. However, this is not the end of the story and the challenge now lies in translating this knowledge into a reliable test that can be used on a large scale through the NHS to find those men at highest risk.

"It is also absolutely vital that researchers build on this work to discover which of these genetic variants can tell us whether a man's cancer is aggressive and likely to go on to kill him, or one that may never cause any harm. This would save those men with non-aggressive disease from undergoing unnecessary treatment."

http://www.eurekalert.org/pub_releases/2014-09/vu-eel091514.php

Early Earth less hellish than previously thought

Conditions on earliest Earth may have been surprisingly similar to the present day

Conditions on Earth for the first 500 million years after it formed may have been surprisingly similar to the present day, complete with oceans, continents and active crustal plates.

This alternate view of Earth's first geologic eon, called the Hadean, has gained substantial new support from the first detailed comparison of zircon crystals that formed more than 4 billion years ago with those formed contemporaneously in Iceland, which has been proposed as a possible geological analog for early Earth.

The study was conducted by a team of geologists directed by Calvin Miller, the William R. Kenan Jr. Professor of Earth and Environmental Sciences at Vanderbilt University, and published online this weekend by the journal Earth and Planetary Science Letters in a paper titled, "Iceland is not a magmatic analog for the Hadean: Evidence from the zircon record."

From the early 20th century up through the 1980's, geologists generally agreed that conditions during the Hadean period were utterly hostile to life. Inability to find rock formations from the period led them to conclude that early Earth was hellishly hot, either entirely molten or subject to such intense asteroid bombardment that any rocks that formed were rapidly remelted.

As a result, they pictured the surface of the Earth as covered by a giant "magma ocean."

This perception began to change about 30 years ago when geologists discovered zircon crystals (a mineral typically associated with granite) with ages exceeding 4 billion years old preserved in younger sandstones.

These ancient zircons opened the door for exploration of the Earth's earliest crust. In addition to the radiometric dating techniques that revealed the ages of these ancient zircons, geologists used other analytical techniques to extract information about the environment in which the crystals formed, including the temperature and whether water was present.

Since then zircon studies have revealed that the Hadean Earth was not the uniformly hellish place previously imagined, but during some periods possessed an established crust cool enough so that surface water could form – possibly on the scale of oceans.

Accepting that the early Earth had a solid crust and liquid water (at least at times), scientists have continued to debate the nature of that crust and the processes that were active at that time: How similar was the Hadean Earth to what we see today? Two schools of thought have emerged: One argues that Hadean Earth was surprisingly similar to the present day. The other maintains that, although it was less hostile than formerly believed, early Earth was nonetheless a foreign-seeming and formidable place, similar to the hottest, most extreme, geologic environments of today. A popular analog is Iceland, where substantial amounts of crust are forming from basaltic magma that is much hotter than the magmas that built most of Earth's current continental crust.

"We reasoned that the only concrete evidence for what the Hadean was like came from the only known survivors: zircon crystals – and yet no one had investigated Icelandic zircon to compare their telltale compositions to those that are more than 4 billion years old, or with zircon from other modern environments," said Miller.

In 2009, Vanderbilt doctoral student Tamara Carley, who has just accepted the position of assistant professor at Layfayette College, began collecting samples from volcanoes and sands derived from erosion of Icelandic volcanoes. She separated thousands of zircon crystals from the samples, which cover the island's regional diversity and represent its 18 million year history.

Working with Miller and doctoral student Abraham Padilla at Vanderbilt, Joe Wooden at Stanford University, Axel Schmitt and Rita Economos from UCLA, Ilya Bindeman at the University of Oregon and Brennan Jordan at the University of South Dakota, Carley analyzed about 1,000 zircon crystals for their age and elemental and isotopic compositions. She then searched the literature for all comparable analyses of Hadean zircon and for representative analyses of zircon from other modern environments.

"We discovered that Icelandic zircons are quite distinctive from crystals formed in other locations on modern Earth. We also found that they formed in magmas that are remarkably different from those in which the Hadean zircons grew," said Carley.

Most importantly, their analysis found that Icelandic zircons grew from much hotter magmas than Hadean zircons. Although surface water played an important role in the generation of both Icelandic and Hadean crystals, in the Icelandic case the water was extremely hot when it interacted with the source rocks while the Hadean water-rock interactions were at significantly lower temperatures.

"Our conclusion is counterintuitive," said Miller. "Hadean zircons grew from magmas rather similar to those formed in modern subduction zones, but apparently even 'cooler' and 'wetter' than those being produced today."

The study was supported by National Science Foundation grants EAR-1220523, EAR-CAREER-0844772 and DGE-0909667, and research grants from the National Geographic Society and the Keck Geology Consortium.

http://www.eurekalert.org/pub_releases/2014-09/du-cwi091014.php

Contaminated water in 2 states linked to faulty shale gas wells

Flawed well casings and cement blamed for drinking water contamination in Pennsylvania and Texas

DURHAM, N.C. - Faulty well integrity, not hydraulic fracturing deep underground, is the primary cause of drinking water contamination from shale gas extraction in parts of Pennsylvania and Texas, according to a new study by researchers from five universities.

The scientists from Duke, Ohio State, Stanford, Dartmouth and the University of Rochester published their peer-reviewed study Sept. 15 in the Proceedings of the National Academy of Sciences. Using noble gas and hydrocarbon tracers, they analyzed the gas content of more than 130 drinking water wells in the two states.

"We found eight clusters of wells - seven in Pennsylvania and one in Texas - with contamination, including increased levels of natural gas from the Marcellus shale in Pennsylvania and from shallower, intermediate layers in both states," said Thomas H. Darrah, assistant professor of earth science at Ohio State, who led the study while he was a research scientist at Duke.

"Our data clearly show that the contamination in these clusters stems from well-integrity problems such as poor casing and cementing," Darrah said.

"These results appear to rule out the possibility that methane has migrated up into drinking water aquifers because of horizontal drilling or hydraulic fracturing, as some people feared," said Avner Vengosh, professor of geochemistry and water quality at Duke.

In four of the affected clusters, the team's noble gas analysis shows that methane from drill sites escaped into drinking water wells from shallower depths through faulty or insufficient rings of cement surrounding a gas well's shaft. In three clusters, the tests suggest the methane leaked through faulty well casings. In one cluster, it was linked to an underground well failure.

"People's water has been harmed by drilling," said Robert B. Jackson, professor of environmental and earth sciences at Stanford and Duke. "In Texas, we even saw two homes go from clean to contaminated after our sampling began."

"The good news is that most of the issues we have identified can potentially be avoided by future improvements in well integrity," Darrah stressed.

Using both noble gas and hydrocarbon tracers - a novel combination that enabled the researchers to identify and distinguish between the signatures of naturally occurring methane and stray gas contamination from shale gas drill sites - the team analyzed gas content in 113 drinking-water wells and one natural methane seep overlying the Marcellus shale in Pennsylvania, and in 20 wells overlying the Barnett shale in Texas. Sampling was conducted in 2012 and 2013. Sampling sites included wells where contamination had been debated previously; wells known to have naturally high level of methane and salts, which tend to co-occur in areas overlying shale gas deposits; and wells located both within and beyond a one-kilometer distance from drill sites.

Noble gases such as helium, neon or argon are useful for tracing fugitive methane because although they mix with natural gas and can be transported with it, they are inert and are not altered by microbial activity or oxidation. By measuring changes in ratios in these tag-along noble gases, researchers can determine the source of fugitive methane and the mechanism by which it was transported into drinking water aquifers - whether it migrated there as a free gas or was dissolved in water.

"This is the first study to provide a comprehensive analysis of noble gases and their isotopes in groundwater near shale gas wells," said Darrah, who is continuing the analysis in his lab at Ohio State. "Using these tracers, combined with the isotopic and chemical fingerprints of hydrocarbons in the water and its salt content, we can pinpoint the sources and pathways of methane contamination, and determine if it is natural or not."

Funding for the study came from a National Science Foundation EAGER grant (#EAR-1249255) and from Duke's Nicholas School of the Environment.

Nathaniel R. Warner, Obering Postdoctoral Fellow at Dartmouth College, and Robert J. Poreda, professor of earth and environmental sciences at the University of Rochester, co-authored the study.

CITATION: "Noble Gases Identify the Mechanisms of Fugitive Gas Contamination in Drinking-Water Wells Overlying the Marcellus and Barnett Shales," Thomas H. Darrah, Avner Vengosh, Robert B. Jackson, Nathaniel R. Warner and Robert J. Poreda, published date here in the Proceedings of the National Academy of Sciences. http://www.pnas.org/cgi/doi/10.1073/pnas.1322107111

http://www.eurekalert.org/pub_releases/2014-09/uok-usi090514.php

UK study identifies molecule that induces cancer-killing protein

Arylquin 1 as a potent inducer of a protein that acts as a tumor suppressor

LEXINGTON, Ky. – A new study by University of Kentucky researchers has identified a novel molecule named Arylquin 1 as a potent inducer of Par-4 secretion from normal cells. Par-4 is a protein that acts as a tumor suppressor, killing cancer cells while leaving normal cells unharmed.

Normal cells secrete small amounts of Par-4 on their own, but this amount is not enough to kill cancer cells. Notably, if Par-4 secretion is suppressed, this leads to tumor growth.

Published in Nature Chemical Biology, the UK study utilized lab cultures and animal models to show that low levels of Arylquin 1 induced Par-4 secretion without causing harm to the producer cells.

Additionally, researchers found that Par-4 is bound to a protein called vimentin, which contributes to tumor metastasis. Arylquin 1 binds to vimentin, displacing the Par-4 for secretion - which means it may also be useful for inhibitiing the spread of cancer.

These findings have strong implications for the development of future cancer treatments, as researchers are now focusing on developing Arylquin 1 into a drug to inhibit both primary and metastatic tumors.

"We found that Par-4 is inactivated by pro-metastasis proteins such as vimentin," said Vivek Rangnekar, UK professor and Alfred Cohen Chair in Oncology Research in the Department of Radiation Medicine. "This implies that by using small molecule drugs that target metastasis proteins, we may be able to both inhibit the spread of cancer while also releasing the tumor suppressor - Par-4 - to then induce the death of the cancerous cells."

Rangnekar, who also serves as Associate Director for the UK Markey Cancer Center, initially discovered the Par-4 gene in 1994. Working closely with UK medicinal chemist David Watt and a multidisciplinary team across the UK campus, their labs are developing secretagogues that can cause elevated secretion of Par-4 for the inhibition of primary and metastatic tumors.

This study was funded by grants from the National Cancer Institute, the National Center for Research Resources, and the UK Center for Clinical and Translational Science.

http://www.eurekalert.org/pub_releases/2014-09/asoc-cfo091514.php

Certain form of baldness at age 45 linked to higher risk of aggressive prostate cancer

Men with moderate baldness affecting both the front and the crown of their head at age 45 were at a 40% increased risk of aggressive prostate cancer

A new, large cohort analysis from the prospective Prostate, Lung, Colorectal and Ovarian (PLCO) Cancer Screening Trial, indicates that men who had moderate baldness affecting both the front and the crown of their head at age 45 were at a 40% increased risk of developing aggressive prostate cancer (usually indicates a faster growing tumor resulting in poorer prognosis relative to non-aggressive prostate cancer) later in life, compared to men with no baldness. There was no significant link between other patterns of baldness and prostate cancer risk. The study, published September 15 in the Journal of Clinical Oncology, supports earlier research suggesting that male pattern baldness and prostate cancer may be linked.

"Our study found an increased risk for aggressive prostate cancer only in men with a very specific pattern of hair loss, baldness at the front and moderate hair-thinning on the crown of the head, at the age of 45. But we saw no increased risk for any form of prostate cancer in men with other hair-loss patterns," said senior study author Michael B. Cook, PhD, an investigator in the Division of Cancer Epidemiology and Genetics at the National Cancer Institute in Bethesda, MD. "While our data show a strong possibility for a link between the development of baldness and aggressive prostate cancer, it's too soon to apply these findings to patient care."

Prostate cancer is the second most common cancer among men. Emerging evidence suggests that prostate cancer and male pattern baldness - progressive scalp hair-loss in a distinct pattern - are both connected to increased levels of male sex hormones (androgens) and androgen receptors, supporting the idea of a biological link between baldness and prostate cancer development and progression.

Researchers analyzed male pattern baldness in relation to prostate cancer risk in a cohort of 39,070 men from the U.S. PLCO Cancer Screening Trial, aged 55-74 years at enrollment. The men received a questionnaire that asked them to recall what their hair-loss patterns were at age 45 using a pictorial tool.

During follow-up, 1,138 prostate cancer cases were diagnosed, 51% of which were aggressive (Gleason score equal to or greater than 7, stage III or IV, or prostate cancer as the cause of death). The mean age at the time of prostate cancer diagnosis was 72.

Men who had a specific pattern of baldness, frontal and moderate crown (vertex), were 40% more likely to develop aggressive prostate cancer, compared to men who had no baldness. There was no association between male pattern baldness and risk of non-aggressive prostate cancer.

Dr. Cook stated that if these findings are confirmed by further studies, medical assessment of baldness could possibly be used to help identify men who may be at increased risk of aggressive prostate cancer. His research team is currently conducting two additional cohort analyses exploring the relationship between male pattern baldness and risk of developing and dying from prostate cancer. One of the studies includes a baseline dermatologic assessment of male pattern baldness, which may be more reliable than the recall method, which was used in the present study.

This research was supported by the intramural program of the U.S. National Cancer Institute, National Institutes of Health.

ASCO Perspective ***Charles Ryan, MD, ASCO expert***

"Previous research linking baldness and prostate cancer has been inconclusive, but this large study suggests a significant link between high risk prostate cancer and hair loss - and suggests that men with hair loss may need to be followed more closely. More evidence is needed, however, before we can routinely consider baldness in prostate cancer screening recommendations."

http://www.eurekalert.org/pub_releases/2014-09/wuso-sna091114.php

Schizophrenia not a single disease but multiple genetically distinct disorders

New research shows that schizophrenia isn't a single disease but a group of eight genetically distinct disorders, each with its own set of symptoms.

New research shows that schizophrenia isn't a single disease but a group of eight genetically distinct disorders, each with its own set of symptoms. The finding could be a first step toward improved diagnosis and treatment for the debilitating psychiatric illness. The research at Washington University School of Medicine in St. Louis is reported online Sept. 15 in the American Journal of Psychiatry.

About 80 percent of the risk for schizophrenia is known to be inherited, but scientists have struggled to identify specific genes for the condition. Now, in a novel approach analyzing genetic influences on more than 4,000 people with schizophrenia, the research team has identified distinct gene clusters that contribute to eight different classes of schizophrenia.

"Genes don't operate by themselves," said C. Robert Cloninger, MD, PhD, one of the study's senior investigators. "They function in concert much like an orchestra, and to understand how they're working, you have to know not just who the members of the orchestra are but how they interact."

Cloninger, the Wallace Renard Professor of Psychiatry and Genetics, and his colleagues matched precise DNA variations in people with and without schizophrenia to symptoms in individual patients. In all, the researchers analyzed nearly 700,000 sites within the genome where a single unit of DNA is changed, often referred to as a single nucleotide polymorphism (SNP). They looked at SNPs in 4,200 people with schizophrenia and 3,800 healthy controls, learning how individual genetic variations interacted with each other to produce the illness.

In some patients with hallucinations or delusions, for example, the researchers matched distinct genetic features to patients' symptoms, demonstrating that specific genetic variations interacted to create a 95 percent certainty of schizophrenia. In another group, they found that disorganized speech and behavior were specifically associated with a set of DNA variations that carried a 100 percent risk of schizophrenia.

"What we've done here, after a decade of frustration in the field of psychiatric genetics, is identify the way genes interact with each other, how the 'orchestra' is either harmonious and leads to health, or disorganized in ways that lead to distinct classes of schizophrenia," Cloninger said.

Although individual genes have only weak and inconsistent associations with schizophrenia, groups of interacting gene clusters create an extremely high and consistent risk of illness, on the order of 70 to 100 percent. That makes it almost impossible for people with those genetic variations to avoid the condition. In all, the researchers identified 42 clusters of genetic variations that dramatically increased the risk of schizophrenia.

"In the past, scientists had been looking for associations between individual genes and schizophrenia," explained Dragan Svrakic, PhD, MD, a co-investigator and a professor of psychiatry at Washington University. "When one study would identify an association, no one else could replicate it. What was missing was the idea that these genes don't act independently. They work in concert to disrupt the brain's structure and function, and that results in the illness."

Svrakic said it was only when the research team was able to organize the genetic variations and the patients' symptoms into groups that they could see that particular clusters of DNA variations acted together to cause specific types of symptoms.

Then they divided patients according to the type and severity of their symptoms, such as different types of hallucinations or delusions, and other symptoms, such as lack of initiative, problems organizing thoughts or a lack of connection between emotions and thoughts. The results indicated that those symptom profiles describe eight qualitatively distinct disorders based on underlying genetic conditions.

The investigators also replicated their findings in two additional DNA databases of people with schizophrenia, an indicator that identifying the gene variations that are working together is a valid avenue to explore for improving diagnosis and treatment.

By identifying groups of genetic variations and matching them to symptoms in individual patients, it soon may be possible to target treatments to specific pathways that cause problems, according to co-investigator Igor Zwir, PhD, research associate in psychiatry at Washington University and associate professor in the Department of Computer Science and Artificial Intelligence at the University of Granada, Spain.

And Cloninger added it may be possible to use the same approach to better understand how genes work together to cause other common but complex disorders. "People have been looking at genes to get a better handle on heart disease, hypertension and diabetes, and it's been a real disappointment," he said. "Most of the variability in the severity of disease has not been explained, but we were able to find that different sets of genetic variations were leading to distinct clinical syndromes. So I think this really could change the way people approach understanding the causes of complex diseases."

http://www.eurekalert.org/pub_releases/2014-09/miot-nik091514.php

Neuroscientists identify key role of language gene

Mutation that arose long ago may be key to humans' unique ability to produce and understand speech.

Written by Anne Trafton, MIT News Office

CAMBRIDGE, MA - Neuroscientists have found that a gene mutation that arose more than half a million years ago may be key to humans' unique ability to produce and understand speech.

Researchers from MIT and several European universities have shown that the human version of a gene called Foxp2 makes it easier to transform new experiences into routine procedures. When they engineered mice to express humanized Foxp2, the mice learned to run a maze much more quickly than normal mice.

The findings suggest that Foxp2 may help humans with a key component of learning language - transforming experiences, such as hearing the word "glass" when we are shown a glass of water, into a nearly automatic association of that word with objects that look and function like glasses, says Ann Graybiel, an MIT Institute Professor, member of MIT's McGovern Institute for Brain Research, and a senior author of the study.

"This really is an important brick in the wall saying that the form of the gene that allowed us to speak may have something to do with a special kind of learning, which takes us from having to make conscious associations in order to act to a nearly automatic-pilot way of acting based on the cues around us," Graybiel says.

Wolfgang Enard, a professor of anthropology and human genetics at Ludwig-Maximilians University in Germany, is also a senior author of the study, which appears in the Proceedings of the National Academy of Sciences this week.

The paper's lead authors are Christiane Schreiweis, a former visiting graduate student at MIT, and Ulrich Bornschein of the Max Planck Institute for Evolutionary Anthropology in Germany.

All animal species communicate with each other, but humans have a unique ability to generate and comprehend language.

Foxp2 is one of several genes that scientists believe may have contributed to the development of these linguistic skills. The gene was first identified in a group of family members who had severe difficulties in speaking and understanding speech, and who were found to carry a mutated version of the Foxp2 gene.

In 2009, Svante Pääbo, director of the Max Planck Institute for Evolutionary Anthropology, and his team engineered mice to express the human form of the Foxp2 gene, which encodes a protein that differs from the mouse version by only two amino acids.

His team found that these mice had longer dendrites - the slender extensions that neurons use to communicate with each other - in the striatum, a part of the brain implicated in habit formation. They were also better at forming new synapses, or connections between neurons.

Pääbo, who is also an author of the new PNAS paper, and Enard enlisted Graybiel, an expert in the striatum, to help study the behavioral effects of replacing Foxp2. They found that the mice with humanized Foxp2 were better at learning to run a T-shaped maze, in which the mice must decide whether to turn left or right at a T-shaped junction, based on the texture of the maze floor, to earn a food reward.

The first phase of this type of learning requires using declarative memory, or memory for events and places.

Over time, these memory cues become embedded as habits and are encoded through procedural memory - the type of memory necessary for routine tasks, such as driving to work every day or hitting a tennis forehand after thousands of practice strokes.

Using another type of maze called a cross-maze, Schreiweis and her MIT colleagues were able to test the mice's ability in each of type of memory alone, as well as the interaction of the two types.

They found that the mice with humanized Foxp2 performed the same as normal mice when just one type of memory was needed, but their performance was superior when the learning task required them to convert declarative memories into habitual routines. The key finding was therefore that the humanized Foxp2 gene makes it easier to turn mindful actions into behavioral routines.

The protein produced by Foxp2 is a transcription factor, meaning that it turns other genes on and off. In this study, the researchers found that FoxP2 appears to turn on genes involved in the regulation of synaptic connections between neurons. They also found enhanced dopamine activity in a part of the striatum that is involved in forming procedures. In addition, the neurons of some striatal regions could be turned off for longer periods in response to prolonged activation - a phenomenon known as long-term depression, which is necessary for learning new tasks and forming memories.

Together, these changes help to "tune" the brain differently to adapt it to speech and language acquisition, the researchers believe. They are now further investigating how Foxp2 may interact with other genes to produce its effects on learning and language.

The research was funded by the Nancy Lurie Marks Family Foundation, the Simons Foundation Autism Research Initiative, the National Institutes of Health, the Wellcome Trust, the Fondation pour la Recherche Médicale, and the Max Planck Society.

http://www.medscape.com/viewarticle/831523

Differentiating Chikungunya From Dengue: A Clinical Challenge

A Woman With Fever, Myalgia, and Arthralgia

Tyler M. Sharp, PhD

In May of this year, a woman in her early 30s visited an outpatient clinic in Missouri, reporting a three-day history of fever, myalgia, and arthralgia. She described recent travel to Haiti for a one-week missionary trip and indicated that her illness began three days after her return. Serologic diagnostic testing for dengue and chikungunya were requested, and the patient was prescribed bed rest and acetaminophen for pain. Test results were returned several days later and were positive for detection of anti-dengue virus (DENV) IgG antibodies but were negative for detection of anti-DENV IgM antibodies. Testing was also negative for anti-chikungunya virus (CHIKV) IgM and IgG antibodies. The patient was diagnosed with dengue and a report was made to the local health department.

Three weeks later the patient returned, complaining of persistent joint pain in her hands and feet. Repeat dengue and chikungunya serologic diagnostic testing was requested and was positive for detection of anti-CHIKV IgM and IgG antibodies; both anti-DENV IgM and IgG antibodies were negative. The patient was referred to a rheumatologist for consultation regarding pain management.

Dengue and Chikungunya: Making the Diagnosis

Clinicians evaluating patients with acute febrile illness need to collect a travel history from the patient. Both chikungunya and dengue should be considered in the differential diagnosis if the patient traveled to any region of the tropics, particularly the Caribbean and Americas, where chikungunya has recently emerged, in the 14 days before the illness began.

Chikungunya and dengue are both acute febrile illnesses characterized by fever, myalgia, and lethargy. Some patients may also have maculopapular rash, nausea, vomiting, and headache. Distinguishing features of chikungunya include potentially debilitating bilateral polyarthralgia and, in some cases, arthritis. Although these signs and symptoms may assist in differentiating dengue and chikungunya, clinicians should include both illnesses in their differential diagnosis of patients with acute febrile illness and recent travel to the tropics. Such patients should also be evaluated for other serious conditions, such as malaria, leptospirosis, and other bacterial infections.

Increasing Concern About Dengue and Chikungunya in the United States

Chikungunya was introduced into the Caribbean in late 2013. Through September 5, 2014, more than 650,000 clinical cases of chikungunya have been reported throughout the Caribbean and Americas. This includes more than 750 travel-associated cases of individuals who were infected while abroad and became ill after returning to the United States. Importation of chikungunya has led to at least eight locally acquired chikungunya cases in Florida. Up-to-date information on the number of chikungunya cases in the Americas and in the United States are available.

Because dengue is endemic in all areas of the Caribbean and Americas that have ongoing chikungunya outbreaks, both dengue and chikungunya should be included on the differential diagnosis of patients returning from these areas with acute febrile illness.

Diagnostic Tests for Suspected Chikungunya and Dengue

During the first five days of illness, RT-PCR to directly detect CHIKV or DENV nucleic acid should be performed on serum from suspected cases. Serum specimens collected five or more days after onset of symptoms should be evaluated for anti-CHIKV and anti-DENV IgM antibodies by immunoassay. If initial results are negative and dengue or chikungunya is still suspected, convalescent serum should be collected seven days or more after illness onset and retested to detect IgM antibodies.

Clinicians should also be aware that detection of anti-DENV IgG antibody has little utility in the diagnosis of acute dengue. Such results do not provide information about the timing of infection, as IgG antibodies that detect viral antigen may be the result of an infection that occurred in previous months or years and may fluctuate in their detectability over time. In addition, IgG antibodies against other flaviviruses (eg, West Nile, Japanese encephalitis, and yellow fever viruses) can cross-react with DENV, thereby yielding false-positive diagnostic results. Cross-reactivity may also occur with IgM antibodies, though less frequently. Therefore, a thorough travel and vaccination history is necessary to accurately interpret dengue serologic diagnostic test results.

Management of Suspected Dengue and Chikungunya

Chikungunya is rarely fatal. In contrast, early identification and proper clinical management for hospitalized dengue cases can reduce the case-fatality rate from 10% to less than 0.1%. Therefore, patients suspected of having dengue or chikungunya should be managed as having dengue until dengue can be ruled out. Patients should be evaluated for the presence of warning signs of severe dengue (eg, persistent vomiting, severe abdominal pain). If present, patients should be hospitalized for close monitoring and management. If no warning signs are present, patients can be discharged home with anticipatory guidance that if such warning signs develop, they should return immediately for medical care. Vital signs and hemodynamic status should be monitored frequently in hospitalized patients.

Most patients who develop severe dengue do so in the 24-48 hours after defervescence, and this can occur rapidly and while the patient is lucid. Hemodynamic status should be maintained with judicious use of isotonic intravenous fluids, which is the central component of dengue patient management. Healthcare professionals can familiarize themselves with recommended dengue patient management though a free online course, now available from the Centers for Disease Control and Prevention, for which clinicians can receive four hours of continuing medical education credit.

Pain and fever in patients with suspected dengue or chikungunya should be managed with acetaminophen. If insufficient, narcotics such as morphine may be considered for pain management. Aspirin and other NSAIDs should not be given to such patients because of the increased risk for bleeding manifestations if the patient has dengue. If patients have been afebrile for at least 48 hours, have no warning signs of severe dengue, and still complain of joint pain, NSAIDs may be considered. Physical therapy may also be beneficial.

Clinical Considerations for Suspected Dengue and Chikungunya

As in the case described above, differentiating chikungunya from dengue can be challenging during the first week of symptoms. Thus, both chikungunya and dengue should be considered in patients returning from the tropics with acute febrile illness. Diagnostic testing by RT-PCR and/or IgM immunoassay should be requested for such cases and the results reported to public health authorities. Clinicians should be aware that detection of anti-DENV IgG antibody alone is not necessarily indicative of recent DENV infection.

The dengue and chikungunya viruses are both transmitted by *Aedes* species mosquitoes. Because vaccines to prevent dengue and chikungunya are not available, the best way to reduce the risk for infection is to avoid mosquito bites by using air conditioning or screens when indoors, and by using insect repellents and wearing long sleeves and pants when outdoors. It is also important to protect people with suspected dengue and chikungunya from mosquitoes during the first week of illness to prevent further spread of the virus.

Related Resources

CDC: Dengue Clinical Case Management Course
CDC: Dengue
CDC: Chikungunya Virus
Chikungunya Virus in the United States
PAHO/WHO: Chikungunya

http://bit.ly/Zp3MHn

Ancient Mexican Tequila Worked as Food, Energy Drink

Tequila-like drink called pulque was a source of food and nutrition

Sep 15, 2014 03:00 PM ET // by Eric Niiler

Less than an hour's drive from the heart of Mexico City lies the expansive ruins of Teotihuacan, a massive city of nearly 120,000 people who built pyramids, temples and palaces before disappearing around 650 A.D.

This civilization, which pre-dates the Aztecs, remains a mystery in many ways. But new research has found they brewed a tequila-like drink called pulque as a source of food and nutrition, not just to forget their woes.

Pulque is a milky-white liquor made from the maguey plant - a relative of the agave used in tequila - and is still popular among local residents. Traces of pulque have been found on pottery shards dating at Teotihuacan dating back to 150 B.C., according to a new study published today in Proceedings of the National Academy of Sciences. Pulque was not just reserved for the upper classes, according to Marisol Correa-Ascencio, a doctoral student in chemistry at the University of Bristol (UK) and first author on the paper.

"The beverage was consumed by greater part of the population," Correa-Ascencio said. "It could have helped to compliment the diet of the people."

While ancient Egyptian and Mesopotamian cultures brewed beer and wine before the rise of the Teotihuacan culture, this is the earliest finding of an alcoholic beverage in Mesoamerica, Correa-Ascencio said.

Her colleagues used a new approach to identifying chemical residue on the pottery using a lipid biomarker, or a tiny fat molecule that had bonded with the ceramic molecules of the vase-like amphoras that held the pulque and were sealed with pine resin.

"The principle is that when you process food like cooking or storing, the lipids are absorbed into the ceramic matrix and get encapsulated," Correa-Ascensio said. "We take a potsherd, clean it, crush it and then perform lipid extraction."

The researcher said this is the first time this method has been used to identify an ancient alcoholic beverage. Pulque was widely used by the Aztecs at the time of the Spanish conquest in 1521, and remains in use today.

One expert on the Teotihuacan people says the method could be used to research the history of other cultures use of alcohol.

"It is exciting to see definite evidence that it was already being used more than a thousand years earlier at the immense pre-Aztec city of Teotihuacan, where it formed an important part of the diet, especially at times when other staples, such as maize, were in short supply," said George Cowgill, professor emeritus at Arizona State University.

"Having such a resource was part of what enabled Teotihuacan to flourish for more than six hundred years. Now that a method of detection is available, evidence for pulque's use will likely be found even earlier at Teotihuacan, as well as elsewhere. Furthermore, the method is applicable everywhere, and it will shed new light on the earliest uses of other fermented beverages worldwide, such as beer, wine, and mead (from honey)."

http://www.eurekalert.org/pub_releases/2014-09/uoc-rdm091514.php

Researchers debunk myth about Parkinson's disease

New knowledge about the complex processes that cause Parkinson's disease

Using advanced computer models, neuroscience researchers at the University of Copenhagen have gained new knowledge about the complex processes that cause Parkinson's disease. The findings have recently been published in the prestigious Journal of Neuroscience.

The defining symptoms of Parkinson's disease are slow movements, muscular stiffness and shaking. There is currently no cure for the condition, so it is essential to conduct innovative research with the potential to shed some light on this terrible disruption to the central nervous system. Using advanced computer models, neuroscience researchers at the University of Copenhagen have gained new knowledge about the complex processes that cause Parkinson?s disease. Dopamine is an important neurotransmitter which affects physical and psychological functions such as motor control, learning and memory. Levels of this substance are regulated by special dopamine cells. When the level of dopamine drops, nerve cells that constitute part of the brain's 'stop signal' are activated.

"This stop signal is rather like the safety lever on a motorised lawn mower: if you take your hand off the lever, the mower's motor stops. Similarly, dopamine must always be present in the system to block the stop signal. Parkinson's disease arises because for some reason the dopamine cells in the brain are lost, and it is known that the stop signal is being over-activated somehow or other. Many researchers have therefore considered it obvious that long-term lack of dopamine must be the cause of the distinctive symptoms that accompanies the disease. However, we can now use advanced computer simulations to challenge the existing paradigm and put forward a different theory about what actually takes place in the brain when the dopamine cells gradually die," explains Jakob Kisbye Dreyer, Postdoc at the Department of Neuroscience and Pharmacology, University of Copenhagen.

A thorn in the side

Scanning the brain of a patient suffering from Parkinson's disease reveals that in spite of dopamine cell death, there are no signs of a lack of dopamine – even at a comparatively late stage in the process.

"The inability to establish a lack of dopamine until advanced cases of Parkinson's disease has been a thorn in the side of researchers for many years. On the one hand, the symptoms indicate that the stop signal is over-activated, and patients are treated accordingly with a fair degree of success. On the other hand, data prove that they are not lacking dopamine," says Postdoc Jakob Kisbye Dreyer.

Computer models predict the progress of the disease

"Our calculations indicate that cell death only affects the level of dopamine very late in the process, but that symptoms can arise long before the level of the neurotransmitter starts to decline. The reason for this is that the fluctuations that normally make up a signal become weaker. In the computer model, the brain compensates for the shortage of signals by creating additional dopamine receptors. This has a positive effect initially, but as cell death progresses further, the correct signal may almost disappear. At this stage, the compensation becomes so overwhelming that even small variations in the level of dopamine trigger the stop signal – which can therefore cause the patient to develop the disease."

The new research findings may pave the way for earlier diagnosis of Parkinson's disease.

http://www.eurekalert.org/pub_releases/2014-09/usmc-ccd091514.php

Cancer-fighting cocktail demonstrates promising results as treatment for advanced cervical cancer

Combining standard chemo drug with drug that stops cells from dividing improves survival and response rates for those with advanced cervical cancer

DALLAS – Combining a standard chemotherapy drug with a second drug that stops cells from dividing improves both the survival and response rates for those with advanced cervical cancer, a new study by UT Southwestern Medical Center cancer researchers finds.

The cancer-fighting cocktail, which combines the chemotherapy drug cisplatin with pemetrexed - an agent that stops cancer cells from dividing - showed promising results for advanced, persistent, or recurrent cervical cancer.

"We found that pemetrexed combined with cisplatin is less toxic, well tolerated, and should be developed for further treatment of cervical cancer," said gynecologic oncology specialist Dr. David Miller, Professor of Obstetrics and Gynecology and a member of the Harold C. Simmons Cancer Center.

In the Phase II clinical trial, Dr. Miller and colleagues in the National Cancer Institute –supported Gynecologic Oncology Group found that in patients who had not received prior chemotherapy, the combination cocktail had a 31 percent response rate for up to 7 months, and an overall survival of 12 months. This outcome compares to the standard alternative - the combination of cisplatin with

the chemotherapy drug paclitaxel, which showed a response rate against the tumor of 29 percent for up to 6 months and an overall survival of 13 months.

While comparable in efficacy, Dr. Miller noted that the pemetrexed combination was less toxic to patients than the paclitaxel combination, and could therefore be a better therapeutic option.

Adding a third drug, called bevacizumab, to the cisplatin-plus-paclitaxel cocktail further increased patient survival and is now the standard of care for patients with metastatic or recurrent carcinoma of the cervix. So the researchers suggested that combining bevacizumab with cisplatin and pemetrexed may offer further survival benefits as well.

"Given that pemetrexed combined with cisplatin may be less toxic than and as active as cisplatin plus paclitaxel and that it can be combined with bevacizumab, investigating the comparison of cisplatin-pemetrexed plus bevacizumab with cisplatin-paclitaxel plus bevacizumab would be the next appropriate step," said Dr. Miller, who holds the Amy and Vernon E. Faulconer Distinguished Chair in Medical Science and the Dallas Foundation Chair in Gynecologic Oncology.

The findings, published online in the Journal of Clinical Oncology, are important because patients with metastatic or recurring tumors face a poor prognosis, and no curative therapy currently exists.

More than 12,000 women in the United States were diagnosed with cervical cancer in 2011, the most recent figures available from the Centers for Disease Control, with nearly 4,100 related deaths. However, a 2014 study in JAMA suggests the rates may be far higher – about 18.6 cases per 100,000 women rather than 12 per 100,000 previously thought. That study also suggested the risk for cervical cancer grew as women age, and was more prevalent among African-American women.

Cervical cancer used to be the leading cause of cancer death for women in the U.S., according to the CDC, but cases and deaths have declined over the years as more women have received regular Pap tests. Pap tests can identify cervical precancer before it turns into cancer. Another factor is use of the human papillomavirus (HPV) vaccine, because HPV is a root cause of most cervical cancers.

Dr. Miller serves as a principal investigator for the Gynecologic Oncology Group, which evaluates cancer treatment protocols. UT Southwestern is the only North Texas member of the multi-center Group, which receives support from the National Cancer Institute (NCI) of the National Institutes for Health (NIH). Other Gynecologic Oncology Group member institutions who participated in the study include the University of Mississippi, University of California Medical Center at Irvine, MD Anderson Cancer Center, and the University of Oklahoma.

http://www.eurekalert.org/pub_releases/2014-09/e-sas091614.php

Smoking and schizophrenia linked by alterations in brain nicotine signals

New study in Biological Psychiatry

Philadelphia, PA, - Schizophrenia is associated with increased rates and intensity of tobacco smoking. A growing body of research suggests that the relationship between schizophrenia and smoking stems, in part, from an effort by patients to use nicotine to self-medicate symptoms and cognitive impairment associated with the disease.

A new study, published in the current issue of Biological Psychiatry, sheds light on this hypothesis. The authors found that the level of nicotine receptors in the brain was lower in schizophrenia patients than in a matched healthy group. Further, smoking, which is known to increase the levels of receptors for nicotine in the brain, had this effect in both groups, although was blunted in schizophrenia. However, in the schizophrenia group, the smoking-related increase in the level of nicotine receptors was associated with lower levels of social withdrawal, blunted emotional and motivational responses, as well as better cognitive function.

Nicotine mimics the actions of a natural chemical messenger, acetylcholine, which stimulates the receptors for nicotine in the brain. So, to conduct this work, Yale University School of Medicine researchers used single photon emission computed tomography to quantify the availability of nicotinic acetylcholine receptors (β2*-nAChRs) in smoking and nonsmoking individuals with schizophrenia and healthy subjects.

First author and Assistant Professor Dr. Irina Esterlis details their findings, "We found a blunted effect of tobacco smoking on the β2*-nAChR system in individuals with schizophrenia. Furthermore, we found that lower receptor availability of β2*-nAChRs in smokers with schizophrenia is associated with worse negative symptoms and worse performance on tests of executive function."

These findings may be relevant to the high rates of smoking in schizophrenia. "The data seem to suggest that smoking might produce some clinical benefits for some patients by increasing the availability of receptor targets for nicotine in the brain," commented Dr. John Krystal, Editor of Biological Psychiatry. "This finding adds to evidence that brain nicotine-related signaling might play a role for new medications developed to treat schizophrenia."

Esterlis agreed and added, "These findings suggest that β2*-nAChRs may be a target for developing treatments for negative symptoms and cognitive deficits associated with schizophrenia, for which no effective treatments exist."

The article is "In Vivo Evidence for β2 Nicotinic Acetylcholine Receptor Subunit Upregulation in Smokers as Compared With Nonsmokers With Schizophrenia" by Irina

Esterlis, Mohini Ranganathan, Frederic Bois, Brian Pittman, Marina R. Picciotto, Lara Shearer, Alan Anticevic, Jon Carlson, Mark J. Niciu, Kelly P. Cosgrove, and D. Cyril D'Souza (doi: 10.1016/j.biopsych.2013.11.001). The article appears in Biological Psychiatry, Volume 76, Issue 6 (September 15, 2014), published by Elsevier.

http://www.eurekalert.org/pub_releases/2014-09/hu-feb091614.php

For electronics beyond silicon, a new contender emerges

New transistor achieves 'colossal' switchable resistance using quantum materials and physics developed in a fuel cell lab

Cambridge, Mass. - Silicon has few serious competitors as the material of choice in the electronics industry. Yet transistors, the switchable valves that control the flow of electrons in a circuit, cannot simply keep shrinking to meet the needs of powerful, compact devices; physical limitations like energy consumption and heat dissipation are too significant.

Now, using a quantum material called a correlated oxide, Harvard researchers have achieved a reversible change in electrical resistance of eight orders of magnitude, a result the researchers are calling "colossal." In short, they have engineered this material to perform comparably with the best silicon switches.

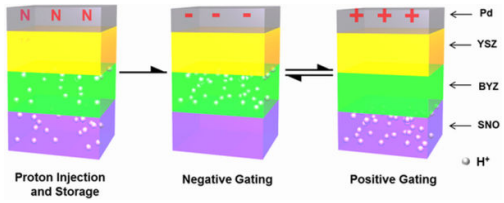
The finding arose in what may seem an unlikely spot: a laboratory usually devoted to studying fuel cells - the kind that run on methane or hydrogen - led by Shriram Ramanathan, Associate Professor of Materials Science at the Harvard School of Engineering and Applied Sciences (SEAS). The researchers' familiarity with thin films and ionic transport enabled them to exploit chemistry, rather than temperature, to achieve the dramatic result.

Because the correlated oxides can function equally well at room temperature or a few hundred degrees above it, it would be easy to integrate them into existing electronic devices and fabrication methods. The discovery, published in Nature Communications, therefore firmly establishes correlated oxides as promising semiconductors for future three-dimensional integrated circuits as well as for adaptive, tunable photonic devices.

Challenging silicon

Although electronics manufacturers continue to pack greater speed and functionality into smaller packages, the performance of silicon-based components will soon hit a wall. "Traditional silicon transistors have fundamental scaling limitations," says Ramanathan. "If you shrink them beyond a certain minimum feature size, they don't quite behave as they should."

Yet silicon transistors are hard to beat, with an on/off ratio of at least 10^4 required for practical use. "It's a pretty high bar to cross," Ramanathan explains, adding that until now, experiments using correlated oxides have produced changes of only about a factor of 10, or 100 at most, near room temperature. But Ramanathan and his team have crafted a new transistor, made primarily of an oxide called samarium nickelate, that in practical operation achieves an on/off ratio of greater than 10^5 - that is, comparable to state-of-the-art silicon transistors.



During fabrication, the annealing process injects hydrogen ions into thin films of samarium nickelate (SNO) and yttrium-doped barium zirconate (BYZ). During operation, an electric field moves the charges from one layer to the other, and the influx or loss of electrons modulates the band gap in the SNO, resulting in a very dramatic change in conductivity. **Jian Shi**

In future work the researchers will investigate the device's switching dynamics and power dissipation; meanwhile, this advance represents an important proof of concept. "Our orbital transistor could really push the frontiers of this field and say, you know what? This is a material that can challenge silicon," Ramanathan says.

Solid-state chemical doping

Materials scientists have been studying the family of correlated oxides for years, but the field is still in its infancy, with most research aimed at establishing the materials' basic physical properties. "We have just discovered how to dope these materials, which is a foundational step in the use of any semiconductor," says Ramanathan.

Doping is the process of introducing different atoms into the crystal structure of a material, and it affects how easily electrons can move through it - that is, to what extent it resists or conducts electricity. Doping typically effects this change by increasing the number of available electrons, but this study was different. The Harvard team manipulated the band gap, the energy barrier to electron flow.

"By a certain choice of dopants - in this case, hydrogen or lithium - we can widen or narrow the band gap in this material, deterministically moving electrons in and out of their orbitals," Ramanathan says. That's a fundamentally different approach than is used in other semiconductors. The traditional method changes the energy level to meet the target; the new method moves the target itself.

In this orbital transistor, protons and electrons move in or out of the samarium nickelate when an electric field is applied, regardless of temperature, so the device can be operated in the same conditions as conventional electronics. It is solid-state, meaning it involves no liquids, gases, or moving mechanical parts. And, in the absence of power, the material remembers its present state - an important feature for energy efficiency.

"That's the beauty of this work," says Ramanathan. "It's an exotic effect, but in principle it's highly compatible with traditional electronic devices."

Quantum materials

Unlike silicon, samarium nickelate and other correlated oxides are quantum materials, meaning that quantum-mechanical interactions have a dominant influence over the material properties - and not just at small scales.

"If you have two electrons in adjacent orbitals, and the orbitals are not completely filled, in a traditional material the electrons can move from one orbital to another. But in the correlated oxides, the electrons repulse each other so much that they cannot move," Ramanathan explains. "The occupancy of the orbitals and the ability of electrons to move in the crystal are very closely tied together - or 'correlated.' Fundamentally, that's what dictates whether the material behaves as an insulator or a metal."

Ramanathan and others at SEAS have successfully manipulated the metal-insulator transition in vanadium oxide, too. In 2012, they demonstrated a tunable device that can absorb 99.75% of infrared light, appearing black to infrared cameras. Similarly, samarium nickelate is likely to catch the attention of applied physicists developing photonic and optoelectronic devices.

"Opening and closing the band gap means you can now manipulate the ways in which electromagnetic radiation interacts with your material," says Jian Shi, lead author of the paper in Nature Communications. He completed the research as a postdoctoral fellow in Ramanathan's lab at Harvard SEAS and joined the faculty of Rensselaer Polytechnic Institute this fall. "Just by applying an electric field, you're dynamically controlling how light interacts with this material."

Further ahead, Researchers at the Center for Integrated Quantum Materials, established at Harvard in 2013 through a grant from the National Science Foundation, aim to develop an entirely new class of quantum electronic devices and systems that will transform signal processing and computation.

Ramanathan compares the current state of quantum materials research to the 1950s, when transistors were newly invented and physicists were still making sense of them. "We are basically in that era for these new quantum materials," he says. "This is an exciting time to think about establishing the basic, fundamental properties. In the coming decade or so, this could really mature into a very exciting device platform."

You Zhou, a graduate student at Harvard SEAS, was co-lead author of the paper in Nature Communications. The research was supported by grants from the National Science Foundation (NSF) (CCF-0926148) and the National Academy of Sciences, as well as an NSF Faculty Early Career Development (CAREER) Award to Prof. Ramanathan (DMR-0952794).

http://www.eurekalert.org/pub_releases/2014-09/uow-eo091614.php

Ebola outbreak 'out of all proportion' and severity cannot be predicated

A mathematical model that replicates Ebola outbreaks can no longer be used to ascertain the eventual scale of the current epidemic, finds research conducted by the University of Warwick.

Dr Thomas House, of the University's Warwick Mathematics Institute, developed a model that incorporated data from past outbreaks that successfully replicated their eventual scale.

The research, titled Epidemiological Dynamics of Ebola Outbreaks and published by eLife, shows that when applying the available data from the ongoing 2014 outbreak to the model that it is, according to Dr House, "out of all proportion and on an unprecedented scale when compared to previous outbreaks".

Dr House commented: "If we analyse the data from past outbreaks we are able to design a model that works for the recorded cases of the virus spreading and can successfully replicate their eventual size. The current outbreak does not fit this previous pattern and, as a result, we are not in a position to provide an accurate prediction of the current outbreak".

Chance events, Dr House argues, are an essential factor in the spread of Ebola and many other contagious diseases. "If we look at past Ebola outbreaks there is an identifiable way of predicting their overall size based on modelling chance events that are known to be important when the numbers of cases of infection are small and the spread is close to being controlled".

Chance events can include a person's location when they are most infectious, whether they are alone when ill, the travel patterns of those with whom they come into contact or whether they are close to adequate medical assistance.

The Warwick model successfully replicated the eventual scale of past outbreaks by analysing two key chance events: the initial number of people and the level of infectiousness once an epidemic is underway.

"With the current situation we are seeing something that defies this previous pattern of outbreak severity. As the current outbreak becomes more severe, it is less and less likely that it is a chance event and more likely that something more fundamental has changed", says Dr House.

Discussing possible causes for the unprecedented nature of the current outbreak, Dr House argues that there could be a range of factors that lead it to be on a different scale to previous cases;

"This could be as a result of a number of different factors: mutation of virus, changes in social contact patterns or some combination of these with other factors.

It is implausible to explain the current situation solely through a particularly severe outbreak within the previously observed pattern".

In light of the research findings and the United Nations calling for a further $1bn USD to tackle the current outbreak, Dr House says that "Since we are not in a position to quantify the eventful scale of this unprecedented outbreak, the conclusion from this study is not to be complacent but to mobilise resources to combat the disease."

The paper can be viewed here:

http://elifesciences.org/content/elife/early/2014/09/12/eLife.03908.full.pdf

http://www.eurekalert.org/pub_releases/2014-09/uoc - hfa091214.php

Human faces are so variable because we evolved to look unique

Socially, humans need to recognize others and to be recognized

The amazing variety of human faces - far greater than that of most other animals - is the result of evolutionary pressure to make each of us unique and easily recognizable, according to a new study by University of California, Berkeley, scientists.

Our highly visual social interactions are almost certainly the driver of this evolutionary trend, said behavioral ecologist Michael J. Sheehan, a postdoctoral fellow in UC Berkeley's Museum of Vertebrate Zoology. Many animals use smell or vocalization to identify individuals, making distinctive facial features unimportant, especially for animals that roam after dark, he said. But humans are different.

"Humans are phenomenally good at recognizing faces; there is a part of the brain specialized for that," Sheehan said. "Our study now shows that humans have been selected to be unique and easily recognizable. It is clearly beneficial for me to recognize others, but also beneficial for me to be recognizable. Otherwise, we would all look more similar."

"The idea that social interaction may have facilitated or led to selection for us to be individually recognizable implies that human social structure has driven the evolution of how we look," said coauthor Michael Nachman, a population geneticist, professor of integrative biology and director of the UC Berkeley Museum of Vertebrate Zoology.

The study will appear Sept. 16 in the online journal Nature Communications.

In the study, Sheehan said, "we asked, 'Are traits such as distance between the eyes or width of the nose variable just by chance, or has there been evolutionary selection to be more variable than they would be otherwise; more distinctive and more unique?'"

As predicted, the researchers found that facial traits are much more variable than other bodily traits, such as the length of the hand, and that facial traits are independent of other facial traits, unlike most body measures. People with longer arms, for example, typically have longer legs, while people with wider noses or widely spaced eyes don't have longer noses. Both findings suggest that facial variation has been enhanced through evolution.

Finally, they compared the genomes of people from around the world and found more genetic variation in the genomic regions that control facial characteristics than in other areas of the genome, a sign that variation is evolutionarily advantageous.

"All three predictions were met: facial traits are more variable and less correlated than other traits, and the genes that underlie them show higher levels of variation," Nachman said. "Lots of regions of the genome contribute to facial features, so you would expect the genetic variation to be subtle, and it is. But it is consistent and statistically significant."

Using Army data

Sheehan was able to assess human facial variability thanks to a U.S. Army database of body measurements compiled from male and female personnel in 1988. The Army Anthropometric Survey (ANSUR) data are used to design and size everything from uniforms and protective clothing to vehicles and workstations.

A statistical comparison of facial traits of European Americans and African Americans – forehead-chin distance, ear height, nose width and distance between pupils, for example – with other body traits – forearm length, height at waist, etc. – showed that facial traits are, on average, more varied than the others. The most variable traits are situated within the triangle of the eyes, mouth and nose.

Sheehan and Nachman also had access to data collected by the 1000 Genome project, which has sequenced more than 1,000 human genomes since 2008 and catalogued nearly 40 million genetic variations among humans worldwide.

Looking at regions of the human genome that have been identified as determining the shape of the face, they found a much higher number of variants than for traits, such as height, not involving the face.

Prehistoric origins

"Genetic variation tends to be weeded out by natural selection in the case of traits that are essential to survival," Nachman said. "Here it is the opposite; selection is maintaining variation. All of this is consistent with the idea that there has been selection for variation to facilitate recognition of individuals."

They also compared the human genomes with recently sequenced genomes of Neanderthals and Denisovans and found similar genetic variation, which indicates that the facial variation in modern humans must have originated prior to the split between these different lineages.

"Clearly, we recognize people by many traits – for example their height or their gait – but our findings argue that the face is the predominant way we recognize people," Sheehan said.

Sheehan's work was supported by a National Institutes of Health postdoctoral fellowship.

http://www.eurekalert.org/pub_releases/2014-09/d-dcm091514.php

Diabetes complications make patients more likely to fall down stairs

People suffering from diabetic peripheral are likely to sway more during stair climbing, and thus are more likely to fall

New research presented at this year's annual meeting of the European Association for the Study of Diabetes (EASD) in Vienna, Austria, shows that people suffering from diabetic peripheral neuropathy (DPN) - a complication of diabetes that affects the nerves in the limbs - are likely to sway more during stair climbing, and thus are more likely to fall. Steven Brown, Manchester Metropolitan University, UK, is the lead author on this research, which has been conducted by researchers at Manchester Metropolitan University and the University of Manchester, UK.

Patients with DPN are known to display unsteadiness during walking and as a result be at increased risk for falling. Whilst some studies have found increased postural sway during quiet standing and walking on level ground in patients with DPN, no data exist on objective measures of balance during stair walking. Since walking on stairs is one of the most dangerous daily activities in terms of fall risk, this study investigated the underlying mechanisms of unsteadiness in patients with DPN during stair ascent and descent.

Motion and force data were collected for 22 diabetes patients with DPN with a mean age of 57 years, and 40 diabetes patients without DPN (also mean age 57 years), plus 32 healthy non-diabetic controls (mean age 50 years). All patients were from Manchester or the surrounding area. Movement data was collected using a 10-camera 3D motion analysis system from reflective markers placed at anatomical locations on the body to calculate whole-body centre-of-mass (CoM). The centre-of-pressure (CoP) under the feet was measured using 4 force platforms mounted into the middle 4 steps of a 7-step staircase, which participants ascended and descended at least 3 times. Balance was quantified by assessing the separation between the centre-of-mass and centre-of-pressure (CoM-CoP separation) in the medial-lateral plane (i.e. side-to-side).

The researchers found that during stair ascent the DPN group showed significantly higher maximum CoM-CoP separation of 13cm, compared to 10cm for both the diabetes patients without DPN and the control group; and also significantly increased variation in CoM-CoP separation: 7cm for the DPN group, 5cm for the diabetes only group, and 6cm for the control group.

During stair descent differences were also evident: the DPN group again showed significantly higher maximum CoM-CoP separation, a mean of 15cm versus 13cm for diabetes patients without DPN and 12cm for controls. The DPN group also saw significantly increased variation in CoM-CoP separation of mean 8cm versus 7cm for both the diabetes patients without DPN and control group. The DPN group also displayed a significantly wider stance width compared to the other groups during stair descent only: mean for DPN 17cm versus 15cm for both diabetes patients without DPN and control groups.

No differences in any variable were observed in the diabetes patients without DPN compared to the control group during stair ascent or descent.

The authors conclude: "Diabetes patients with peripheral neuropathy display greater extremes in magnitude of medial-lateral sway during stair ascent and descent as well as displaying higher variability during stair ascent and descent. This indicates that patients with DPN have difficulty regulating control of balance during this challenging task. A larger and more variable medial- lateral sway means that patients with DPN are more likely to lose control of balance and experience a fall during what is known to be an activity - using stairs - where the risk of falls is already very high."

The authors acknowledge that, while it would be impractical to suggest patients with DPN avoid stairs completely, they are at higher risk of a fall and should take measures to keep themselves safe. "Avoiding particularly steep and/or long flights of stairs may be advisable, especially if an elevator is available as an alternative," say the authors. "Using a handrail on stairs if available could also help patients with DPN prevent falls." They add that "Since our research has identified details regarding how patients with DPN sway, and therefore how they are most at risk, this may allow future research to target balance interventions to improve the medial-lateral balance in this population."

The research team is doing further investigations various aspects of gait and how diabetes and DPN affects how these patients walk on level ground and on stairs, to identify and further understand factors that may contribute to unsteadiness and in turn the increased risk of falls. They add: "Many issues that affect balance in patients with DPN stem from deterioration of muscle size and function, so whilst it is not currently possible to positively improve the sensory deterioration, we have been looking at elements that we can positively influence, such as strength training and interventions to help vision focus and avoidance of obstacles. We are investigating the impact of such interventions and how they might translate to improvements in gait and balance control."

http://bit.ly/1wpahor

Mindlessly Vegging Out Is Good for You, But Only If You Don't Guilt Yourself for It

Relaxing only works if you let yourself do it

By Colin Schultz

You've spent all week at work, putting in long hours to meet a big deadline. You roll in to your home totally brain dead - you've no energy left to muster. You still have some work to do, some emails to send, and your house is a disaster. You really should get some stuff done, but without thinking you're on the couch. Five hours later you've accidentally watched the first half of Firefly, and you're still just as stressed as before - but now you're kicking yourself for wasting so much time. Now, consider a slightly different version of this same story.

You're overworked and tired, but you decide you're going to give yourself a breather. You have some work to do, but you can handle it tomorrow. Right now, you need some "me time." You kick back, relax and watch a few episodes of your favorite show, cheering on as the Browncoats subvert the Alliance at every turn. You go to bed rejuvenated, ready for another day.

The actions are identical, but the outcome is totally different. Actually relaxing, says the British Psychological Society, is all a matter of perspective.

In a new study, researchers found that whether people feel better after a break all comes down to whether they feel guilty about their downtime or not. The unfortunate twist, according to the new research, is that the more wiped out you are the more likely you will be to see your break as a waste of time.

"The key finding," says the BPS's Research Digest, "is that the more depleted people felt after work (agreeing with statements like "I felt like my willpower was gone"), the more they tended to view their TV or gaming as procrastination, the more guilt they felt, and the less likely they were to say they felt restored afterwards."

So the next time you're totally overloaded and find yourself mindlessly watching TV or clicking away at a video game, just remember: you're already doing it, so you may as well enjoy it.

http://www.eurekalert.org/pub_releases/2014-09/tl-tls091514.php

The Lancet: Scientists use modern forensic techniques to identify most likely cause of King Richard III's death

Account of King Richard III's battle injuries

New research led by the University of Leicester in the UK gives a blow-by-blow account of the injuries inflicted on King Richard III's body at the Battle of Bosworth Field on Aug 22, 1485. Modern forensic analysis of the King's skeletal remains reveals that three of his injuries had the potential to cause death quickly - two to the skull (page 4, figure 4) and one to the pelvis (page 5, figure 6).

The remains of King Richard III - the last English monarch to die in battle - were found under a car park in Leicester by archaeologists from the University of Leicester, and subsequently identified by a multidisciplinary team from the University.

The forensic imaging team, working with the Forensic Pathology Unit and the Department of Engineering at the University of Leicester, used whole body CT scans and micro-CT imaging of injured bones to analyse trauma to the 500-year-old skeleton carefully, and to determine which of the King's wounds might have proved fatal. They also analysed tool marks on bone to identify the medieval weapons potentially responsible for his injuries.

The results, published in The Lancet, show that Richard's skeleton sustained 11 wounds at or near the time of his death - nine of them to the skull, clearly inflicted in battle and suggesting he had removed or lost his helmet, and two to the postcranial skeleton.

Sarah Hainsworth, study author and Professor of Materials Engineering at the University of Leicester explains, "Richard's injuries represent a sustained attack or an attack by several assailants with weapons from the later medieval period. The wounds to the skull suggest that he was not wearing a helmet, and the absence of defensive wounds on his arms and hands indicate that he was otherwise still armoured at the time of his death."*

The investigators, led by Dr Jo Appleby of the University of Leicester School of Archaeology and Ancient History, surmise that the postcranial injuries, including the potentially fatal one to the pelvis, might have been inflicted after Richard's death, on the basis that had he been alive he would have been wearing a specific type of armour worn in the late 15th century that would have prevented such wounds (page 6, figure 7).

According to Professor Guy Rutty, study co-author, from the East Midlands Pathology Unit at the University of Leicester, "The most likely injuries to have caused the King's death are the two to the inferior aspect of the skull - a large sharp force trauma possibly from a sword or staff weapon, such as a halberd or bill, and a penetrating injury from the tip of an edged weapon. Richard's head injuries are consistent with some near-contemporary accounts of the battle, which suggest that Richard abandoned his horse after it became stuck in a mire and was killed while fighting his enemies."*

Commenting on the research, Dr Heather Bonney from the Natural History Museum in London, UK, says, "Appleby and colleagues provide a compelling account, giving tantalising glimpses into the validity of the historic accounts of his

death, which were heavily edited by the Tudors in the following 200 years. Wherever his remains are again laid to rest, I am sure that Richard III will continue to divide opinion fiercely for centuries to come."

The Dig for Richard III was led and funded by the University of Leicester, working with Leicester City Council and in association with the Richard III Society. The originator of the Search project was Philippa Langley of the Richard III Society.

http://www.eurekalert.org/pub_releases/2014-09/wuso-hhm091614.php

Healthy humans make nice homes for viruses

Viruses that make us sick can live in and on the human body without provoking symptoms

The same viruses that make us sick can take up residence in and on the human body without provoking a sneeze, cough or other troublesome symptom, according to new research at Washington University School of Medicine in St. Louis.

On average, healthy individuals carry about five types of viruses on their bodies, the researchers report online in BioMed Central Biology. The study is the first comprehensive analysis to describe the diversity of viruses in healthy people.

The research was conducted as part of the Human Microbiome Project, a major initiative funded by the National Institutes of Health (NIH) that largely has focused on cataloging the body's bacterial ecosystems.

"Most everyone is familiar with the idea that a normal bacterial flora exists in the body," said study co-author Gregory Storch, MD, a virologist and chief of the Division of Pediatric Infectious Diseases. "Lots of people have asked whether there is a viral counterpart, and we haven't had a clear answer. But now we know there is a normal viral flora, and it's rich and complex."

In 102 healthy young adults ages 18 to 40, the researchers sampled up to five body habitats: nose, skin, mouth, stool and vagina. The study's subjects were nearly evenly split by gender. At least one virus was detected in 92 percent of the people sampled, and some individuals harbored 10 to 15 viruses.

"We were impressed by the number of viruses we found," said lead author Kristine M. Wylie, PhD, an instructor of pediatrics. "We only sampled up to five body sites in each person and would expect to see many more viruses if we had sampled the entire body."

Scientists led by George Weinstock, PhD, at Washington University's Genome Institute, sequenced the DNA of the viruses recovered from the body, finding that each individual had a distinct viral fingerprint. (Weinstock is now at The Jackson Laboratory in Connecticut.) About half of people were sampled at two or three points in time, and the researchers noted that some of the viruses established stable, low-level infections.

The researchers don't know yet whether the viruses have a positive or negative effect on overall health but speculate that in some cases, they may keep the immune system primed to respond to dangerous pathogens while in others, lingering viruses increase the risk of disease.

Study volunteers were screened carefully to confirm they were healthy and did not have symptoms of acute infection. They also could not have been diagnosed in the past two years with human papillomavirus infection (HPV), which can cause cervical and throat cancer, or have an active genital herpes infection.

Analyzing the samples, the scientists found seven families of viruses, including strains of herpes viruses that are not sexually transmitted. For example, herpesvirus 6 or herpesvirus 7 was found in 98 percent of individuals sampled from the mouth. Certain strains of papillomaviruses were found in about 75 percent of skin samples and 50 percent of samples from the nose. Novel strains of the virus were found in both sites.

Not surprisingly, the vagina was dominated by papillomaviruses, with 38 percent of female subjects carrying such strains. Some of the women harbored certain high-risk strains that increase the risk of cervical cancer. These strains were more common in women with communities of vaginal bacteria that had lower levels of Lactobacillus and an increase in bacteria such as Gardnerella, which is associated with bacterial vaginosis. http://www.medscape.com/viewarticle/831773

Adenoviruses, the viruses that cause the common cold and pneumonia, also were common at many sites in the body.

It's possible that some of the viruses the researchers uncovered were latent infections acquired years ago. But many viruses were found in body secretions where the presence of a virus is an indicator of an active infection. Dormant or latent viruses hide in cells, not in body fluids such as saliva or nasal secretions, Wylie explained.

A further direction for researchers is to distinguish between active viral infections that aren't causing symptoms and those that are making a person sick.

"It's very important to know what viruses are present in a person without causing a problem and what viruses could be responsible for serious illnesses that need medical attention," said Storch, the Ruth L. Siteman Professor of Pediatrics. "While more research remains, we now have a much clearer picture of the communities of viruses that naturally exist in healthy people."

Wylie KM, Mihindukulasuriya KA, Zhou Y, Sodergren E, Storch GA, Weinstock GM. Metagenomic analysis of double-stranded DNA viruses in healthy adults. BioMed Central Biology, online Sept. 10, 2014.

The research was supported by the National Human Genome Research Institute at the National Institutes of Health (NIH). Grant number: U54HG004968.

http://www.medscape.com/viewarticle/831773

Saving Dr Brantly: A Race Against Time

The Race to Save Dr. Brantly: The Inside Story

Brenda Goodman, MA

On the Brink of Death

Editor's Note: *This compelling story was originally published on WebMD with the title "The Race to Save Dr. Brantly: The Inside Story." We are publishing it here so that our medical professional readers will learn what happened behind the scenes when the first Americans contracted Ebola.*

Peering into the small house in Liberia where Kent Brantly, MD, was bedridden and quarantined with Ebola, there was no doubt in Dr Lance Plyler's mind that his friend and colleague was going to die. Brantly, a 33-year-old physician just months out of his residency, had come to Liberia in October to serve on a two-year medical mission. He had two young children.

"When I looked in the window, it just hit me like a ton of bricks," says Plyler, an internal medicine specialist. He is the director of disaster response for Samaritan's Purse, the missionary organization both men were working for in Africa.

Brantly was burning with a nearly 105° fever, his breathing was fast and shallow, and his blood oxygenation was very low, says Plyler, who is also trained in palliative care.

"I've been doing internal medicine for 25 years, so I'm not an alarmist. But I was certain he had a couple of hours to live, at best." Plyler knew he had something that might save the young doctor's life, or hasten his demise. It was up to him to make the decision. And he prayed.

Just one week earlier, Plyler, who was Brantly's boss, had received the bad news. A scientist at the National Institutes of Health (NIH) reference lab that was testing Brantly's blood samples for Ebola texted Plyler a coded message.

"We had a pseudonym for Kent so it wouldn't raise alarm - his name was Tamba Snell (Tamba is a common Liberian name). The text read, 'I am very sad to inform you that Tamba Snell is positive.' I'll never forget it as long as I live, because it was my worst moment in Liberia," Plyler says.

A Race Against Time

With the diagnosis confirmed, Plyler started a frantic search for something to help his friend and another American, Nancy Writebol, who had also caught the virus. He got on his phone and computer, making urgent inquiries for hour after hour, trying to find a way to save their lives. He contacted experts at the Centers for Disease Control and Prevention (CDC), NIH, and the Public Health Agency of Canada. Through those experts, he learned about two promising experimental treatments: ZMapp and TKM-Ebola.

ZMapp, a cocktail of Ebola-fighting antibodies, intrigued Plyler more. He reached out to Larry Zeitlin, PhD, president of Mapp Biopharmaceuticals, one of the companies developing the treatment, to find out more about it.

Zeitlin warned him that the drug had never been tested in humans. But he did share promising research, which has since been published in the journal *Nature,* [1] showing that the serum had saved all 18 macaque monkeys after they were experimentally infected with the deadly virus.

That gave Plyler hope that it might not be too late to try on his friends.

As luck would have it, there was one course of ZMapp treatment in Sierra Leone. Plyler isn't sure why it was there. He had heard that researchers were planning to test how stable the drug might be in the hot, humid climate of Africa, where it would most likely be used in clinics with only rudimentary facilities.

After he located the ZMapp, the next goal was getting it to Liberia. After another flurry of phone calls, he got the drug across the Guinean border. From there, it was transported to Foya, a border town in Liberia, where Samaritan's Purse picked it up and flew it into the capital, Monrovia, the location of ELWA (Eternal Love Winning Africa) Hospital, where Brantly was medical director of the Samaritan's Purse Ebola Consolidated Case Management Center.

The drug arrived in a Styrofoam cooler. It held a single course of treatment consisting of three doses of the drug, and each dose was frozen. All three doses were meant to be given to a single patient. Plyler had been given strict instructions not to split the doses, because the first dose just knocks down the virus. Without the final two doses, the infection can flare again.

"If you think of it like a boxing match, the initial dose just gives it the first big blow, but the viral load will rise again, so you have to give it again and then give it a third time," he says.

"I was absolutely petrified when it arrived, because I had to make a decision if I was going to administer or not," Plyler says.

"Unbelievable" Pressure

After consulting with Brantly, who was in stable condition at the time, they decided to give the treatment to Writebol, who was in worse shape.

To start thawing the ZMapp, they placed a single 250-mL vial under her arm as she lay in bed. They hoped her body heat would safely speed the thawing process. Too much heat - from a hot-water bath, for example - could kill the precious antibodies.

That night, though, Brantly's condition worsened. When Plyler looked in on his friend on Wednesday, July 30, he says he immediately grasped the urgency of the situation.

"I can't describe to you the pressure. It was unbelievable," he says. He called Brantly's wife, Amber, who is a nurse, and told her that things looked dire.

"I told her, 'Amber, he's in very bad condition. I'm very, very concerned.' I never said he was dying because I was trying to be tactful, but she knew. And Kent knew he was dying. We never talked about it, but he's a great doctor. He knew."

Then, Plyler says, he prayed. "I said, 'God, he cannot die.'" He called others, including Franklin Graham, the president and CEO of Samaritan's Purse, and asked them to pray.

He says he felt a calm sense of certainty and knew what he had to do. He had to split the doses. He quickly grabbed another frozen vial of ZMapp. "I was trying like crazy to defrost it. I was putting it under my leg, sitting on it, and time was of the essence," he says.

Then he remembered the vial they had placed under Writebol's arm the day before. It takes some time to properly put on the personal protective equipment required to safely approach a person who is infected with Ebola, and Plyler wasn't wearing any. So he quickly grabbed someone who was wearing the gear and sent that person into Writebol's house to retrieve the vial, which thankfully had thawed.

The vial was placed in a plastic bag and sprayed with a chlorine solution. Then it was rushed back to Brantly's house, where it was hung in an intravenous solution.

"I told Kent, 'I'm going to give you the antibodies.' And he just said, 'OK.'"

Then Plyler waited outside the window, watching as the antibodies dripped into Brantly's arm. He stayed there through the night, watching for any change.

Prayers and Antibodies

About half an hour after the treatment started, Brantly began to shake uncontrollably. "I'm certain that was the antibodies saturating and overwhelming the virus," Plyler says.

After a while, the rigors subsided. Brantly's temperature came down. His breathing became more regular. A rash that had spread across his torso became less intense. Within hours, Brantly got up and walked to the bathroom, which he had not done in a day and a half.

Plyler got out his cell phone and texted Lisa Hensley, PhD, a microbiologist and Ebola specialist at NIH who had helped him find the ZMapp.

"I said, 'Lisa, Kent is distinctly better. Is that possible from the antibodies?'" Plyler recalls. "And she said, 'Yes, it's possible; the macaques would get better within hours.'"

The next day, after more ZMapp had thawed, he gave Writebol her first dose. She would get two doses of ZMapp in Africa. She, too, responded well to the drug.

After being evacuated from Liberia, both patients would finish their final doses of ZMapp at Emory Hospital in Atlanta and recover. Emory had requested additional vials from Kentucky BioProcessing, the small biotech company that is growing the antibodies in tobacco plants.

Plyler understands that scientists might be skeptical about Brantly's rapid recovery. And he doesn't discount the hard work of the 10 doctors and nurses who gave Writebol and Brantly round-the-clock supportive care while they were in Liberia. He knows that proper hydration and nutrition play a big part in whether Ebola-infected patients live or die.

"I'm a doctor. I know that was just one anecdotal experience," he says. "We need to do a large number of studies to see if this can be reproduced in a large number of people. But that was the most powerful anecdotal experience I've ever had in my life."

Asked what he thinks saved his friend, Plyler has a ready answer.

"I call it prayers and antibodies, in that order, that saved his life," he says. "That's how it went down."

http://bit.ly/1qX9muO

Simple urine test detects cervical cancer virus

Dread going for a smear test? A simple urine test can pick up the human papilloma virus (HPV) that causes cervical cancer.

23:30 16 September 2014 by Linda Geddes

Though it's not as accurate as sampling viral DNA from the cervix itself, the test might benefit women who are too busy or scared to have a cervical swab taken, or who live in developing countries where the infrastructure for conventional smear tests is less developed.

Traditional cytology-based smear tests involve using a speculum to hold the vagina open, while a small brush is used to collect cells from the cervix, which are then assessed for pre-cancerous changes using a microscope. "The advantage is that if you have an abnormal result, there is a reasonable chance that you have an underlying abnormality," says Henry Kitchener at the Institute of Cancer Sciences in Manchester, UK, who was not involved in the current study.

More recently, DNA tests have been developed that test for HPV directly – again by taking a sample from the cervix. This is more sensitive than a conventional smear test meaning that those who test negative are very unlikely to develop cervical cancer in the near future. But those who test positive don't necessarily have cancer – their cervix may be perfectly healthy – so a positive DNA test needs to be followed up with a physical examination.

Cancer screening

DNA testing for HPV is being piloted in the UK, and was recently incorporated into US guidelines for cervical cancer screening .

Neha Pathak at Barts and The London School of Medicine and her colleagues combined the results of 14 clinical trials of urine testing and compared the results against the new cervical DNA test. Urine tests could correctly identify 87 per cent of HPV positive samples, and 94 per cent of negative samples. "It suggests urine testing is definitely something worth investigating further," says Pathak. Unfortunately, data doesn't exist that would allow urine testing to be compared with more traditional smear tests – something Pathak says should be investigated in any future trials.

HPV tests for all

However, cervical HPV DNA testing is already known to be more sensitive than microscope-based methods. "It may be that the urinary HPV test is as good as a cytology sample," says Kitchener.

Even so, urine-based HPV testing is unlikely to replace cervical HPV testing completely. "The actual test in itself isn't a better test," Kitchener adds. "But it is another way of obtaining results from the lower genital tract, and it may well be the way forward for women who don't otherwise engage with screening."

It could also be useful in developing countries where rates of cervical cancer are often far higher, and the infrastructure for screening and preventative treatment is lacking. "We're not saying that this is a direct replacement for cervical testing, but it is something that could be rolled out a little more easily," Pathak says.

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http://www.eurekalert.org/pub_releases/2014-09/bc-ssh091514.php

Sharks' skin has teeth in the fight against hospital superbugs

Transmission of MRSA could be curbed by coating hospital surfaces with microscopic bumps

Transmission of bacterial infections, including MRSA and MSSA could be curbed by coating hospital surfaces with microscopic bumps that mimic the scaly surface of shark skin, according to research published in the open access journal Antimicrobial Resistance and Infection Control.

The study modelled how well different materials prevented the spread of human disease bacteria through touching, sneezes or spillages. The micropattern, named Sharklet™, is an arrangement of ridges formulated to resemble shark skin. The study showed that Sharklet harboured 94% less MRSA bacteria than a smooth surface, and fared better than copper, a leading antimicrobial material. The bacteria were less able to attach to Sharklet's imperceptibly textured surface, suggesting it could reduce the spread of superbugs in hospital settings.

The surfaces in hospitals and healthcare settings are often rife with bacteria and patients are vulnerable to bacterial infection. Scientists are investigating the ability of different materials to prevent the spread of bacteria. Copper alloys are a popular option, as they are toxic to bacterial cells, interfering with their cellular processes and killing them. The Sharklet micropattern works differently – the size and composition of its microscopic features prevent bacteria from attaching to it. It mimics the unique qualities of shark skin, which, unlike other underwater surfaces, inhibits bacteria, because it is covered with a natural micropattern of tooth-like structures, called denticles.

Dr Ethan Mann, a research scientist at Sharklet Technologies, the manufacturer of the micropattern, says: "The Sharklet texture is designed to be manufactured directly into the surfaces of plastic products that surround patients in hospital, including environmental surfaces as well as medical devices. Sharklet does not introduce new materials or coatings – it simply alters the shape and texture of existing materials to create surface properties that are unfavorable for bacterial contamination."

The researchers from Sharklet Technologies compared how well two types of infection-causing bacteria, methicillin-resistant or susceptible Staphylococcus aureus (MRSA and MSSA), fared at contaminating three surfaces - the Sharklet micropattern, a copper alloy, and a smooth control surface. They created experimental procedures to mimic common ways bacteria infect surfaces. Sneezing was mimicked by using a paint sprayer to spread the bacterial solution on 10 samples of each surface. To mimic infected patients touching the surfaces, velveteen cloth was put in contact with bacteria for 10s, and then placed on another set of each test surface for 10s. A third set of each surface was immersed in bacterial solution for an hour, then rinsed and dried, to mimic spills. Surfaces were sampled for remaining contaminations either immediately following exposure to MSSA and MRSA or 90 minutes after being exposed. The Sharklet micropattern reduced transmission of MSSA by 97% compared to the smooth control, while copper was no better than the control. The micropattern also harboured 94% less MRSA bacteria than the control surface, while the copper had 80% less.

Dr Mann says: "Shark skin itself is not an antimicrobial surface, rather it seems highly adapted to resist attachment of living organisms such as algae and barnacles. Shark skin has a specific roughness and certain properties that deter marine organisms from attaching to the skin surface. We have learned much from nature in building this material texture for the future."

Surface micropattern limits bacterial contamination
Ethan E Mann, Dipankar Manna, Michael R Mettetal, Rhea M May, Elisa M Dannemiller, Kenneth K Chung, Anthony B Brennan and Shravanthi T Reddy
Antimicrobial Resistance and Infection Control 2014, 3: 28

http://www.eurekalert.org/pub_releases/2014-09/nu-fbt091214.php

First blood test to diagnose depression in adults

Test identifies 9 blood markers tied to depression; predicts who will benefit from therapy

CHICAGO - The first blood test to diagnose major depression in adults has been developed by Northwestern Medicine® scientists, a breakthrough approach that provides the first objective, scientific diagnosis for depression. The test identifies depression by measuring the levels of nine RNA blood markers. RNA molecules are the messengers that interpret the DNA genetic code and carry out its instructions.

The blood test also predicts who will benefit from cognitive behavioral therapy based on the behavior of some of the markers. This will provide the opportunity for more effective, individualized therapy for people with depression.

In addition, the test showed the biological effects of cognitive behavioral therapy, the first measurable, blood-based evidence of the therapy's success. The levels of markers changed in patients who had the therapy for 18 weeks and were no longer depressed.

"This clearly indicates that you can have a blood-based laboratory test for depression, providing a scientific diagnosis in the same way someone is diagnosed with high blood pressure or high cholesterol," said Eva Redei, who developed the test and is a professor of psychiatry and behavioral sciences at Northwestern University Feinberg School of Medicine. "This test brings mental health diagnosis into the 21st century and offers the first personalized medicine approach to people suffering from depression."

Redei is co-lead author of the study, which will be published Sept. 16 in Translational Psychiatry. Redei previously developed a blood test that diagnosed depression in adolescents. Most of the markers she identified in the adult depression panel are different from those in depressed adolescents.

Decades-Long Search for Biological Depression Test

The search for a biological diagnostic test for major depression has been ongoing for decades.

The current method of diagnosing depression is subjective and based on non-specific symptoms such as poor mood, fatigue and change in appetite, all of which can apply to a large number of mental or physical problems. A diagnosis also relies on the patient's ability to report his symptoms and the physician's ability to interpret them. But depressed patients frequently underreport or inadequately describe their symptoms.

"Mental health has been where medicine was 100 years ago when physicians diagnosed illnesses or disorders based on symptoms," said co-lead author David Mohr, a professor of preventive medicine and director of the Center for Behavioral Intervention Technologies at Feinberg. "This study brings us much closer to having laboratory tests that can be used in diagnosis and treatment selection."

The new blood test will allow physicians for the first time to use lab tests to determine what treatments will be most useful for individual patients.

"Currently we know drug therapy is effective but not for everybody and psychotherapy is effective but not for everybody, " Mohr said. "We know combined therapies are more effective than either alone but maybe by combining therapies we are using a scattershot approach. Having a blood test would allow us to better target treatment to individuals."

Major depressive disorder affects 6.7 percent of the U.S. adult population in a year, a number that is rising. There is a two-to 40- month delay in diagnosis, and the longer the delay, the more difficult it is to treat depression. An estimated 12.5 percent of patients in primary care have major depression but only about half of those cases are diagnosed. A biologically based test has the potential to provide a more timely and accurate diagnosis.

How the Study Worked

The study included 32 patients, ages 21 to 79, who had been independently diagnosed as depressed in a clinical interview, and 32 non-depressed controls in the same age range. Some of the patients had been on long-term antidepressants but were still depressed. The patients, from Northwestern general internal medicine clinics, also were participating in a previously reported study comparing the effectiveness of face-to-face and telephone-administered cognitive behavioral therapy.

At baseline before the therapy, Northwestern scientists found nine RNA blood markers with levels significantly different in the depressed patients from those of controls. These markers were able to diagnose depression.

After 18 weeks of therapy (face-to-face and telephone), the changed levels of certain markers could differentiate patients who had responded positively and were no longer depressed (based on a clinical interview and patients' self-reported symptoms) from patients who remained depressed. This is the first biological indicator of the success of cognitive behavioral therapy, the study authors said.

"Fingerprint" Predicts Who Will Benefit from Therapy

In addition, the blood test predicts who will benefit from the cognitive behavioral therapy based on a distinct pattern or fingerprint of the levels of the nine marker levels at baseline in patients who recover from depression as a result of the therapy. The blood levels of these markers did not show this pattern in the patients who did not improve with the therapy.

"This distinction could be used in the future to predict who would respond to the therapy," Redei said.

Test Indicates Vulnerability to Depression

The blood concentration of three of the nine RNA markers remained different in depressed patients and non-depressed controls, even if the depressed patients achieved remission from depression after the therapy. This appears to indicate a vulnerability to depression. "These three markers move us towards the ultimate goal of identifying predisposition to depression, even in the absence of a current depressive episode," said Redei, also the David Lawrence Stein Research Professor of Psychiatric Diseases Affecting Children and Adolescents.

"Being aware of people who are more susceptible to recurring depression allows us to monitor them more closely," Mohr noted. "They can consider a maintenance dose of antidepressants or continued psychotherapy to diminish the severity of a future episode or prolong the intervals between episodes."

Next Redei plans to test the results in a larger population. She also wants to see if the test can differentiate between major depression and bipolar depression.

Redei's and Mohr's research represents a pillar of Northwestern's Strategic Plan by discovering new ways to treat disease in the biomedical sciences.

The paper is titled "Blood transcriptomic biomarkers in adult primary care patients with major depressive disorder undergoing cognitive behavioral therapy."

Northwestern coauthors include Brian M. Andrus, Mary J. Kwasny, Junhee Seok, Xuan Cai, and Joyce Ho.

The study was supported by grants R21 MH077234 and R01 MH059708 from the National Institute of Mental Health of the National Institutes of Health and by grants from the Davee Foundation.

http://www.eurekalert.org/pub_releases/2014-09/hhmi-med091614.php

Modern Europeans descended from three groups of ancestors

New studies of ancient DNA are shifting scientists' ideas of how groups of people migrated across the globe and interacted with one another thousands of years ago.

By comparing nine ancient genomes to those of modern humans, Howard Hughes Medical Institute (HHMI) scientists have shown that previously unrecognized groups contributed to the genetic mix now present in most modern-day Europeans.

"There are at least three major, highly differentiated populations that have contributed substantial amounts of ancestry to almost everybody that has European ancestry today," says David Reich, an HHMI investigator at Harvard Medical School.

Those include hunter-gatherers from western Europe, the early farmers who brought agriculture to Europe from the Near East, and a newly identified group of ancient north Eurasians who arrived in Europe sometime after the introduction of agriculture. That means there were major movements of people into Europe later than previously thought. The team, led by Reich and Johannes Krause at the University of Tübingen in Germany, reported their findings in the September 18, 2014, issue of the journal Nature.

In the last five years, genetic evidence has demonstrated that migrants from the Near East brought agriculture with them to Europe when they arrived about 8,500 years ago.

But the genomes of present-day Europeans show signs that they come from more than just the indigenous hunter-gatherers and these early farmers.

Two years ago, Reich's group uncovered genetic evidence that most present-day Europeans are a mixture of groups related to southern Europeans, Near Easterners, and a third group most closely related to Native Americans.

"That was a crazy observation, but it's very strong statistically," Reich says. "We argued that this is because of the contribution of an ancient north Eurasian population some of whose members contributed to the peopling of the Americas more than 15,000 years ago, and others of which later migrated to Europe."

To clarify that early history, Reich's team, including more than 100 collaborators worldwide, collected genetic data from nine ancient skeletons and 203 present-day populations living all over the world. Collaborators isolated human DNA and sequenced the complete genomes from the bones of a 7,000-year old skeleton found in Germany and eight skeletons of hunter-gatherers who lived in Luxembourg and Sweden about 8,000 years ago.

They compared those genomes to those of the 2,345 people in their contemporary populations.

That required developing new computational methods for genetic analysis.

"Figuring out how these populations are related is extremely hard," Reich says. "There's a lot that happened in Europe in the last 8,000 years, and this history acts like a veil, making it difficult to discern what happened at the beginning of this period. We had to find statistics that were able to tell us what happened deep in the past without getting confused by 8,000 years of intervening history, when massive and important events occurred."

"What we find is unambiguous evidence that people in Europe today have all three of these ancestries: early European farmers who brought agriculture to Europe, the indigenous hunter-gatherers who were in Europe prior to 8,000 years ago, and these ancient north Eurasians," Reich says.

Further analyses showed that describing present-day Europeans as a mixture of the three populations is a good fit for most, although not all, populations.

When the study began, the ancient north Eurasian population was a "ghost population" – identified based on genetic patterns without any ancient DNA. But in 2013, another group analyzed DNA from two skeletons found in Siberia, one from 24,000 years ago and one from 17,000 years ago, and found that it shared genetic similarities with Europeans and North Americans. The ghost, Reich says, had been found.

Although DNA from ancient north Eurasians is present in nearly all modern Europeans, Reich's team did not find it in their ancient hunter-gatherers or the ancient farmers. That means the north Eurasian line of ancestry was introduced into Europe after agriculture had been established, a scenario most archaeologists had thought unlikely.

"We have this amazing observation that only two ancestries are represented among the first farmers, from about 7,000 to 5,000 years ago. And then suddenly everybody today has ancient north Eurasian ancestry," Reich says. "So there must have been a later movement of this ancestry into Europe."

Anthropologists have long thought that densely settled populations would be resistant to the arrival of new groups. "But this is hard evidence that exactly such a major migration occurred," Reich says. "It's very important because it's a major contributor to Europeans today."

The time of the ancient north Eurasians' arrival remains to be determined, but Reich says their later-than-expected movement into Europe might help explain the complex mix of languages that exists there today.

The team's data also reveals that the first farmers to reach Europe from the Near East had ancestors from a previously unidentified lineage, which Reich's group named the Basal Eurasians. Basal Eurasians were the first people to separate from the larger group of non-Africans, before other non-African groups diversified.

Reich says that attempts to identify the first group to split from the non-Africans had always been puzzling: genetic evidence indicates that this is likely to be Europeans or Near Easterners, even though some archaeological evidence has indicated that people were in New Guinea and Australia before they were Europe.

The new analysis shows that the Near Easterners who came into Europe 8,000 years ago brought with them a strand of ancestry that had separated before the ancestors of Australian aborigines separated from the indigenous people of Europe. "That population must have been hanging out somewhere in the Near East for a very long time," Reich says.

Now he would like to know how that population fits into the archaeological history of the region. Ancient DNA from Basal Europeans, if found, might lead to new revelations about early human history.

http://www.eurekalert.org/pub_releases/2014-09/fccc-mtc091614.php

Many throat cancer patients can skip neck surgery

Study shows that among those whose cancer was triggered by a virus, any lingering bumps after chemotherapy and radiation tend to be benign

A new study shows that patients with human papillomavirus (HPV) – the same virus associated with both cervical and head and neck cancer – positive oropharyngeal cancer see significantly higher rates of complete response on a post-radiation neck dissection than those with HPV-negative oropharyngeal cancer. Fox Chase Cancer Center researchers presented the findings at the American Society for Radiation Oncology's 56th Annual Meeting on Wednesday, September 17.

"For patients that achieve a complete response, neck surgery is probably unnecessary," says Thomas J. Galloway, MD, Attending Physician and Director of Clinical Research at Fox Chase and lead author on the study.

After radiation and chemotherapy to remove tumors from the tonsils or back of the tongue, many head and neck cancer patients still have persistent lumps in their neck, albeit perhaps smaller than when they were first diagnosed. "The question is: Do we need to remove those lumps, as well, or can we just let them dissolve on their own?" asks Dr. Galloway.

To investigate, he and his colleagues reviewed the medical records from 396 patients whose oropharyngeal tumors had spread to at least one lymph node. Within 180 days after completing radiation therapy, 146 patients underwent neck surgery. For 99 patients, their records indicated whether or not their tumors had likely been triggered by HPV. Interestingly, patients with HPV often respond better to treatment for their oropharyngeal tumors than those without.

The researchers noted the same trend here – people who tested positive for HPV (measured by the presence of a protein called p16) were less likely to have a recurrence of their cancers, regardless of whether or not the tumors had completely disappeared following treatment. Indeed, patients' HPV status was the strongest predictor of whether or not they were alive at the end of the study.

Among the patients who underwent neck surgery, any lingering bumps were more likely to be benign if patients were infected with HPV.

"The bump might have become a permanent scar, or in some cases, it would have eventually disappeared," says Dr. Galloway.

Currently, it is not routine to consider a patients' HPV status before making the decision to perform neck surgery (the decision is based on physical examination and imaging studies), which can cause problems in the shoulder and neck, including swallowing, says Dr. Galloway; these findings suggest they should. "There's good reason to avoid neck surgery if we can."

The study that Dr. Galloway presented was supported by both a Radiation Therapy Oncology Group and Community Clinical Oncology Program grant from the National Cancer Institute.

http://bit.ly/1wHDqy

Yale Study Shows Risk Patterns for Autism and Schizophrenia Associated with Birth Size

Genetic Tug of War Explains Autism and Schizophrenia

A new study from Yale University shows that bigger babies do have increased risk of autism, while smaller babies are more likely to develop schizophrenia.

The size of babies and even human behavior may be shaped during early fetal development by a molecular tug of war between paternal and maternal genes, according to an emerging theory in evolutionary biology.

Yale evolutionary biologist Stephen Stearns and colleagues at the University of Copenhagen wanted to test a corollary of this theory: that autism and schizophrenia are extremes on a behavioral continuum that may arise from the same genomic conflict of interest.

Their analysis of 1.75 million Danish babies published online September 17 in the Proceedings of Royal Society B shows that, as the theory predicts, bigger babies do have increased risk of autism, while smaller babies are more likely to develop schizophrenia.

"I was startled at how clear the data were," Stearns said. "The theory isn't generally accepted yet, but I think there is a growing awareness that this sort of variation may be underlying some forms of human behavior, only grading into mental disorders at the extremes."

The theory is that the activation of select paternal genes that favor larger and more demanding babies - even though this may endanger the health of the mother and her ability to have more offspring - might also increase the risk of autism.

Conversely, maternal genes that favor smaller and easier-to-handle babies - thereby protecting the mother's ability to deliver more children - might confer greater risk of schizophrenia.

Stearns says a possible explanation begins very early in the development of placenta and brains, when either the male copies or the female copies of certain genes are inactivated. Genes inherited from the father will tend to favor growth of larger - and more resource-demanding - infants who have a greater chance of survival. The interests of genes inherited from the mother are different; they tend to produce smaller babies, which require less resources and investment of time. In other words, male genetic interests are weighted more toward the health of the infant even at some cost to the health of the mother, while female interest is in preserving her ability to produce more offspring.

In the extension of this theory to behavior, autism is the extreme form of a behaviorally demanding infant, while schizophrenia is the opposite end of the behavioral spectrum, favoring a more social and easy-going child. "These conditions may just be extreme exaggeration of normal behaviors," Stearns said.

For instance, natural selection in a tool-making culture might favor a mixture of individuals with different degrees of these personality traits - some slightly anti-social but mechanically-oriented individuals in a mix with more creative empathetic persons.

In this view, variations in both birth size and mental disposition are seen as different, independent reflections of an underlying continuum from demanding to non-demanding offspring, said Stearns.

Publication: Sean G. Byars, et al., "Opposite risk patterns for autism and schizophrenia are associated with normal variation in birth size: phenotypic support for hypothesized diametric gene-dosage effects," Proc. R. Soc. B, 2014, vol. 281 no. 1794 20140604; doi: 10.1098/rspb.2014.0604

http://www.eurekalert.org/pub_releases/2014-09/uoc-vrc091614.php

Violence rates can be halved in just 30 years, say leading experts

New evidence will be presented at the first Global Violence Reduction

Conference in Cambridge this week which shows that homicide rates have been declining since the mid-1990s in many parts of the world - in some cases dramatically.

Nations as diverse as Estonia, Hong Kong, South Africa, Poland, and Russia have seen average recorded homicide rates drop by 40% or more in the course of just 15 years. Out of 88 countries where trend data could be found, 67 showed a decline and only 20 showed an increase between 1995 and 2010, a new analysis of data from the United Nations Office on Drugs and Crime has revealed.

The new findings are part of an emerging body of evidence - from research into effective policing strategies, rehabilitation methods, better child protection services, and societal attitude shifts - which has many experts agreeing that global rates of violence could be halved by just 2040 if the right policies can be defined and implemented.

The University of Cambridge and the World Health Organisation (WHO) have brought together 150 of the world's foremost scientists and criminologists to set out the first roadmap for reducing global rates of interpersonal violence - a problem that now causes more death and costs more money than all wars combined.

International support is growing, with the World Health Assembly issuing a resolution for an action plan on interpersonal violence in May this year. Those gathered in Cambridge call on governments and other stakeholders to lobby for

violence prevention and reduction to become a concrete part of the UN's post-2015 development agenda.

"Examples of successful homicide reduction over the past 15 years can be found across the world: from Canada and Italy to New Zealand and China. But if we want to achieve a worldwide decline in homicide we need to learn from these success stories and understand what they did right," said Prof Manuel Eisner, conference co-convener and director of Cambridge's Centre for Violence Reduction.

"Evidence from many places in the world suggests reductions in violence by about 2.3% per year - needed for a 50% drop in 30 years - are feasible and realistic." Eisner emphasises that this is not a yet global decline; some countries - primarily Latin American - have seen recent increases in homicide which may offset the overall picture, and little is known about trends in much of Africa. But many European, Northern American and Asian countries are showing a steep decline in homicide over the past two decades, and the lessons from these nations need to be built on.

Eisner's analysis shows that homicide fell in societies that combined improved governance with effective policing strategies, a tighter net of control including surveillance technologies, and a lower tolerance for violent and disruptive behaviour from an earlier age.

The problem of interpersonal violence can seem insurmountable. In the 2st century, homicide has a higher body count than all wars combined - some 8 million people since 2000. Around 30% of women have experienced domestic violence; one in seven children on the planet is thought to be a victim of sexual abuse. Recent research commissioned by the Copenhagen Consensus Centre estimated that domestic violence costs the world $8 trillion annually (more than war).

But many experts feel there is cause for optimism. Interpersonal violence has been steadily declining for hundreds of years; a decline that has become particularly sharp in many societies over the past few decades:

"In London, the risk of being murdered has declined by a staggering 99% from the late Middle Ages to the present day. In the last ten years alone, the number of homicides in London has been cut in half, from around 200 in 2003 to less than 100 in 2013, for example - making it one of the safest cities in the world," said Eisner.

Significant challenges are faced in developing countries, and more research on effective violence reduction needs to be focused on these societies. Almost half (45%) of all homicides worldwide are committed in just 23 countries where only 10% of the world population lives. However, only 5% of all evaluations of effective violence prevention have been conducted outside wealthy western societies.

The causes of violence extend to the institutional backbone of many of these countries. Analysis shows that societies with the highest murder rates in Latin America, Africa and Asia – such as El Salvador, Congo and Russia – suffer from a mix of corruption, highly profitable illegal markets, low investment in public health and education, and an ineffective police force that is not trusted by the citizens.

"Making the state more legitimate in the eyes of its citizens, the police more effective and accountable, and promoting the rule of law will be critical to achieve a significant decline of violence," Eisner said.

Global step-changes are required in the way societies are policed and new technologies are used to prevent violence, say the experts. Currently only 20% of the world's populations live in societies that gather evidence to support better policing; this should increase to 60% by 2044.

"An accountable and effective police that are trusted by civil society is indispensable," said Prof Lawrence Sherman, Director of Cambridge's Institute of Criminology. Sherman, an authority in 'crime experiments', points to a recent example of the role such work could play in violence reduction: an experiment he conducted in Trinidad showed a GPS-mapping strategy for police patrols caused a 41% reduction in murders and shootings.

Most experts agree that violence prevention needs to start earlier in life. Parenting support systems, child protection measures and evidence-based early social skills training hardly exist in areas most affected by child abuse and domestic violence.

"We are beginning to see more initiatives in poor countries, where academics, governments and stake-holders find ways to disseminate prevention strategies found to be effective in rich countries," said the conference organisers.

The joint WHO/Cambridge conference will feature latest evidence from a global range of reduction research - from Sao Paulo street gangs to civil conflict in sub-Saharan Africa - and create vital links between violence researchers worldwide with the aim of placing violence reduction on the international agenda.

The WHO's first status report on global violence prevention will be launched this winter, providing a solid information base of where countries stand in prevention efforts, and where the major gaps lie. "This offers an unprecedented opportunity for violence prevention stakeholders to come together and step up their activities," said Alex Butchart, conference co-convener from the WHO.

Eisner calls on governments to develop their own national action plans to reduce violence, and to this end his team will be working closely with the WHO and researchers from every continent to create a series of policy recommendations.

The conference, supported by the UBS Optimus Foundation, will close with a speech from one of the world's pre-eminent writers and thinkers: Steven Pinker, Professor of Psychology at Harvard University, whose best-selling book The Better Angels of our Nature (2011) draws upon research by Eisner and others to explore the decline in violence.

http://www.eurekalert.org/pub_releases/2014-09/uos-wbe091614.php

Wild berry extract may strengthen effectiveness of pancreatic cancer drug

North American berry may strengthen the effectiveness of a chemotherapy drug commonly used to treat pancreatic cancer

A wild berry native to North America may strengthen the effectiveness of a chemotherapy drug commonly used to treat pancreatic cancer, reveals research published online in the Journal of Clinical Pathology. The study by researchers at King's College Hospital and the University of Southampton suggests that adding nutraceuticals to chemotherapy cycles may improve the effectiveness of conventional drugs, particularly in hard to treat cancers, such as pancreatic cancer.

The team tested the effectiveness of extract of chokeberry (Aronia melanocarpa) in killing off cancer cells, probably by apoptosis (programmed cell death) as markers of early apoptosis appear in treated cells.

Chokeberry is a wild berry that grows on the eastern side of North America in wetlands and swamp areas. The berry is high in vitamins and antioxidants, including various polyphenols - compounds that are believed to mop up the harmful by-products of normal cell activity. The researchers chose to study the impact of the extract on pancreatic cancer, because of its persistently dismal prognosis: less than 5 per cent of patients are alive five years after their diagnosis.

The study used a well-known line of pancreatic cancer cells (AsPC-1) in the laboratory and assessed how well this grew when treated with either the chemotherapy drug gemcitabine or different levels of commercially available chokeberry extract alone, and when treated with a combination of gemcitabine and chokeberry extract. The analysis indicated that 48 hours of chokeberry extract treatment of pancreatic cancer cells induced cell death at 1 ug/ml.

The toxicity of chokeberry extract on normal blood vessel lining cells was tested and found to have no effects up to the highest levels used (50 ug/ml), suggesting that the cell death effect is happening in a way other than through preventing new blood vessel formation (anti-angiogenesis), a process that is important in cancer cell growth.

Bashir Lwaleed, at the University of Southampton, comments: "These are very exciting results. The low doses of the extract greatly boosted the effectiveness of gemcitabine, when the two were combined. In addition, we found that lower doses of the conventional drug were needed, suggesting either that the compounds work together synergistically, or that the extract exerts a "supra-additive" effect. This could change the way we deal with hard to treat cancers in the future. "

The team believe that more clinical trials are now needed to explore the potential of naturally occurring micronutrients in plants, such as those found in chokeberry. Similar experimental studies, indicating that chokeberry extract seems to induce cell death and curb invasiveness in brain cancer, as well as other research, highlighting the potential therapeutic effects of particular polyphenols found in green tea, soya beans, grapes, mulberries, peanuts and turmeric, show potential, Dr Lwaleed adds.

Dr Harcharan Rooprai, King's College Hospital, comments: "The promising results seen are encouraging and suggest that these polyphenols have great therapeutic potential not only for brain tumours but pancreatic cancer as well."

The study was funded by The Ministry of Higher Education, Malaysia and Have a Chance Inc, USA.

http://bit.ly/1uKBd2A

Artificial sweeteners may leave their users glucose intolerant

Saccharin and other sweeteners alter the bacteria living in our guts.

by John Timmer - Sept 18 2014, 3:59am TST

People who are watching their weight will often opt for a diet soda, reasoning that the fewer calories, the better. But the availability of drinks and foods made with artificial sweeteners like saccharin, sucralose, and aspartame hasn't seemed to help much with our booming obesity levels. Now, some researchers might have identified a reason for this: the sweeteners leave their users with elevated blood glucose levels. But they don't seem to act directly on human metabolism. Instead, the effects come through alterations in the bacterial populations that live inside us.

The paper that describes this work, which was performed by a large collaboration of researchers from Israel, is being released by Nature today. The researchers note that epidemiological studies about the effects of artificial sweeteners have produced mixed results; some show a benefit, while others indicate that they're associated with weight gain and diabetes risk. Given that human populations haven't given us a clear answer, the researchers turned to mice, where they could do a carefully controlled study.

They started taking a group of genetically matched mice and spiking their drinking water with either sucrose or a commercial prep of an artificial sweetener (either saccharin, sucralose, or aspartame). After five weeks, they checked the blood glucose levels of these animals. Eleven weeks later, the groups that were given the artificial sweeteners all had elevated blood glucose levels compared to those that received sucrose. This is typically a sign of metabolic problems, most

often caused by insulin losing its effectiveness. It can be a precursor to type 2 diabetes.

The same held true if the animals were given a high-fat diet, which indicates the same problem occurs in the population that is likely to be using the artificial sweeteners: the obese.

That's a striking result, but it doesn't tell us anything about how the artificial sweeteners are causing this effect. Over the past few years, however, diabetes research has pointed a finger at the symbiotic bacteria that live in our digestive tract - termed the "gut microbiome." These organisms get a chance to digest anything we eat as well, and they can both alter the nutrients our own cells have access to and release chemicals that influence human health.

The authors wondered whether the gut bacteria might be acting as intermediaries between the artificial sweeteners and the glucose response. Their first test of this idea was simply to wipe out the bacteria with a heavy dose of antibiotics. When they did so, the difference between the animals getting glucose and the animals getting artificial sweeteners vanished. To really nail down the case, the authors obtained fecal material from the mice given artificial sweeteners and transferred it to mice that had been treated with antibiotics. The mice receiving the transplants showed reduced tolerance to glucose.

Could this really be relevant to human health? To get a hint, the team got seven healthy volunteers to start consuming high levels of saccharin (the FDA's recommended maximum daily dose). At the end of a week, four of them ended up with a reduced insulin response. Again, the researchers took stool samples and gave them to germ-free mice. Fecal transplants from those who had a poor insulin response transferred this response to the mice; fecal transplants from the ones who were unaffected by the saccharine had no effect.

What could possibly be happening with these bacteria? To find out, the researchers did a sampling of the DNA in the fecal samples. Having artificial sweeteners clearly shifted the bacterial species present in the gut microbiome, causing the numbers of some groups to rise and others to fall. The same result occurred if the samples were grown in culture. In addition, the genes expressed by the resulting populations were different. Some metabolic pathways became more active, while others were toned down. (It's not clear whether this shift is from the changing bacterial populations or from different metabolic behavior among whatever bacterial species are present.)

This will have two effects: it will both change the nutrients available for human cells, and it will change the metabolic products that are released by the bacteria. Presumably, one or both of these effects alters how the body handles insulin and glucose, although the precise mechanism will need to await further studies.

For those of you who remember early health scares about artificial sweeteners and are thinking "aha, they were right!" - they weren't. Those worries focused on effects specific to the chemicals themselves. These findings are general to any artificial sweetener, even though the three have distinctive chemical properties. This also doesn't mean that these sweeteners are unadulterated evil. The human trials were extremely short and had a small population, so they will need a more thorough follow-up. Even then, it was clear that not everyone has the same response to artificial sweeteners. This shouldn't be a surprise. People have a far more varied microbiome than genetically identical lab mice raised in sterile conditions will, and that microbiome will interact with the different things that people eat as a normal part of their diets.

Understanding the details of when and how the microbiome influences insulin levels will take a lot of additional work. Only when that work is done will we have a clear picture of who is likely to see a negative effect from using artificial sweeteners. So although this was a comprehensive study about what happens in mice, the emphasis has to be on the word "may" when the authors conclude, "Our findings suggest that NAS may have directly contributed to enhancing the exact epidemic that they themselves were intended to fight."

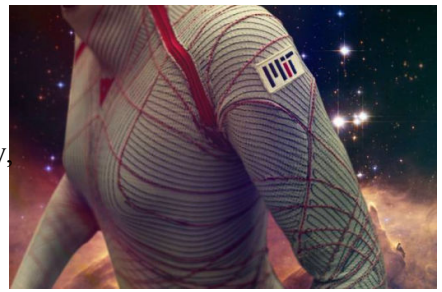
Nature, 2014. DOI: 10.1038/nature13793 (About DOIs).

http://phys.org/news/2014-09-spacesuits-future-resemble-skin.html

Spacesuits of the future may resemble a streamlined second skin

Shrink-wrapping spacesuits

Sep 18, 2014 by Jennifer Chu



For future astronauts, the process of suiting up may go something like this: Instead of climbing into a conventional, bulky, gas-pressurized suit, an astronaut may don a lightweight, stretchy garment, lined with tiny, musclelike coils. She would then plug in to a spacecraft's power supply, triggering the coils to contract and essentially shrink-wrap the garment around her body. The skintight, pressurized suit would not only support the astronaut, but would give her much more freedom to move during planetary exploration. To take the suit off, she would only have to apply modest force, returning the suit to its looser form.

The MIT BioSuit, a skintight spacesuit that offers improved mobility and reduced mass compared to modern gas-pressurized spacesuits. **Jose-Luis Olivares/MIT**

Now MIT researchers are one step closer to engineering such an active, "second-skin" spacesuit: Dava Newman, a professor of aeronautics and astronautics and

engineering systems at MIT, and her colleagues have engineered active compression garments that incorporate small, springlike coils that contract in response to heat. The coils are made from a shape-memory alloy (SMA) - a type of material that "remembers" an engineered shape and, when bent or deformed, can spring back to this shape when heated.

The team incorporated the coils in a tourniquet-like cuff, and applied a current to generate heat. At a certain trigger temperature, the coils contract to their "remembered" form, such as a fully coiled spring, tightening the cuff in the process. In subsequent tests, the group found that the pressure produced by the coils equaled that required to fully support an astronaut in space.

"With conventional spacesuits, you're essentially in a balloon of gas that's providing you with the necessary one-third of an atmosphere [of pressure,] to keep you alive in the vacuum of space," says Newman, who has worked for the past decade to design a form-fitting, flexible spacesuit of the future. "We want to achieve that same pressurization, but through mechanical counterpressure - applying the pressure directly to the skin, thus avoiding the gas pressure altogether. We combine passive elastics with active materials. … Ultimately, the big advantage is mobility, and a very lightweight suit for planetary exploration."

The coil design was conceived by Bradley Holschuh, a postdoc in Newman's lab. Holschuh and Newman, along with graduate student Edward Obropta, detail the design in the journal IEEE/ASME: Transactions on Mechatronics.

How to train a spacesuit

While skintight spacesuits have been proposed in the past, there's been one persistent design hurdle: how to squeeze in and out of a pressurized suit that's engineered to be extremely tight. That's where shape-memory alloys may provide a solution. Such materials only contract when heated, and can easily be stretched back to a looser shape when cool.

To find an active material that would be most suitable for use in space, Holschuh considered 14 types of shape-changing materials - ranging from dielectric elastomers to shape-memory polymers - before settling on nickel-titanium shape-memory alloys. When trained as tightly packed, small-diameter springs, this material contracts when heated to produce a significant amount of force, given its slight mass - ideal for use in a lightweight compression garment.

The material is commonly produced in reels of very thin, straight fiber. To transform the fiber into coils, Holschuh borrowed a technique from another MIT group that previously used coiled nickel-titanium to engineer a heat-activated robotic worm.

Shape-memory alloys like nickel-titanium can essentially be "trained" to return to an original shape in response to a certain temperature. To train the material, Holschuh first wound raw SMA fiber into extremely tight, millimeter-diameter coils then heated the coils to 450 degrees Celsius to set them into an original, or "trained" shape. At room temperature, the coils may be stretched or bent, much like a paper clip. However, at a certain "trigger" temperature (in this case, as low as 60 C), the fiber will begin to spring back to its trained, tightly coiled state.

The researchers rigged an array of coils to an elastic cuff, attaching each coil to a small thread linked to the cuff. They then attached leads to the coils' opposite ends and applied a voltage, generating heat. Between 60 and 160 C, the coils contracted, pulling the attached threads, and tightening the cuff.

"These are basically self-closing buckles," Holschuh says. "Once you put the suit on, you can run a current through all these little features, and the suit will shrink-wrap you, and pull closed."

Keeping it tight

The group's next challenge is finding a way to keep the suit tight. To do this, Holschuh says there are only two options: either maintaining a constant, toasty temperature, or incorporating a locking mechanism to keep the coils from loosening. The first option would overheat an astronaut and require heavy battery packs - a design that would significantly impede mobility, and is likely infeasible given the limited power resources available to astronauts in space. Holschuh and Newman are currently exploring the second option, looking into potential mechanisms to lock or clip the coils in place.

As for where the coils may be threaded within a spacesuit, Holschuh is contemplating several designs. For instance, an array of coils may be incorporated into the center of a suit, with each coil attached to a thread that radiates to the suit's extremities. As the coils activate, they could pull on the attached threads - much like the strings of a puppet - to tighten and pressurize the suit. Or, smaller arrays of coils could be placed in strategic locations within a spacesuit to produce localized tension and pressure, depending on where they are needed to maintain full body compression.

While the researchers are concentrating mostly on applications in space, Holschuh says the group's designs and active materials may be used for other purposes, such as in athletic wear or military uniforms.

"You could use this as a tourniquet system if someone is bleeding out on the battlefield," Holschuh says. "If your suit happens to have sensors, it could tourniquet you in the event of injury without you even having to think about it."

"An integrated suit is exciting to think about to enhance human performance," Newman adds. "We're trying to keep our astronauts alive, safe, and mobile, but these designs are not just for use in space."

More information: "Low Spring Index NiTi Coil Actuators for Use in Active Compression Garments." Holschuh, B Obropta, E. ; Newman, D. Mechatronics, IEEE/ASME Trans, Volume: PP Issue:99, DOI: 10.1109/TMECH.2014.2328519

http://phys.org/news/2014-09-baseline-array-radio-image-voyager.html

Very Long Baseline Array takes radio image of Voyager 1

Faint radio signal of the distant probe is captured

Sep 18, 2014 by Brian Koberlein

The image above is a radio image of Voyager 1. It was taken from the Very Long Baseline Array, which is a collection of 10 radio telescopes scattered from Hawaii to the Virgin Islands. It captures the faint radio signal of the distant probe. That pale blue dot is the most distant object made by humans.

Very Long Baseline Array takes radio image of Voyager 1 **NRAO/AUI/NSF**

The radio strength of Voyager 1 is about 23 watts. That signal is directed toward Earth, but Voyager is about 15 billion kilometers from Earth, so by the time the probe's signal reaches us its power is less than an attowatt, or a billionth of a billionth of a watt. That faint signal is the only information we have from a probe that left our planet 36 years ago.

Of course it isn't enough to simply detect the signal from Voyager 1, we must receive the signal the way you might receive a radio signal, or a mobile phone call. That requires even greater sensitivity, which is why it requires large radio telescopes to communicate with Voyager. We have to be able to hear Voyager's faint messages, and we have to send radio responses that are powerful enough and focused enough for Voyager to receive.

Yesterday I wrote about how Voyager 1 had entered interstellar space, but had only begun its journey to the edge of our solar system. It will eventually leave our Sun's grasp, since it has enough speed to escape the Sun's gravity, but it will become silent long before then. In another 5 – 10 years it won't have enough power to operate its instruments. That's part of what makes this current milestone so significant. Voyager 1 has not only reached interstellar space, but it has told us it did.

That pale blue dot, a radio blip in a radio dark sky, is a part of us. It is an 800 kg, car sized, nuclear-powered computer that we launched into space to explore the solar system. Our curiosity drove us to create it, and our intelligence allowed us to build it. And after a 36 year journey to interstellar space, it continues to communicate with its creators.

One pale blue dot looking at another one.

http://www.eurekalert.org/pub_releases/2014-09/uoc--ssh091514.php

Study shows how epigenetic memory is passed across generations

Researchers traced markers of gene repression through cell division and showed that both sperm and eggs transmit a memory of gene repression to embryos

A growing body of evidence suggests that environmental stresses can cause changes in gene expression that are transmitted from parents to their offspring, making "epigenetics" a hot topic. Epigenetic modifications do not affect the DNA sequence of genes, but change how the DNA is packaged and how genes are expressed. Now, a study by scientists at the University of California, Santa Cruz, shows how epigenetic memory can be passed across generations and from cell to cell during development.

The study, published September 19 in Science, focused on one well studied epigenetic modification--the methylation of a DNA packaging protein called histone H3. Methylation of a particular amino acid (lysine 27) in histone H3 is known to turn off or "repress" genes, and this epigenetic mark is found in all multicellular animals, from humans to the tiny roundworm C. elegans that was used in this study.

"There has been ongoing debate about whether the methylation mark can be passed on through cell divisions and across generations, and we've now shown that it is," said corresponding author Susan Strome, a professor of molecular, cell and developmental biology at UC Santa Cruz.

Strome's lab created worms with a mutation that knocks out the enzyme responsible for making the methylation mark, then bred them with normal worms. Using fluorescent labels, they were able to track the fates of marked and unmarked chromosomes under the microscope, from egg cells and sperm to the dividing cells of embryos after fertilization. Embryos from mutant egg cells fertilized by normal sperm had six methylated chromosomes (from the sperm) and six unmarked or "naked" chromosomes (from the egg).

As embryos develop, the cells replicate their chromosomes and divide. The researchers found that when a marked chromosome replicates, the two daughter chromosomes are both marked. But without the enzyme needed for histone methylation, the marks become progressively diluted with each cell division. "The mark stays on the chromosomes derived from the initial chromosome that had the mark, but there's not enough mark for both daughter chromosomes to be fully loaded," Strome said. "So the mark is bright in a one-cell embryo, less bright after the cell divides, dimmer still in a four-cell embryo, and by about 24 to 48 cells we can't see it anymore."

The researchers then did the converse experiment, fertilizing normal egg cells with mutant sperm. The methylation enzyme (called PRC2) is normally present in egg cells but not in sperm, which don't contribute much more than their chromosomes to the embryo. So the embryos in the new experiment still had six naked chromosomes (this time from the sperm) and six marked chromosomes, but now they also had the enzyme.

"Remarkably, when we watch the chromosomes through cell divisions, the marked chromosomes remain marked and stay bright, because the enzyme keeps restoring the mark, but the naked chromosomes stay naked, division after division," Strome said. "That shows that the pattern of marks that was inherited is being transmitted through multiple cell divisions."

Strome noted that the findings in this study of transmission of histone methylation in C. elegans have important implications in other organisms, even though different organisms use the repressive marker that was studied to regulate different genes during different aspects of development. All animals use the same enzyme to create the same methylation mark as a signal for gene repression, and her colleagues who study epigenetics in mice and humans are excited about the new findings, Strome said.

"Transgenerational epigenetic inheritance is not a solved field--it's very much in flux," she said. "There are dozens of potential epigenetic markers. In studies that document parent-to-child epigenetic inheritance, it's not clear what's being passed on, and understanding it molecularly is very complicated. We have a specific example of epigenetic memory that is passed on, and we can see it in the microscope. It's one piece of the puzzle."

The first author of the Science paper is Laura Gaydos, a graduate student in Strome's lab at UC Santa Cruz who led the study for her Ph.D. thesis and is now a postdoctoral researcher at Fred Hutchinson Cancer Research Center in Seattle. The other coauthor is Wenchao Wang, who did one of the initial experiments as a graduate student in Strome's lab several years ago when she was at Indiana University. This research was supported by the National Institutes of Health, a UCSC Dissertation Year Fellowship, and the ARCS Foundation.

http://www.eurekalert.org/pub_releases/2014-09/cwru-csp091814.php

Curcumin, special peptides boost cancer-blocking PIAS3 to neutralize STAT3 in mesothelioma

Case Western Reserve scientist helps lead study on potential treatment approaches that could extend life of mesothelioma patients

A common Asian spice and cancer-hampering molecules show promise in slowing the progression of mesothelioma, a cancer of the lung's lining often linked to asbestos. Scientists from Case Western Reserve University and the Georg-Speyer-Haus in Frankfurt, Germany, demonstrate that application of curcumin, a derivative of the spice turmeric, and cancer-inhibiting peptides increase levels of a protein inhibitor known to combat the progression of this cancer. Their findings appeared in the Aug. 14 online edition Clinical Cancer Research; the print version of the article will appear Oct. 1.

Malignant mesothelioma has received widespread notoriety because it occurs frequently in the lung linings of people exposed to asbestos. However, asbestos does not always cause this particular cancer that kills 43,000 people worldwide each year. Many mesothelioma patients were never exposed to asbestos.

"Mesothelioma is a disease that continues to have a significant burden worldwide, and the treatment option is really suboptimal. We must find better ways to treat it," said senior author Afshin Dowlati, MD, Professor of Medicine – Hematology/Oncology, Case Western Reserve University School of Medicine, and member of the Case Comprehensive Cancer Center. "We now understand the mechanisms that drive cell proliferation and growth in malignant mesothelioma."

The culprit in sparking many cancers, particularly mesothelioma, is the intracellular protein and transcription factor STAT3 (signal transducer and activator of transcription 3). A signal transducer and activator is a pathway for instructing the growth and survival of cells, and a transcription factor is a protein that controls genetic information directing cells how to perform. STAT3 is notorious for sending signals to trigger the onset of human cancers and to fuel their continued growth. The great neutralizer of STAT3 is PIAS3 (protein inhibitor of activated STAT3). PIAS3 possesses the strength to inhibit and block STAT3's ability to cause cancer.

In this study, investigators assessed PIAS3 expression in tissue samples of mesothelioma solid tumors and the protein inhibitor's subsequent effects on STAT3 activity. Tissue samples came from three different locations in the country, and information logged for each specimen detailed how long the patient lived and the types of mesothelioma they had. Investigators then linked the levels of PIAS3 with STAT3 activity in each sample. Additionally, investigators examined the effects of curcumin and peptides extracted from PIAS3 segments on malignant mesothelioma cells in vitro.

"In those mesothelioma patients where PIAS3 is low, indeed STAT3 is activated," said Dowlati, Director of the Center for Cancer Drug Development at University Hospitals Seidman Cancer Center. "Mesothelioma patients who have low PIAS3 and high STAT3 have a greater chance of dying early. On the flip side, those patients with a high PIAS3 levels have a 44 percent decreased chance of dying in one year, which is substantial."

Investigators also found that curcumin and PIAS3 peptides raised PIAS3 levels, which brought down STAT3 activity and caused mesothelioma cells to die. Their

study served as proof of principle about the effectiveness of these two compounds in treating malignant mesothelioma, a first step in moving a treatment toward clinical trials. Additionally, their findings demonstrated that PIAS3 could serve as a predictive marker for managing mesothelioma because the disease's tumors do not always progress in a consistent, predictable manner, even when tumor stages, grades and clinical presentations appear similar.

"Our findings suggest that PIAS3 expression positively affects survival in mesothelioma patients and that PIAS3 activation could become a therapeutic strategy," Dowlati said. "Our interest for the future is that we want to find better, more simple ways to increase intracellular levels of PIAS3 for malignant mesothelioma through the use of synthetic PIAS3 peptide or curcumin analogs. We must develop a curcumin analog that is absorbable by the human body. Currently, curcumin ingested as the spice turmeric has practically no absorption within the gut."

Their investigation also contributes to the overall body of scientific knowledge for all cancer. "Our findings beg the question of what role PIAS3 could play in limiting STAT3 activation in other cancers as well," Dowlati said. "There is an opportunity to extend this discovery because a number of cancers are STAT3-activated."

The National Institutes of Health supported this research by providing investigators with mesothelioma tissue microarrays through the Mesothelioma Research Bank [CDC NIOSH 1-U19-OH009077-01 National Mesothelioma Virtual Bank for Translational Research].

http://www.eurekalert.org/pub_releases/2014-09/uab-nsn091814.php

No sedative necessary: Scientists discover new 'sleep node' in the brain

Findings may lead to new therapies for sleep disorders, including insomnia

BUFFALO, N.Y. – A sleep-promoting circuit located deep in the primitive brainstem has revealed how we fall into deep sleep. Discovered by researchers at Harvard School of Medicine and the University at Buffalo School of Medicine and Biomedical Sciences, this is only the second "sleep node" identified in the mammalian brain whose activity appears to be both necessary and sufficient to produce deep sleep.

Published online in August in Nature Neuroscience, the study demonstrates that fully half of all of the brain's sleep-promoting activity originates from the parafacial zone (PZ) in the brainstem. The brainstem is a primordial part of the brain that regulates basic functions necessary for survival, such as breathing, blood pressure, heart rate and body temperature.

"The close association of a sleep center with other regions that are critical for life highlights the evolutionary importance of sleep in the brain," says Caroline E. Bass, assistant professor of Pharmacology and Toxicology in the UB School of Medicine and Biomedical Sciences and a co-author on the paper.

The researchers found that a specific type of neuron in the PZ that makes the neurotransmitter gamma-aminobutyric acid (GABA) is responsible for deep sleep. They used a set of innovative tools to precisely control these neurons remotely, in essence giving them the ability to turn the neurons on and off at will.

"These new molecular approaches allow unprecedented control over brain function at the cellular level," says Christelle Ancelet, postdoctoral fellow at Harvard School of Medicine. "Before these tools were developed, we often used 'electrical stimulation' to activate a region, but the problem is that doing so stimulates everything the electrode touches and even surrounding areas it didn't. It was a sledgehammer approach, when what we needed was a scalpel."

"To get the precision required for these experiments, we introduced a virus into the PZ that expressed a 'designer' receptor on GABA neurons only but didn't otherwise alter brain function," explains Patrick Fuller, assistant professor at Harvard and senior author on the paper. "When we turned on the GABA neurons in the PZ, the animals quickly fell into a deep sleep without the use of sedatives or sleep aids."

How these neurons interact in the brain with other sleep and wake-promoting brain regions still need to be studied, the researchers say, but eventually these findings may translate into new medications for treating sleep disorders, including insomnia, and the development of better and safer anesthetics.

"We are at a truly transformative point in neuroscience," says Bass, "where the use of designer genes gives us unprecedented ability to control the brain. We can now answer fundamental questions of brain function, which have traditionally been beyond our reach, including the 'why' of sleep, one of the more enduring mysteries in the neurosciences."

The work was funded by the National Institutes of Health.

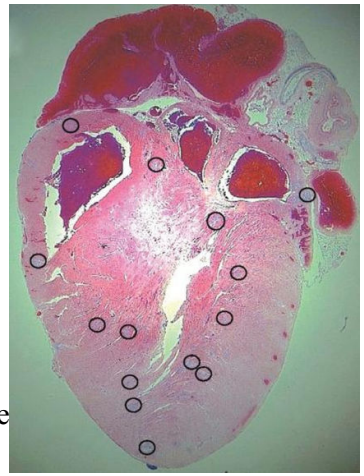
http://www.eurekalert.org/pub_releases/2014-09/p-hpb091114.php

How pneumonia bacteria can compromise heart health

Streptococcus pneumoniae can invade the heart and cause the death of heart muscle cells

Bacterial pneumonia in adults carries an elevated risk for adverse cardiac events (such as heart failure, arrhythmias, and heart attacks) that contribute substantially to mortality - but how the heart is compromised has been unclear. A study published on September 18th in PLOS Pathogens now demonstrates that Streptococcus pneumoniae, the bacterium responsible for most cases of bacterial pneumonia, can invade the heart and cause the death of heart muscle cells.

Carlos Orihuela, from the University of Texas Health Science Center in San Antonio, USA, and colleagues initially studied the reasons for heart failure during invasive pneumococcal disease (when S. pneumoniae bacteria infect major organs such as the lungs, bloodstream, and brain) in mice, and subsequently confirmed some of their main findings in rhesus macaques and in heart tissue from deceased human patients.



This image shows microlesions (indicated by circles) in the heart of a mouse 30 hours after induction of invasive pneumococcal disease. **Orihuela et al.**

Mice with severe invasive pneumococcal disease showed elevated levels of troponin, a marker for heart injury, in their blood. They also had abnormal EKGs. When the researchers examined the hearts of the mice, they found microscopic sites of injury (called microlesions) in the heart muscle. S. pneumoniae were found within these microlesions, indicating the bacteria were able to invade and multiply within the heart. Looking in more detail, the researchers identified dying heart muscle cells in the tissue surrounding microlesions.

At the molecular level, the researchers found that the S. pneumoniae toxin pneumolysin was present within the microlesions and responsible for heart muscle cell death. They also showed that S. pneumoniae requires a molecule called CbpA to exit the bloodstream and invade the heart. Moreover, an experimental vaccine formulation composed of CbpA and a non-toxic version of pneumolysin generated antibodies that protected mice against cardiac invasion and heart damage.

Having obtained tissues from three rhesus macaques that had died from pneumococcal pneumonia, the researchers found cardiac microlesions that were similar in size and appearance to those seen in mice, but without the presence of S. pneumoniae bacteria. The situation was similar in cardiac samples from human patients who had died from invasive pneumococcal disease. Two of the samples (they looked at a total of nine) showed microlesions, but the lesions did not contain bacteria.

As the macaques and the human patients had been treated with antibiotics, the researchers wondered whether the bacteria had caused the lesions but subsequently been killed by the treatment. To test this, they infected mice with S. pneumoniae and treated them with a high-dose antibiotic (ampicillin) when the lesions were first apparent. The hearts of these mice looked similar to the macaques and human samples, with clear presence of microlesions but devoid of bacteria. As the researchers discuss, ampicillin acts by breaking bacteria apart and releasing their contents, including pneumolysin, and this could exacerbate the death of heart muscle cells. Alternative antibiotics that do not spill their bacterial targets' contents exist and might be advantageous.

Having shown for the first time that S. pneumoniae can directly damage the heart - which could help explain the link between pneumonia and adverse heart events - the researchers conclude that "research is merited to determine the true frequency of cardiac microlesions in patients hospitalized with invasive pneumococcal disease, if modifications in antibiotic therapy improve long-term outcomes, and if prevention of cardiac damage is an indication for vaccination".

All works published in PLOS Pathogens are open access, which means that everything is immediately and freely available. Use this URL to provide readers access to the paper: http://dx.plos.org/10.1371/journal.ppat. 1004383 (Link goes live upon article publication)

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http://www.eurekalert.org/pub_releases/2014-09/ason-cod091214.php

Cooling of dialysis fluids protects against brain damage

Simple step may help protect against cognitive, psychological, and functional abnormalities in dialysis patients

Washington, DC - While dialysis can cause blood pressure changes that damage the brain, cooling dialysis fluids can protect against such effects. The findings come from a study appearing in an upcoming issue of the Journal of the American Society of Nephrology (JASN). The cooling intervention can be delivered without additional cost and is simple to perform.

While dialysis is an essential treatment for many patients with kidney disease, it can cause damage to multiple organs, including the brain and heart, due to the sudden removal of bodily fluids.

To characterize dialysis-induced brain injury and to see whether cooled dialysis fluids (called dialysate) might help reduce such injury, Christopher McIntyre, DM, and his colleagues randomized 73 new dialysis patients to dialyze with body temperature dialysate or dialysate cooled to 0.5◦C below body temperature for 1 year. (Dr. McIntyre was at the University of Nottingham in the UK while conducting this work but is now at the University of Western Ontario and the London Health Sciences Centre, in Canada.)

The study demonstrated that dialysis drives progressive white matter brain injury due to blood pressure instability; however, patients who dialyzed at 0.5◦C below body temperature were completely protected against such white matter changes.

"This study demonstrates that paying attention to improving the tolerability of dialysis treatment - in this case by the simple and safe intervention of reducing the temperature of dialysate - does not just make patients feel better, but also can completely protect the brain from progressive damage," said Dr. McIntyre.

Study co-authors include Aghogho Odudu, MBChB, PhD and Mohamed Tarek Eldehni MD, MSc.

Disclosures: The study was funded by the UK National Institute of Health Research. Dr. McIntyre has received research funding and speaking honoraria from several dialysis companies (Fresenius, Baxter, Gambro, Braun).
The article, entitled "Randomized Clinical Trial of Dialysate Cooling and Its Effect on Brain White Matter," will appear online at http://jasn.asnjournals.org/ on September 18, 2014.

http://bit.ly/XJ4rSs

Primal pull of a baby crying reaches across species

Mother deer will rush protectively to the distress calls of other infant mammals
18 September 2014 by Bob Holmes

THERE'S something primal in a mother's response to a crying infant. So primal, in fact, that mother deer will rush protectively to the distress calls of other infant mammals, such as fur seals, marmots and even humans. This suggests such calls might share common elements – and perhaps that these animals experience similar emotions.

Researchers – and, indeed, all pet owners – know that humans respond emotionally to the distress cries of their domestic animals, and there is some evidence that dogs also respond to human cries. However, most people have assumed this is a by-product of domestication.

However, Susan Lingle, a biologist at the University of Winnipeg, Canada, noticed that the infants of many mammal species have similar distress calls: simple sounds with few changes in pitch. She decided to test whether cross-species responses occur more widely across the evolutionary tree.

So, Lingle and her colleague Tobias Riede, now at Midwestern University in Glendale, Arizona, recorded the calls made by infants from a variety of mammal species when separated from their mother or otherwise threatened. They then played the recordings through hidden speakers to wild mule deer (Odocoileus hemionus) out on the Canadian prairies. They found that deer mothers quickly moved towards the recordings of infant deer, but also towards those of infant fur seals, dogs, cats and humans, all of which call at roughly the same pitch. Even the ultrasonic calls of infant bats attracted the deer mothers if Lingle used software to lower their pitch to match that of deer calls. In contrast, they found the deer did not respond to non-infant calls such as birdsong or the bark of a coyote (American Naturalist, DOI: 10.1086/677677).

This implies that infant distress calls share some common element across a range of mammals – some of them separated by over 90 million years of evolution – and that many mammalian mothers are attuned to that common element, says Lingle. They are likely to have evolved to respond quickly, rather than carefully, to situations that threaten their offspring, she speculates. "These are calls that are

generally made in a life-or-death situation," she says. "I think the advantage of securing survival for your offspring outweighs the potential for error."

Lingle and Riede's study is one of the first to show that wild mammals respond instinctively to the calls of other species, says Jaak Panksepp, a neuroscientist at Washington State University in Pullman. "They're showing that these deer can perceive the emotional content of another animal's separation call," he says. The work supports the idea that certain acoustic elements are associated with particular emotions across species, suggesting that different animals may experience similar emotional states.

http://www.eurekalert.org/pub_releases/2014-09/yu-stc091914.php

Simple test can help detect Alzheimer's before dementia signs show: York U study

York University researchers say a simple test that combines thinking and movement can help to detect heightened risk for developing Alzheimer's disease in a person, even before there are any telltale behavioral signs of dementia.

TORONTO - York University researchers say a simple test that combines thinking and movement can help to detect heightened risk for developing Alzheimer's disease in a person, even before there are any telltale behavioural signs of dementia.

Faculty of Health Professor Lauren Sergio and PhD candidate Kara Hawkins who led the study asked the participants to complete four increasingly demanding visual-spatial and cognitive-motor tasks, on dual screen laptop computers. The test aimed at detecting the tendency for Alzheimer's in those who were having cognitive difficulty even though they were not showing outward signs of the disease.

"We included a task which involved moving a computer mouse in the opposite direction of a visual target on the screen, requiring the person's brain to think before and during their hand movements," says Sergio in the School of Kinesiology & Health Science. "This is where we found the most pronounced difference between those with mild cognitive impairment (MCI) and family history group and the two control groups."

Hawkins adds, "We know that really well-learned, stereotyped motor behaviours are preserved until very late in Alzheimer's disease." These include routine movements, such as walking. The disruption in communication will be evident when movements require the person to think about what it is they are trying to do.

For the test, the participants were divided into three groups – those diagnosed with MCI or had a family history of Alzheimer's disease, and two control groups, young adults and older adults, without a family history of the disease. The study, Visuomotor Impairments in Older Adults at Increased Alzheimer's Disease Risk, published in the Journal of Alzheimer's Disease, found that 81.8 per cent of the participants that had a family history of Alzheimer's disease and those with MCI displayed difficulties on the most cognitively demanding visual motor task.

"The brain's ability to take in visual and sensory information and transform that into physical movements requires communication between the parietal area at the back of the brain and the frontal regions," explains Sergio. "The impairments observed in the participants at increased risk of Alzheimer's disease may reflect inherent brain alteration or early neuropathology, which is disrupting reciprocal brain communication between hippocampal, parietal and frontal brain regions."

"In terms of being able to categorize the low Alzheimer's disease risk and the high Alzheimer's disease risk, we were able to do that quite well using these kinematic measures," says Hawkins. "This group had slower reaction time and movement time, as well as less accuracy and precision in their movements."

Hawkins says the findings don't predict who will develop Alzheimer's disease, but they do show there is something different in the brains of most of the participants diagnosed with MCI or who had a family history of the disease.

http://www.eurekalert.org/pub_releases/2014-09/asu-rpp091914.php

Research predicts possible 6,800 new Ebola cases this month

Rate of rise in cases significantly increased in August in Liberia and Guinea, around the time that a mass quarantine was put in place

Tempe, Ariz. - New research published today in the online journal PLoS Outbreaks predicts new Ebola cases could reach 6,800 in West Africa by the end of the month if new control measures are not enacted.

Arizona State University and Harvard University researchers also discovered through modelling analysis that the rate of rise in cases significantly increased in August in Liberia and Guinea, around the time that a mass quarantine was put in place, indicating that the mass quarantine efforts may have made the outbreak worse than it would have been otherwise. Deteriorating living and hygiene conditions in some of the quarantined areas sparked riots last month. Sierra Leone began a three day country-wide quarantine today, where all citizens have been asked to stay at home, said Sherry Towers, research professor for the ASU Simon A. Levin Mathematical, Computational and Modelling Sciences Center (MCMSC).

"There may be other reasons for the worsening of the outbreak spread, including the possibility that the virus has become more transmissible, but it's also possible that the quarantine control efforts actually made the outbreak spread more quickly by crowding people together in unsanitary conditions," Towers said.

The study, "Temporal variations in the effective reproduction number of the 2014 West Africa Ebola outbreak," is authored by Towers, Oscar Patterson-Lomba of the Harvard School of Public Health and Carlos Castillo-Chavez, ASU Regent's professor and MCMSC executive director.

Researchers assessed whether or not attempted control efforts are effective in curbing the ongoing West African Ebola outbreak that has spread over a large geographic area, causing thousands of infections and deaths. Because the outbreak has spread to densely populated areas, the risk of international spread is increased. Also compounding the problem is a lack of resources for effective quarantine and isolation in the under-developed countries that have been affected, and the high mobility of the population in a region with porous borders, according to the study. "No licensed vaccine or specific treatment for the disease is currently available. This leaves improved hygiene, quarantine, isolation and social distancing as the only potential interventions," Castillo-Chavez said. "Improved control measures must be put into place." On Tuesday, President Obama announced that 3,000 US troops and medical personnel would be sent to the region to help control the outbreak, he added.

Researchers examined the current outbreak data for Guinea, Sierra Leone and Liberia through statistical research methods up until Sept. 8, 2014, as estimated by the World Health Organization. The analysis examines the local rates of exponential rise to estimate how the reproduction number of cases appears to be changing over time. Calculations showed a range of 6,800 predicted new cases at the upper end of the spectrum and 4,400 on average. The study was funded by the National Institute of General Medical Sciences at the National Institutes of Health.

http://bit.ly/1rgseoI

There's a Black Market in Africa for Ebola Survivors' Blood

Using survivors' blood is an unproven treatment option

By Colin Schultz

Ebola is a disease without a cure. Getting through the infection involves, basically, waiting for your body to figure it out. It's not a promising prognosis. Yet not everyone who gets Ebola dies, and researchers with the World Health Organization think Ebola survivors might hold the key to a potential fix.

As the CBC wrote earlier this month, the WHO announced that they were going to start using "whole blood therapies and convalescent serums" to treat Ebola. Survivors' blood may carry antibodies to the disease, says the *Guardian*, and injecting infected people with this blood could help them fight off their infections. The WHO said they could have the blood treatment ready for widespread use by the end of the year.

But some people in the Ebola stricken region aren't content to wait for the WHO. A black market has emerged, says CNN, with people taking it upon themselves to self-medicate with survivors' blood. The treatment approach is unproven, and according to the *Washington Post* carries considerable risk: "[G]iving a patient someone else's blood can cause anaphylactic shock and death or infect [them] with other diseases such as HIV if the blood is tainted."

Not everyone who gets Ebola dies, but the lack of a proven cure changes the psychology of the disease. For the ongoing West African outbreak, the untreated mortality rate is sitting at 90 percent. With medical care, the rate drops to around 30 to 50 percent.

http://bit.ly/1uXss4n

"Someday" is Now for Solar and Wind Power, says Lazard

Large wind and solar power farms have the economics to go toe-to-toe with the cheapest fossil fuel-based power

By Peter Fairley

Large wind and solar power farms have the economics to go toe-to-toe with the cheapest fossil fuel-based power supplies in the United States according to the venerable financial advisory firm Lazard Ltd. Thanks to falling costs and rising efficiency, reports Lazard in an analysis released this week, utility-scale installations of solar panels and wind turbines now produce power at a cost that's competitive with natural gas and coal-fired generating stations - even without subsidies.

The results appear in the eighth annual update of Lazard's Levelized Cost of Energy Analysis [pdf], which compares the combined cost of financing, building, and operating power generating plants using a variety of energy technologies. Lazard projects that new utility-scale solar plants will deliver energy at US $72-86 per megawatt-hour, and wind turbines beat that with a cost of $37-81/MWh.

Those renewable energy options compare well against the cost of the most cost-effective natural gas-fired technology - combined cycle plants - which delivers at a projected $61-127/MWh (depending on whether the plant captures its carbon dioxide emissions). The renewables look even better against coal in Lazard's analysis, which prices new coal-fired generation at $66-171/MWh.

The London-based *Financial Times* says the message is that renewables are starting to "outshine" gas. The *FT* quotes George Bilicic, Lazard global head of power, energy & infrastructure, accepting that renewable energy has finally arrived: "We used to say some day solar and wind power would be competitive with conventional generation. Well, now it is some day."

Lazard is less keen on the present competitiveness of distributed renewables, such as rooftop photovoltaics. It estimates that rooftop PV delivers power at

$180/MWh for homes and $126/MWh for businesses due to, for example, the higher cost of rooftop installation and higher transaction costs associated with smaller-scale projects.

However, sophisticated studies show a more nuanced picture. As *IEEE Spectrum* reported in March 2013, rooftop PV installations are already cost-effective in the U.S. without subsidies in areas with strong sunlight and higher-than-average local power prices. According to the solar parity mapping tool profiled in that article and created by the Minnesota-based Institute for Local Self Reliance, California should have enough of these solar parity niche zones to support the installation of 10,780 MW of residential rooftop PV and 13,910 MW of commercial rooftop PV in 2014. That opportunity - if seized - also adds up to a considerable competitive challenge to conventional power plant technology.

http://nyti.ms/1sgIlVC

Lockdown Begins in Sierra Leone to Battle Ebola

Everyone in Sierra Leone ordered to remain indoors for three days

By ADAM NOSSITER SEPT. 19, 2014

FREETOWN, Sierra Leone - The most ambitious and aggressive government campaign against the Ebola epidemic gripping parts of West Africa began on Friday when Sierra Leone ordered everyone in the country to remain indoors for three days, suspending commerce, emptying the streets and halting this beleaguered nation in its tracks in an attempt stop the disease from spreading.

Calling the struggle against Ebola a matter of life or death, the government mustered police officers, soldiers and nearly 30,000 volunteers to go house to house, hoping to educate the country about the dangers of Ebola and identify people who might pass the disease to those around them.

"Some of the things we are asking you to do are difficult, but life is better than these difficulties," President Ernest Bai Koroma said in an extraordinary radio address on Thursday night explaining the national lockdown.

From the start, the limits of the government campaign were evident. The warnings, mobilization and exhortations quickly clashed with the reality that cases here are surging and the infrastructure to deal with them hardly exists.

There is no large-scale treatment center for Ebola patients in the capital, Freetown, so many patients have to be placed in a holding center until they can be transported to a facility hours away - that is, if an ambulance can be found to pick them up and if those packed facilities have room.

The countrywide lockdown showed the desperation among West African governments - particularly in the three hardest-hit countries, Guinea, Liberia and Sierra Leone - as they grapple with an epidemic that has already killed more than 2,600 people and shows no signs of slowing down.

While governments in the region have already cordoned off large swaths of territory in hopes of containing the outbreak, none have attempted anything on the scale of what is being tried here. The government says it wants to visit every residence in this country of about 6 million, with the aim of instructing people in how to stop the disease from being transmitted and to find out who is harboring sick people, with potentially deadly consequences.

"We have been sending lifesaving messages through radio, TV and print, but it's not enough," said Roeland Monasch, a representative for Unicef, which supported the government effort, providing money, advice and information materials. "We need to take information to where people are."

In the streets of the capital on Friday, one woman lay curled in a fetal position, eyes shut, precariously balanced on cardboard sheets next to an open gutter in front of locked storefronts. From a wary distance, the anti-Ebola volunteers said she had high fever. Hours of calls had produced no ambulance.

A small crowd, including the police, soldiers brandishing guns, presidential advisers and spectators taking cellphone pictures of the immobile woman, milled about. A medical worker said two more bodies in the vicinity needed attention. But still there was no ambulance. "They are not responding; they say they have lots of cases now," said a volunteer, Alhassan Kamara.

Finally, a rickety ambulance pulled up, more than five hours after the initial calls, the volunteers said. But the loosely outfitted attendants refused to pick up the sick woman: they had no chlorine spray and said it was not their job. A loud anti-Ebola jingle played on a car radio. It took a second ambulance, and the president of a moped club who quickly suited up in protective gear, to get the sick woman bundled off to uncertain care.

On nearby streets, other volunteers were going house to house to warn people of the disease's dangers. Normally clogged streets in the capital were empty, stores were shut down tight, and pedestrians were rare on the main thoroughfares.

The senior United Nations envoy appointed to work on the Ebola crisis, Dr. David Nabarro, said he was struck by the yawning gap between the spread of the disease and the ability to fight it. The world needed to increase the efforts on the ground many times over, he said. That would include "the capacity to treat between 9,000 and 10,000 people within the countries at any time," he said. "To get there, we need to get extra people and cash into the countries, obviously, but also we need fantastic organization and logistics that are second to none."

Dr. Dan Lucey, an American who volunteered in an Ebola holding center at a Freetown hospital, described the situation as horrific. "There were not enough beds, space," he said. "When you first see this, you say this is totally intolerable.

It can't be this bad," he said after returning home. "It was an incredible, searing experience not like anything I've ever seen."

Without treatment units in the capital, he said, patients who tested positive for Ebola had to be driven at least four hours away. Those who tested negative could be exposed to Ebola while they waited. When Dr. Lucey volunteered, there was just one other doctor present. Patients were housed together in open wards with a plastic curtain between beds, awaiting their test results. At the foot of each bed were three buckets - one for urine, one for stool, one for vomit.

"There were body fluids everywhere," he said. Fuel for the ambulances could be hard to come by. "It's beyond belief until you see it day after day," he said.

Dr. Oliver Johnson, a British physician currently working at the hospital with King's Health Partners, said Friday that the 18-bed unit had received 10 patients during the first day of the lockdown and now had four physicians. He said two other isolation units had opened in the Freetown area in the past several days. "We're starting to see more beds, more supplies. More staff are coming to work," he said.

Sierra Leonean health workers, who he said have worked bravely, are now being offered hazard pay. "Things are improving," he said, but "the real question is whether we can get ahead of the curve. We've been seeing more new patients than we've been able to build new beds."

The United States is planning to build as many as 17 Ebola treatment centers in Liberia, with about 1,700 treatment beds, while the United Nations is planning an expanded mission in the region, based in Accra, Ghana, according to Anthony Banbury, the United Nation's Ebola operation crisis manager. It is intended to be more nimble than the United Nations' notoriously bureaucratic operations, bringing in as many as 500 trucks and jeeps from other missions in Africa, possibly paying teams in one country to speed up safe burials, buying fuel for monitoring teams in another country, or offering helicopters to transport health workers where they are needed.

But even with the promises of help, international health officials are worried by what they describe as a rapid growth of cases here in Sierra Leone's capital - a dense urban environment where containment is difficult and the ability to respond is limited. "The situation in Freetown is very worrisome as cases increase," said Michael Goldfarb, a spokesman for Doctors Without Borders. "Without an immediate, massive, and effective response, there could be an explosion of cases as has been witnessed in Monrovia," he added, referring to the capital of Liberia.

Whether Sierra Leone's lockdown will constitute an effective response is open to question. Despite the mobilization, the volunteers hardly appeared to be thick on the ground. In some neighborhoods, residents said they were yet to see any of the green-vested young men and women who had volunteered.

In other neighborhoods, the volunteers - many of them students, all working for no pay - complained that there was no response to their knocks at most houses. If they arrived without supplies like soap or chlorine, residents were not interested in speaking with them, the volunteers said.

Where there was a response, it was often followed by cursory admonitions to residents to wash their hands, report on neighbors suspected of illness and wear long-sleeve shirts at the market.

At one house, several volunteers talked loudly at once about hand washing, leaving the residents visibly dazed. At another, they were amazed to discover residents who were supposed to be under quarantine because of their suspected exposure to Ebola, but were actually unguarded and free to roam about. At still another, one gave out questionable information about the Ebola virus - seeming to contradict some basic precautions.

Well into the morning, the house-to-house visits had yet to begin in Kroo Bay, a densely populated neighborhood of iron-roof shanties where roughly 14,000 people live, despite officials saying they would start at dawn. The police cruised into Kroo Bay on a pickup truck, yelling at residents to go indoors and warning of imprisonment. People simply stared at the officers and continued lingering as the police drove off.

"The policeman is doing his thing, and I am doing my thing," said Kerfala Koroma, 22, a building contractor. "We can't even afford something to eat on a normal day. How can we get something now?"

http://www.eurekalert.org/pub_releases/2014-09/ssoe-src091914.php

Stanford researchers create 'evolved' protein that may stop cancer from spreading

Experimental therapy stopped the metastasis of breast and ovarian cancers in lab mice, pointing toward a safe and effective alternative to chemotherapy

A team of Stanford researchers has developed a protein therapy that disrupts the process that causes cancer cells to break away from original tumor sites, travel through the blood stream and start aggressive new growths elsewhere in the body. This process, known as metastasis, can cause cancer to spread with deadly effect.

"The majority of patients who succumb to cancer fall prey to metastatic forms of the disease," said Jennifer Cochran, an associate professor of bioengineering who describes a new therapeutic approach in Nature Chemical Biology.

Today doctors try to slow or stop metastasis with chemotherapy, but these treatments are unfortunately not very effective and have severe side effects.

The Stanford team seeks to stop metastasis, without side effects, by preventing two proteins – Axl and Gas6 – from interacting to initiate the spread of cancer.

Axl proteins stand like bristles on the surface of cancer cells, poised to receive biochemical signals from Gas6 proteins. When two Gas6 proteins link with two Axls, the signals that are generated enable cancer cells to leave the original tumor site, migrate to other parts of the body and form new cancer nodules.

To stop this process Cochran used protein engineering to create a harmless version of Axl that acts like a decoy. This decoy Axl latches on to Gas6 proteins in the blood stream and prevents them from linking with and activating the Axls present on cancer cells.

In collaboration with Professor Amato Giaccia, who heads the Radiation Biology Program in Stanford's Cancer Center, the researchers gave intravenous treatments of this bioengineered decoy protein to mice with aggressive breast and ovarian cancers. Mice in the breast cancer treatment group had 78 percent fewer metastatic nodules than untreated mice. Mice with ovarian cancer had a 90 percent reduction in metastatic nodules when treated with the engineered decoy protein. "This is a very promising therapy that appears to be effective and non-toxic in pre-clinical experiments," Giaccia said. "It could open up a new approach to cancer treatment."

Giaccia and Cochran are scientific advisors to Ruga Corp., a biotech startup in Palo Alto that has licensed this technology from Stanford. Further preclinical and animal tests must be done before determining whether this therapy is safe and effective in humans.

Greg Lemke, of the Molecular Neurobiology Laboratory at the Salk Institute, called this "a prime example of what bioengineering can do" to open up new therapeutic approaches to treat metastatic cancer.

"One of the remarkable things about this work is the binding affinity of the decoy protein," said Lemke, a noted authority on Axl and Gas6 who was not part of the Stanford experiments. "The decoy attaches to Gas6 up to a hundredfold more effectively than the natural Axl," Lemke said. "It really sops up Gas6 and takes it out of action."

Directed Evolution

The Stanford approach is grounded on the fact that all biological processes are driven by the interaction of proteins, the molecules that fit together in lock-and-key fashion to perform all the tasks required for living things to function.

In nature proteins evolve over millions of years. But bioengineers have developed ways to accelerate the process of improving these tiny parts using technology called directed evolution. This particular application was the subject of the doctoral thesis of Mihalis Kariolis, a bioengineering graduate student in Cochran's lab.

Using genetic manipulation, the Stanford team created millions of slightly different DNA sequences. Each DNA sequence coded for a different variant of Axl. The researchers then used high-throughput screening to evaluate over 10 million Axl variants. Their goal was to find the variant that bound most tightly to Gas6. Kariolis made other tweaks to enable the bioengineered decoy to remain in the bloodstream longer and also to tighten its grip on Gas6, rendering the decoy interaction virtually irreversible.

Yu Rebecca Miao, a postdoctoral scholar in Giaccia's lab, designed the testing in animals and worked with Kariolis to administer the decoy Axl to the lab mice. They also did comparison tests to show that sopping up Gas6 resulted in far fewer secondary cancer nodules.

Irimpan Mathews, a protein crystallography expert at the SLAC National Accelerator Laboratory, joined the research effort to help the team better understand the binding mechanism between the Axl decoy and Gas6.

Protein crystallography captures the interaction of two proteins in a solid form, allowing researchers to take X-ray-like images of how the atoms in each protein bind together. These images showed molecular changes that allowed the bioengineered Axl decoy to bind Gas6 far more tightly than the natural Axl protein.

Next steps

Years of work lie ahead to determine whether this protein therapy can be approved to treat cancer in humans. Bioprocess engineers must first scale up production of the Axl decoy to generate pure material for clinical tests. Clinical researchers must then perform additional animal tests in order to win approval for and to conduct human trials. These are expensive and time-consuming steps.

But these early, hopeful results suggest that the Stanford approach could become a non-toxic way to fight metastatic cancer.

Glenn Dranoff, a professor of medicine at Harvard Medical School and a leading researcher at the Dana-Farber Cancer Institute, reviewed an advance copy of the Stanford paper but was otherwise unconnected with the research. "It is a beautiful piece of biochemistry and has some nuances that make it particularly exciting," Dranoff said, noting that tumors often have more than one way to ensure their survival and propagation.

Axl has two protein cousins, Mer and Tyro3, that can also promote metastasis. Mer and Tyro3 are also activated by Gas6. "So one therapeutic decoy might potentially affect all three related proteins that are critical in cancer development and progression," Dranoff said.

Dr. Erinn Rankin, a postdoctoral fellow in the Giaccia lab, carried out proof of principle experiments that paved the way for this study.
Other co-authors on the Nature Chemical Biology paper include Douglas Jones, a former doctoral student, and Shiven Kapur, a postdoctoral scholar, both of Cochran's lab, who contributed to the protein engineering and structural characterization, respectively.
Cochran said Stanford's support for interdisciplinary research made this work possible. Stanford ChEM-H Institute (Chemistry, Engineering & Medicine for Human Health) provided seed funds that allowed Cochran and Mathews to collaborate on protein structural studies. The Stanford Wallace H. Coulter Translational Research Grant Program, which supports collaborations between engineers and medical researchers, supported the efforts of Cochran and Giaccia to apply cutting edge bioengineering techniques to this critical medical need.

http://www.bbc.com/news/health-29260295

Call to offer HPV vaccine to boys

Scientific experts are meeting on Monday to discuss whether boys as well as girls should be offered the HPV jab.

By Helen Briggs Health editor, BBC News website

It comes amid pressure to extend vaccination to all adolescent boys in the UK, in line with other countries. The committee is expected to focus initially on whether to offer the vaccine to men who have sex with men, who may be at higher risk.
But a coalition of health experts and campaigners say vaccinating all boys aged 12 to 13 would save lives.
HPV (human papillomavirus) infections cause 5% of all cancers worldwide, and rates are rising. The virus causes most cases of cervical cancer, and some cancers in other parts of the body, including the throat, anus and penis. The UK's HPV vaccination programme reaches over 80% of girls, but coverage rates are lower in some communities. The Royal Society for Public Health is among those calling for all boys aged 12 to 13 to be offered the vaccine. It is thought that vaccinating girls will reduce the number of men getting HPV because infection occurs through sexual contact.
But Shirley Cramer, chief executive of the Royal Society for Public Health, said vaccinating all boys would help to protect girls from cancer, as well as protecting men who have sex with men. "Since introducing the HPV vaccination for girls in 2008, we have seen incredible uptake and sharp declines in HPV infection rates but we must ensure that boys, who don't profit from herd immunity can also reap these benefits," she said. "Herd immunity only works in later life for males who are sexually active with females who have been vaccinated - it won't work for men who are sexually active in countries where the vaccine isn't available, those who have sex with men, or those who have sex with the estimated 15% of girls who haven't had the vaccine."
Earlier this month, a group of MPs called for all adolescent boys to be offered the vaccine. They said more than 2,000 cases of cancer in men each year in the UK were caused by HPV. "The long-term savings in treatment and care of men with HPV-related diseases would considerably outweigh the extra cost (about £20 million a year) of extending the programme," they wrote in a letter to the Times. It was signed by the heads of the All-Party Parliamentary Groups on Cancer, Dentistry, Sexual and Reproductive Health, Men's Health and HIV and Aids.
Vaccination programmes offering protection for girls against HPV have been introduced in many countries. Some countries - including Australia, the US, Austria and part of Canada - have also extended the jab to boys.

Recommendations

Monday's meeting involves HPV experts from the government's Joint Committee on Vaccination and Immunisation. Their task is to investigate whether to extend the vaccine to boys, or men who have sex with men, or both. Any decision made will be passed to the main committee for consideration in October.
Public Health England said the UK HPV programme had achieved very high coverage for girls. "Extending vaccinating to boys in the UK, therefore, is likely to provide relatively few additional benefits, and under current assessment conditions and costs may not be the best use of health care resources," said Dr Kate Soldan, head of HPV surveillance at the health body.
"Some males, particularly men who have sex with men, are likely to gain far less protection from HPV through herd immunity from the vaccination of females."
Further studies were under way to inform the potential design and implementation of a vaccination policy targeted at men who have sex with men, she added.

http://nyti.ms/1po80ny

NASA Craft in Mars's Orbit, to Study Its Air

NASA's latest Mars spacecraft, Maven, arrived Sunday evening to study the mystery of what happened to the planet's air.

By KENNETH CHANG SEPT. 21, 2014

After a 33-minute engine firing, mission controllers received acknowledgment at about 10:25 p.m. Eastern time that Maven was in orbit around Mars.
After a six-week period to turn on and check systems on the spacecraft and to move it to its final orbit, Maven - the name is short for Martian Atmosphere and Volatile Evolution - is to take detailed measurements of the dynamics of Mars's upper atmosphere.
But first, it will have a sideshow, taking observations of a comet that, by rare happenstance, will make a close flyby of Mars on Oct. 19, passing within 82,000 miles. Mission managers have arranged to activate Maven's eight scientific sensors by then.

Bruce M. Jakosky, a professor of geological sciences at the University of Colorado who is the mission's principal investigator, said the spacecraft would spend five days observing how the comet's dust, traveling at 125,000 miles per hour, might heat up and expand Mars's atmosphere, and how water ice from the comet might bump up the levels of hydrogen.

As a precaution, Maven will be on the other side of Mars when the shower of comet dust is heaviest. "Just in case there's any dust that might hit us, we'll be shielded by the planet," Dr. Jakosky said.

On Monday, he will turn his attention to the coming science measurements. Planetary scientists believe that about four billion years ago, the young Mars was blanketed with a thick layer of air - heat-trapping carbon dioxide, in particular - that kept it warmer and wetter than it is today.

Sometime since then, the air thinned, leaving the surface dry and cold. The air molecules could have escaped to space or been transformed by chemical reactions into rock. Maven's eight instruments will take stock of Mars's upper atmosphere and catalog the solar wind particles bombarding the planet. That will allow the scientists to determine not only the rate at which the atmosphere is disappearing, but also how it is disappearing. The first science results are expected by the spring.

Maven is not the only new visitor to Mars. India's Mars Orbiter Mission, or MOM, is to swing into orbit on Tuesday night Eastern time. Three other orbiters are currently around Mars - NASA's Mars Odyssey and Mars Reconnaissance Orbiter, and the European Space Agency's Mars Express spacecraft. NASA also has two rovers, Opportunity and Curiosity, operating on the surface.

http://www.eurekalert.org/pub_releases/2014-09/uoc--moc090914.php

Mothers of children with autism less likely to have taken iron supplements

Five-fold greater risk found in children whose mothers had low supplemental iron and other risk factors for delivering a child with ASD

SACRAMENTO, Calif. - Mothers of children with autism are significantly less likely to report taking iron supplements before and during their pregnancies than the mothers of children who are developing normally, a study by researchers with the UC Davis MIND Institute has found. Low iron intake was associated with a five-fold greater risk of autism in the child if the mother was 35 or older at the time of the child's birth or if she suffered from metabolic conditions such as obesity hypertension or diabetes.

The research is the first to examine the relationship between maternal iron intake and having a child with autism spectrum disorder, the authors said. The study, "Maternal intake of supplemental iron and risk for autism spectrum disorders," is published online today in the American Journal of Epidemiology.

"The association between lower maternal iron intake and increased ASD risk was strongest during breastfeeding, after adjustment for folic acid intake," said Rebecca J. Schmidt, assistant professor in the Department of Public Health Sciences and a researcher affiliated with the MIND Institute.

The authors of the current study in 2011 were the first to report associations between supplemental folic acid and reduced risk for autism spectrum disorder, a finding later replicated in larger scale investigations.

"Further, the risk associated with low maternal iron intake was much greater when the mother was also older and had metabolic conditions during her pregnancy."

The study was conducted in mother-child pairs enrolled in the Northern California-based Childhood Autism Risks from Genetics and the Environment (CHARGE) Study between 2002 and 2009. The participants included mothers of children with autism and 346 mothers of children with typical development.

The researchers examined maternal iron intake among the study's participants, including vitamins, other nutritional supplements, and breakfast cereals during the three months prior to through the end of the women's pregnancies and breastfeeding. The mothers' daily iron intake was examined, including the frequency, dosages and the brands of supplements that they consumed.

"Iron deficiency, and its resultant anemia, is the most common nutrient deficiency, especially during pregnancy, affecting 40 to 50 percent of women and their infants," Schmidt said. "Iron is crucial to early brain development, contributing to neurotransmitter production, myelination and immune function. All three of these pathways have been associated with autism."

"Iron deficiency is pretty common, and even more common among women with metabolic conditions," Schmidt said. "However we want to be cautious and wait until this study has been replicated. "In the meantime the takeaway message for women is do what your doctor recommends. Take vitamins throughout pregnancy, and take the recommended daily dosage. If there are side effects, talk to your doctor about how to address them."

Other study authors are Daniel J. Tancredi, Paula Krakowiak, Robin L. Hansen and Sally Ozonoff, all of UC Davis.

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