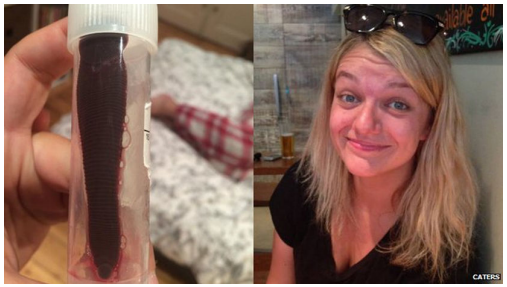
http://www.bbc.com/news/uk-scotland-29595164

Woman finds three-inch leech in nose after South East Asia trip

A backpacker found a 3in (7.5cm) leech that had been living up her nose for a month after a trip to South East Asia.



Daniela Liverani and the leech

Daniela Liverani, 24, from Edinburgh, had been having nosebleeds for weeks but put them down to a burst blood vessel from a motorbike crash. Ms Liverani was having a shower last Thursday when she was realised the dark shape wriggling in her nose was actually an animal. Hospital staff used forceps and tweezers to remove the parasite.

Ms Liverani believes she picked up the leech in Vietnam or Cambodia, but even when she felt it moving up and down her nostril, she thought it was a blood clot.

She told BBC Radio Scotland: "Your initial reaction isn't to start thinking, oh God, there's obviously a leech in my face."

Daniela Liverani tells 5 live: "I just thought it was a congealed blood clot"

It was when Ms Liverani was in the shower that the leech's presence was most noticeable. She said: "Obviously my nasal passages would open up because of the steam and the heat and the water, and it would come out quite far, about as far as my lip.

"So I could kind of see it out of the corner of my eye but still didn't think it was a worm because it just looked like a blood clot.

"On Thursday I jumped out the shower and I unsteamed the mirror and I had a proper good look, and I could see little ridges on him." That was the moment when Ms Liverani realised she was housing a parasite.

'Strange situation'

She went to accident and emergency where doctors removed "Mr Curly" - as Ms Liverani nicknamed the leech - with forceps and tweezers.

"The doctors did a great job, hats off to them, because obviously they don't see something like that every day", she added.

"They did what they could in a strange situation while trying to keep their cool."

Ms Liverani then took the leech home for the night, at the doctors' suggestion.

However, Mr Curly did not live to see another day.

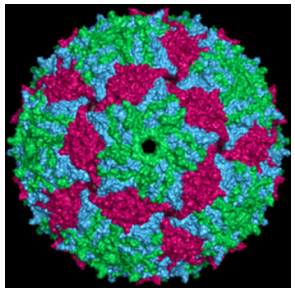
"He's in an Edinburgh City Council bin," said Ms Liverani. "He's probably long gone by now. I boiled him first."

http://bit.ly/1wdrCjE

The Epstein–Barr Virus Wears Chain Mail

Electron microscopy reveals a meshlike protective layer in the viruses that cause herpes and mononucleosis, among other disorders

October 13, 2014 |By Diana Crow



The Epstein–Barr virus and its relatives in the herpesvirus family are known for their longevity. They persist in host tissues for years, causing diseases like mononucleosis, Kaposi's sarcoma and herpes, and are notoriously difficult to kill. University of California, Los Angeles, biophysicist Z. Hong Zhou thinks the secret to herpesviruses' resilience may be a layer of microscopic chain mail.

Although no one has developed a vaccine against bacteriophages, now that human pathogens like Epstein–Barr and herpes simplex have been added to the viral chain mail club, that's likely to change. **Naranson via Wikimedia Commons**

Zhou and his colleagues examined the outer shells, or capsids, of a primate herpesvirus under an electron microscope and saw a pattern of interlocking protein rings. Those rings form a mesh that can withstand intense pressures and explain why herpesviruses can maintain decades-long infections.

The study, published in the October 7 issue of Structure, marks the first time anyone has been able to bring the herpesvirus structure into focus - literally. Solving the configuration of a viral capsid requires both the ability to discern individual molecules and the ability to see how those molecules fit together in the viral shell.

Herpesviruses are so big that they don't fit within most electron microscopes' fields of view. Trying to understand their structure by looking at atomic-resolution images is like trying to understand the anatomy of an elephant based on extreme close-ups - easier said than done. Once Zhou's team brought the image into focus, however, they saw a familiar pattern. The interlocking mesh pattern is very similar to the structure other virologists have found in bacteriophages, a family of viruses that infect bacteria, which suggests that herpesviruses and bacteriophages may share a common evolutionary origin. "We never would have seen that connection based on genetic sequences alone," says Jack Johnson, a virologist at The Scripps Research Institute not involved with the study who first discovered the chain mail pattern in bacteriophages. "This study shows how important it is to actually look at the structure."

These results may also open up new possibilities for vaccine development. According to Zhou, understanding the geometry of chemical bonds within the

chain mail may help researchers develop antiviral particles that can break them apart. “Most viruses do not have these rings,” Zhou says. “Instead, their capsids are made of ‘bricks’ that disassemble once they've entered a host cell.” These capsid bricks are like LEGO blocks ; even though they fit together tightly, they're meant to be pulled apart. Herpesviruses, however, are built to last.

They have to be. Their DNA is packed into the capsid so tightly that the pressure it exerts on the capsid wall is about 50 times greater than the pressure Earth's atmosphere exerts at sea level. Techniques that neutralize viruses which have LEGO-style capsids often don't work on Epstein–Barr, herpes or Kaposi's sarcoma viruses, much to the disappointment of many vaccine developers. Solving the structure is only a first step toward a vaccine, but a crucial one. Although no one has developed a vaccine against bacteriophages (“There really isn't a market for immunizing bacteria,” Johnson says), now that human pathogens like Epstein–Barr and herpes simplex have been added to the viral chain mail club, that's likely to change.

http://www.eurekalert.org/pub_releases/2014-10/uoc--mlo100914.php

Moderate levels of 'free radicals' found beneficial to healing wounds

Long assumed to be destructive to tissues and cells, "free radicals" generated by the cell's mitochondria - the energy producing structures in the cell - are actually beneficial to healing wounds.

That's the conclusion of biologists at UC San Diego who discovered that "reactive oxygen species" - chemically reactive molecules containing oxygen, such as peroxides, commonly referred to as free radicals - are necessary for the proper healing of skin wounds in the laboratory roundworm C. elegans.

In a paper published in the October 13 issue of the journal Developmental Cell, the researchers found that free radicals generated in the mitochondria not only are necessary for skin wound healing, but that increased levels of reactive oxygen species, or ROS, can actually make wounds heal faster.

"There are many ways you can generate ROS in the cell, but no one had looked in the mitochondria in detail," said Andrew Chisholm, a professor of biology at UC San Diego, who conducted the study with Suhong Xu, a postdoctoral fellow in his laboratory. "Our discovery was surprising because we didn't realize that mitochondria were playing these roles in wound healing."

Free radicals, or ROS, have long been known to damage DNA, RNA and proteins. Because such oxidative damage is thought to contribute to premature aging and cancer, many people take antioxidants to minimize the cellular damage from free radicals.

But the UC San Diego researchers found that while too much ROS in the cell may be bad for you, eliminating ROS altogether prevents wound healing, at least for roundworms. Their discovery has implications for the development of new pharmaceuticals to treat the elderly and people with diabetes who have chronic issues with wound healing.

"It appears you need some optimal level of ROS signaling," explains Chisholm. "Too much is bad for you, but too little is also bad. We discovered in our experiments that when we knocked out the genes that produced ROS in the mitochondria and eliminated antioxidants, the roundworms had trouble closing up their wounds. We also found that a little more ROS helped the wounds close faster than normal."

While the researchers have confirmed their results only for the lowly roundworm, they suspect it applies to higher animals and are planning to continue further investigations in rodents. "We suspect that these genetic pathways are conserved, so that they would apply to vertebrates and mammals as well," said Chisholm.

The project was supported by a grant from the National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health (R01 GM054657).

http://www.eurekalert.org/pub_releases/2014-10/bmj-hcd101014.php

High carb diet, acidic sports drinks and eating disorders take toll on athletes' teeth

But poor understanding of importance of good dental health on performance and training also key

But diet is not the only culprit, says the Statement. There is little in the way of education or encouragement to help athletes appreciate the importance of good dental health on their training and performance, it says.

The Consensus Statement, which draws on a comprehensive review of the published evidence and a recent symposium on the lessons of the London 2012 Olympic Games, is intended as a call to action.

The UK and North American authors, all experts in dental health and sport and exercise medicine, point out that dental consultations accounted for almost a third of all medical visits at London 2012, and that demand has continued to increase at subsequent major competitive events.

Their review of the published evidence, which includes 39 studies on elite or professional sports men and women, showed that poor dental health is widespread: tooth decay (dental caries); gum disease (periodontal disease); enamel erosion, and infected wisdom teeth (pericoronitis) /impacted molars were the most commonly reported problems.

Tooth decay affected 15-75% of athletes; moderate to severe gum disease up to 15%; enamel erosion 36-85%; and pericoronitis/impacted molars 5-39%. Damage caused by trauma was reported by between 14-57% of athletes in high risk sports.

Athletes from rich countries were no less likely to be affected than those from poor countries, the data showed. And, overall, the dental health of athletes was on a par with that of non-athletes living in deprived communities.

Unsurprisingly, up to two thirds of those who had sustained trauma to their teeth said that this had adversely affected them. But up to 40% said that their dental health "bothered" them or affected their quality of life, while between one in 20 and one in five said that it had affected their performance.

There is a wealth of published evidence to show the impact of poor dental health on wellbeing, say the authors. "With clear psychosocial impacts of oral health, it would be surprising if training and performance were not affected in those athletes with poor oral health," they write.

And this could be especially important in competition, where marginal gains...or losses can make all the difference, they say.

Athletes with poor dental health are likely to suffer pain, difficulties sleeping and eating, systemic inflammation, a dent to their confidence and may be generally out of sorts, all of which could be detrimental to their performance, they suggest.

In a bid to explain the prevalence of poor dental health among athletes, the authors point to the preference for a high carb diet and acidic sports drinks during training and performance, the impact of which is likely to be worsened by a dry mouth during competition.

Eating disorders are also likely to be a factor, particularly in sports, such as boxing, horse riding, gymnastics, and long distance running, where body weight, composition, and aesthetics are crucial.

There has been little research on elite athletes' attitudes to dental health, but what there is suggests that their understanding of its importance is relatively poor. And it does not appear to be a priority for trainers and sporting bodies either, say the authors.

The steps needed to prevent poor dental health and maintain good mouth hygiene are simple and cheap, say the authors, who list them for each of the commonly reported conditions. But they need to be integrated at all levels, they say.

"To achieve a sustained effect, oral health should be embedded within other aspects of health promotion, taking into account the structural issues and inter-relationship of athletes within their sport and peer networks," they write.

"National sport funders and policy organisations should take a lead in integrating such an approach," they add.

http://www.eurekalert.org/pub_releases/2014-10/jhm-cdf100814.php

Chemical derived from broccoli sprouts shows promise in treating autism

Improvements were seen within 4 weeks and generally persisted during treatment duration

Results of a small clinical trial suggest that a chemical derived from broccoli sprouts - and best known for claims that it can help prevent certain cancers - may ease classic behavioral symptoms in those with autism spectrum disorders (ASDs).

The study, a joint effort by scientists at MassGeneral Hospital for Children and the Johns Hopkins University School of Medicine, involved 40 teenage boys and young men, ages 13 to 27, with moderate to severe autism.

In a report published online in the journal Proceedings of the National Academy of Sciences during the week of Oct. 13, the researchers say that many of those who received a daily dose of the chemical sulforaphane experienced substantial improvements in their social interaction and verbal communication, along with decreases in repetitive, ritualistic behaviors, compared to those who received a placebo.

"We believe that this may be preliminary evidence for the first treatment for autism that improves symptoms by apparently correcting some of the underlying cellular problems," says Paul Talalay, M.D., professor of pharmacology and molecular sciences, who has researched these vegetable compounds for the past 25 years.

"We are far from being able to declare a victory over autism, but this gives us important insights into what might help," says co-investigator Andrew Zimmerman, M.D., now a professor of pediatric neurology at UMass Memorial Medical Center.

ASD experts estimate that the group of disorders affects 1 to 2 percent of the world's population, with a much higher incidence in boys than girls. Its behavioral symptoms, such as poor social interaction and verbal communication, are well known and were first described 70 years ago by Leo Kanner, M.D., the founder of pediatric psychiatry at The Johns Hopkins University.

Unfortunately, its root causes remain elusive, though progress has been made, Talalay says, in describing some of the biochemical and molecular abnormalities that tend to accompany ASD. Many of these are related to the efficiency of energy generation in cells. He says that studies show that the cells of those with ASD often have high levels of oxidative stress, the buildup of harmful, unintended byproducts from the cell's use of oxygen that can cause inflammation, damage DNA, and lead to cancer and other chronic diseases.

In 1992, Talalay's research group discovered that sulforaphane has some ability to bolster the body's natural defenses against oxidative stress, inflammation and DNA damage. In addition, the chemical later turned out to improve the body's heat-shock response — a cascade of events used to protect cells from the stress caused by high temperatures, including those experienced when people have fever. Intriguingly, he says, about one-half of parents report that their children's autistic behavior improves noticeably when they have a fever, then reverts back when the fever is gone. In 2007, Zimmerman, a principal collaborator in the current study, tested this anecdotal trend clinically and found it to be true, though a mechanism for the fever effect was not identified.

Because fevers, like sulforaphane, initiate the body's heat-shock response, Zimmerman and Talalay wondered if sulforaphane could cause the same temporary improvement in autism that fevers do. The current study was designed to find out.

Before the start of the trial, the patients' caregivers and physicians filled out three standard behavioral assessments: the Aberrant Behavior Checklist (ABC), the Social Responsiveness Scale (SRS) and the Clinical Global Impressions-Improvement scale (CGI-I). The assessments measure sensory sensitivities, ability to relate to others, verbal communication skills, social interactions and other behaviors related to autism.

Twenty-six of the subjects were randomly selected to receive, based on their weight, 9 to 27 milligrams of sulforaphane daily, and 14 received placebos. Behavioral assessments were again completed at four, 10 and 18 weeks while treatment continued. A final assessment was completed for most of the participants four weeks after the treatment had stopped.

Most of those who responded to sulforaphane showed significant improvements by the first measurement at four weeks and continued to improve during the rest of the treatment. After 18 weeks of treatment, the average ABC and SRS scores of those who received sulforaphane had decreased 34 and 17 percent, respectively, with improvements in bouts of irritability, lethargy, repetitive movements, hyperactivity, awareness, communication, motivation and mannerisms.

After 18 weeks of treatment, according to the CGI-I scale, 46, 54 and 42 percent of sulforaphane recipients experienced noticeable improvements in social interaction, aberrant behaviors and verbal communication, respectively.

Talalay notes that the scores of those who took sulforaphane trended back toward their original values after they stopped taking the chemical, just like what happens to those who experience improvements during a fever. "It seems like sulforaphane is temporarily helping cells to cope with their handicaps," he says.

Zimmerman adds that before they learned which subjects got the sulforaphane or placebo, the impressions of the clinical team — including parents — were that 13 of the participants noticeably improved. For example, some treated subjects looked them in the eye and shook their hands, which they had not done before. They found out later that all 13 had been taking sulforaphane, which is half of the treatment group.

Talalay cautions that the levels of sulforaphane precursors present in different varieties of broccoli are highly variable. Furthermore, the capacity of individuals to convert these precursors to active sulforaphane also varies greatly. It would be very difficult to achieve the levels of sulforaphane used in this study by eating large amounts of broccoli or other cruciferous vegetables.

These studies were designed at The Johns Hopkins University by Andrew Zimmerman in collaboration with Paul Talalay and Kirby Smith. Jed Fahey prepared the sulforaphane-rich broccoli sprout extract that was administered in capsules to patients. The clinical studies were done at the Lurie Center in Lexington, Massachusetts, which is dedicated to the study of autism and is a satellite of Massachusetts General Hospital's Department of Pediatrics. Other authors of the report include Kanwaljit Singh, Eric Macklin and Susan Connors of Harvard Medical School.

This work was supported by grants from the Nancy Lurie Marks Family Foundation, the Hussman Foundation, the Lewis B. and Dorothy Cullman Foundation, the Agnes Gund Foundation, the N of One Foundation and the Brassica Foundation for Chemoprotection Research.

U.S. patent applications have been filed by The Johns Hopkins University for inventors Smith, Talalay and Zimmerman. Talalay and Zimmerman have divested themselves from all potential financial benefits. The sulforaphane-rich broccoli sprout extract is not a commercial product. Broccoli sprouts and seeds rich in glucosinolates have been licensed by Johns Hopkins to Brassica Protection Products LLC; Antony Talalay, son of Paul Talalay, is chief executive officer. The university owns Brassica Protection Products stock, which is subject to certain restrictions under university policy. The terms of this arrangement are being managed by The Johns Hopkins University in accordance with its conflict of interest policies. ***View the article at PNAS (after the embargo lifts).***

http://bit.ly/1rH59Hi

Ebola Gorilla Vaccine Could Prevent Human Outbreaks

Infected gorillas and chimps butchered for meat may be behind Ebola outbreaks. David Biello reports

Download MP3

Humans are not the only primates ravaged by the deadly Ebola virus. Chimps and gorillas are also susceptible to the disease. The current Ebola epidemic, the biggest in human history, may have started with the butchering of an infected fruit bat. But it just as easily could have come from a chimpanzee, found dead in the forest and eaten by people who cannot afford to pass up free meat.

It would not be the first time.

Ebola has killed thousands of great apes. Some 95 percent of gorillas who become infected die. Several previous outbreaks of Ebola in central Africa stemmed from dead gorillas or chimps found in the forest and butchered for food. All it takes to start an epidemic is infected blood getting in a person's eye, mouth or open wound.

That's why veterinarians from the Wildlife Conservation Society and other conservation organizations may prove to be the front line for defending humans against Ebola.

Like their physician counterparts, vets are hoping to develop a vaccine, perhaps to be administered orally. At the very least, monitoring Ebola outbreaks in apes could provide early warning for potential human outbreaks. By saving the apes we may be saving ourselves.

http://nyti.ms/1xYvm9U

Smell Turns Up in Unexpected Places

A team of biologists has found that our skin is bristling with olfactory receptors.

By ALEX STONE OCT. 13, 2014

Smell is one of the oldest human faculties, yet it was one of the last to be understood by scientists. It was not until the early 1990s that biologists first described the inner workings of olfactory receptors — the chemical sensors in our noses — in a discovery that won a Nobel Prize.

Since then, the plot has thickened. Over the last decade or so, scientists have discovered that odor receptors are not solely confined to the nose, but found throughout body — in the liver, the heart, the kidneys and even sperm — where they play a pivotal role in a host of physiological functions.

Now, a team of biologists at Ruhr University Bochum in Germany has found that our skin is bristling with olfactory receptors. "More than 15 of the olfactory receptors that exist in the nose are also found in human skin cells," said the lead researcher, Dr. Hanns Hatt. Not only that, but exposing one of these receptors (colorfully named OR2AT4) to a synthetic sandalwood odor known as Sandalore sets off a cascade of molecular signals that appears to induce healing in injured tissue.

In a series of human tests, skin abrasions healed 30 percent faster in the presence of Sandalore, a finding the scientists think could lead to cosmetic products for aging skin and to new treatments to promote recovery after physical trauma.

The presence of scent receptors outside the nose may seem odd at first, but as Dr. Hatt and others have observed, odor receptors are among the most evolutionarily ancient chemical sensors in the body, capable of detecting a multitude of compounds, not solely those drifting through the air.

"If you think of olfactory receptors as specialized chemical detectors, instead of as receptors in your nose that detect smell, then it makes a lot of sense for them to be in other places," said Jennifer Pluznick, an assistant professor of physiology at Johns Hopkins University who in 2009 found that olfactory receptors help control metabolic function and regulate blood pressure in the kidneys of mice.

Think of olfactory receptors as a lock-and-key system, with an odor molecule the key to the receptor's lock. Only certain molecules fit with certain receptors. When the right molecule comes along and alights on the matching receptor, it sets in motion an elaborate choreography of biochemical reactions. Inside the nose, this culminates in a nerve signal being sent to brain, which we perceive as odor. But the same apparatus can fulfill other biological functions as well.

Dr. Hatt was one of the first scientists to study these functions in detail. In a study published in 2003, he and his colleagues reported that olfactory receptors found inside the testes function as a kind of chemical guidance system that enables sperm cells to find their way toward an unfertilized egg, giving new meaning to the notion of sexual chemistry.

He has since identified olfactory receptors in several other organs, including the liver, heart, lungs, colon and brain. In fact, genetic evidence suggests that nearly every organ in the body contains olfactory receptors.

"I've been arguing for the importance of these receptors for years," said Dr. Hatt, who calls himself an ambassador of smell, and whose favorite aromas are basil, thyme and rosemary. "It was a hard fight."

But researchers have gradually awakened to the biological importance of these molecular sniffers and the promise they hold for the diagnosis and treatment of disease. In 2009, for instance, Dr. Hatt and his team reported that exposing olfactory receptors in the human prostate to beta-ionone, a primary odor compound in violets and roses, appeared to inhibit the spread of prostate cancer cells by switching off errant genes.

The same year, Grace Pavlath, a biologist at Emory University, published a study on olfactory receptors in skeletal muscles. She found that bathing the receptors in Lyral, a synthetic fragrance redolent of lily of the valley, promoted the regeneration of muscle tissue. Blocking these receptors (by neutralizing the genes that code for them), on the other hand, was found to inhibit muscular regeneration, suggesting that odor receptors are a necessary component of the intricate biochemical signaling system that causes stem cells to morph into muscles cells and replace damaged tissue.

"This was totally unexpected," Dr. Pavlath said. "When we were doing this, the idea that olfactory receptors were involved in tissue repair was not out there." No

doubt, few scientists ever imagined that a fragrance sold at perfume counters would possess any significant medical benefits.

But it may not be all that surprising. Olfactory receptors are the largest subset of G protein-coupled receptors, a family of proteins, found on the surface of cells, that allow the cells to sense what is going on around them. These receptors are a common target for drugs - 40 percent of all prescription drugs reach cells via GPCRs - and that augurs well for the potential of what might be called scent-based medicine.

But because of the complexity of the olfactory system, this potential may still be a long way off. Humans have about 350 different kinds of olfactory receptors, and that is on the low end for vertebrates. (Mice, and other animals that depend heavily on their sense of smell for finding food and evading predators, have more than 1,000.)

Despite recent advances, scientists have matched just a handful of these receptors to the specific chemical compounds they detect - an effort further complicated by the fact that many scent molecules may activate the same receptor and, conversely, multiple receptors often react to the same scent. Little is still known about what most of these receptors do - or, for that matter, how they ended up scattered throughout the body in the first place.

Nor is it even clear that olfactory receptors have their evolutionary origins in the nose. "They're called olfactory receptors because we found them in the nose first," said Yehuda Ben-Shahar, a biologist at Washington University in St. Louis who published a paper this year on olfactory receptors in the human lung, which he found act as a safety switch against poisonous compounds by causing the airways to constrict when we inhale noxious substances. "It's an open question," he said, "as to which evolved first."

http://bit.ly/1yJQR1u

Quick Ebola Test, Not Quarantine, Could Be Best Defense

It's been coming up in just about every conversation I have about Ebola: why doesn't the United States ban flights from Liberia or at least putting people into quarantine to determine whether or not they have the virus?

Oct 13, 2014 04:01 PM ET // by Tracy Staedter

Both of those proposals have a humanitarian and economic cost that's hard to overlook. Banning people from traveling to and from Liberia, as well as other affected countries such as Sierra Leone, would put the brakes on healthcare in the locations it's needed most. And locking people into quarantine for the 21-day incubation period is not free. It's a civil liberties question; plus it takes manpower, money and time. Not ideal.

Could Ebola Become Airborne?

But in an opinion-piece for the NY Times, Siddhartha Mukherjee, an assistant professor of medicine at Columbia and the author of The Emperor of All Maladies: A Biography of Cancer, suggests that a test involving polymerase chain reaction, or P.C.R., could work well. The test involves a blood sample from a person, which then undergoes a chemical reaction to amplify genetic information, including that belonging to the virus.

Mukherjee estimates that a P.C.R.-based technique would cost between $60 and $200, quite a bit less than quarantining someone. And he points out that Texas health officials spent 100 times more than that disposing of the contaminated sheets from the home Thomas Eric Duncan, the first US-based Ebola patient to die. And because the test results come back "in about a third of the time of a trans-Atlantic flight, the flight would become the quarantine."

The test is not 100 percent conclusive. It's been known to give out a small number of false positives and negatives. But those numbers are fairly low overall.

Mukherjee suggests that a pilot program in the hardest-hit area could be effective. "Ebola is an ingenious virus," he writes. "To fight it, we need to be just as ingenious."

http://bit.ly/1zeXtGn

Only 58 percent of votes cast on tamper-resistant systems counted

A Rice University study of tamper-resistant voting methods revealed that only 58 percent of ballots were successfully cast across three voting systems.

Oct 14, 2014 by David Ruth

The researchers concluded additional work is needed to make voting both secure and user-friendly.

The study, "Usability of Voter Verifiable, End-to-End Voting Systems: Baseline Data for Helios, Prêt à Voter and Scantegrity II," examined three new end-to-end voting systems – systems that give voters the option to both verify the system is working properly and to check that their votes have been recorded after leaving the polling place.

Claudia Acemyan, a postdoctoral fellow at Rice and the study's lead author, said voting concerns such as accuracy, privacy and bribery/coercion have prompted research and development of ways to make voting tamper-resistant and verifiable by voters.

She said that while the three systems evaluated solved many of the security problems surrounding voting with traditional methods – such as voters being able to independently confirm that a vote was counted correctly – the systems' added complexity appeared to negatively impact their usability.

"Overall, the tested systems were exceptionally difficult to use," Acemyan said. "Our data revealed that success rates of voters casting ballots on these systems were extraordinarily low – specifically, only 58 percent of ballots were successfully cast across all three systems."

The research also revealed that using the three voting systems took twice as long as traditional voting systems. The three systems studied were Helios, a Web-based voting system; Prêt à Voter, a system that allows voting with paper forms that are scanned after they are filled out by voters; and Scantegrity II, an optical scan voting system that enables someone to vote with a specially designed paper bubble ballot.

Challenges ranged from voters having to complete new, confusing voting procedures that deviated from what they currently do to cast a vote, to voters having to use equipment with which they are unfamiliar.

"If voting is more time-consuming, then it might mean more people will have to wait in longer lines and election officials might need to purchase more equipment," Acemyan said. "And if individuals are unable to complete the voting process, it can impact the outcome of elections."

Acemyan said that voting-system developers must be mindful of different types of voters and their level of comfort with technology and unfamiliar procedures. "When designing voting systems, you must keep the diverse population in mind – otherwise you have the potential to disenfranchise voters and change election outcomes," Acemyan said. "Voting security is important, but there needs to be a way for it to happen behind the scenes. It should not require additional effort on the voter's behalf."

The study of the three voting systems included 37 participants (22 male, 15 female) who were U.S. citizens at least 18 years of age. Thirty-eight percent of the participants were African-American, 27 percent Caucasian, 11 percent Mexican-American/Chicano, 11 percent Hispanic/Latino and 13 percent other ethnicities. The majority of participants – 62 percent – completed some college or had an associate's degree, 5 percent had a high school diploma or GED, 22 percent had a bachelor's degree or equivalent and 11 percent held a postgraduate degree. Participants had normal or corrected-to-normal vision and had, on average, voted in 5.1 state and local elections. Volunteers rated their computer expertise on a scale from one to 10, with one being novice and 10 being expert; the average was 8.2.

Acemyan said that she hopes the research will encourage further improvements in end-to-end voting systems.

More information: The study is available online: www.usenix.org/system/files/co… ets_0203-acemyan.pdf

http://www.eurekalert.org/pub_releases/2014-10/sri-sla101314.php

Scientists link ALS progression to increased protein instability

New study provides evidence that proteins linked to more severe forms of ALS are less stable structurally and more prone to form clusters or aggregates.

LA JOLLA, CA - A new study by scientists from The Scripps Research Institute (TSRI), Lawrence Berkeley National Laboratory (Berkeley Lab) and other institutions suggests a cause of amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's disease.

"Our work supports a common theme whereby loss of protein stability leads to disease," said John A. Tainer, professor of structural biology at TSRI and senior scientist at Berkeley Lab, who shared senior authorship of the new research with TSRI Professor Elizabeth Getzoff.

Getzoff, Tainer and their colleagues, who focused on the effects of mutations to a gene coding for a protein called superoxide dismutase (SOD), report their findings this week in the online Early Edition of the Proceedings of the National Academy of Sciences. The study provides evidence that those proteins linked to more severe forms of the disease are less stable structurally and more prone to form clusters or aggregates.

"The suggestion here is that strategies for stabilizing SOD proteins could be useful in treating or preventing SOD-linked ALS," said Getzoff.

Striking in the Prime of Life

ALS is notorious for its ability to strike down people in the prime of life. It first leapt into public consciousness when it afflicted baseball star Lou Gehrig, who succumbed to the disease in 1941 at the age of only 38. Recently, the ALS Association's Ice Bucket Challenge has enhanced public awareness of the disease. ALS kills by destroying muscle-controlling neurons, ultimately including those that control breathing. At any one time, about 10,000 Americans are living with the disease, according to new data from the Centers for Disease Control and Prevention, but it is almost always lethal within several years of the onset of symptoms.

SOD1 mutations, the most studied factors in ALS, are found in about a quarter of hereditary ALS cases and seven percent of ordinary "sporadic" ALS cases. SOD-linked ALS has nearly 200 variants, each associated with a distinct SOD1 mutation. Scientists still don't agree, though, on just how the dozens of different SOD1 mutations all lead to the same disease.

One feature that SOD1-linked forms of ALS do have in common is the appearance of SOD clusters or aggregates in affected motor neurons and their support cells. Aggregates of SOD with other proteins are also found in affected cells, even in ALS cases that are not linked to SOD1 mutations.

In 2003, based on their and others' studies of mutant SOD proteins, Tainer, Getzoff and their colleagues proposed the "framework destabilization" hypothesis. In this view, ALS-linked mutant SOD1 genes all code for structurally unstable forms of the SOD protein. Inevitably some of these unstable SOD proteins lose their normal folding enough to expose sticky elements that are normally kept hidden, and they begin to aggregate with one another, faster than neuronal cleanup systems can keep up—and that accumulating SOD aggregation somehow triggers disease.

Faster Clumping, Worse Disease

In the new study, the Tainer and Getzoff laboratories and their collaborators used advanced biophysical methods to probe how different SOD1 gene mutations in a particular genetic ALS "hotspot" affect SOD protein stability.

To start, they examined how the aggregation dynamics of the best-studied mutant form of SOD, known as SOD G93A, differed from that of non-mutant, "wild-type" SOD. To do this, they developed a method for gradually inducing SOD aggregation, which was measured with an innovative structural imaging system called SAXS (small-angle X-ray scattering) at Berkeley Lab's SIBYLS beamline.

"We could detect differences between the two proteins even before we accelerated the aggregation process," said David S. Shin, a research scientist in Tainer's laboratories at Berkeley Lab and TSRI who continues structural work on SOD at Berkeley.

The G93A SOD aggregated more quickly than wild-type SOD, but more slowly than an SOD mutant called A4V that is associated with a more rapidly progressing form of ALS. Subsequent experiments with G93A and five other G93 mutants (in which the amino acid glycine at position 93 on the protein is replaced with a different amino acid) revealed that the mutants formed long, rod-shaped aggregates, compared to the compact folded structure of wild-type SOD. The mutant SOD proteins that more quickly formed longer aggregates were again those that corresponded to more rapidly progressing forms of ALS.

What could explain these SOD mutants' diminished stability?

Further tests focused on the role of a copper ion that is normally incorporated within the SOD structure and helps stabilize the protein. Using two other techniques, electron-spin resonance (ESR) spectroscopy and inductively coupled plasma mass spectrometry (ICP-MS), the researchers found that the G93-mutant SODs seemed normal in their ability to take up copper ions, but had a reduced ability to retain copper under mildly stressing conditions—and this ability was lower for the SOD mutants associated with more severe ALS.

"There were indications that the mutant SODs are more flexible than wild-type SOD, and we think that explains their relative inability to retain the copper ions," said Ashley J. Pratt, the first author of the study, who was a student in the Getzoff laboratory and postdoctoral fellow with Tainer at Berkeley Lab.

Toward New Therapies

In short, the G93-mutant SODs appear to have looser, floppier structures that are more likely to drop their copper ions—and thus are more likely to misfold and stick together in aggregates.

Along with other researchers in the field, Getzoff and Tainer suspect that deviant interactions of mutant SOD trigger inflammation and disrupt ordinary protein trafficking and disposal systems, stressing and ultimately killing affected neurons.

"Because mutant SODs get bent out of shape more easily," said Getzoff, "they don't hold and release their protein partners properly. By defining these defective partnerships, we can provide new targets for the development of drugs to treat ALS."

The researchers also plan to confirm the relationship between structural stability and ALS severity in other SOD mutants. "If our hypothesis is correct," said Shin, "future therapies to treat SOD-linked ALS need not be tailored to each individual mutation—they should be applicable to all of them."

The ESR experiments were performed at the laboratories of Brian Crane and Jack H. Freed at Cornell University, and the ICP-MS experiments at the laboratory of Michael W.W. Adams at the University of Georgia.

Other contributors to the study, "Aggregation propensities of Superoxide Dismutase G93 hotspot mutants mirror Amyotrophic Lateral Sclerosis clinical phenotypes," were Gregory E. Merz and Peter P. Borbat of Cornell University, Robert P. Rambo and Kevin N. Dyer of Berkeley Lab, and W. Andrew Lancaster and Farris L. Poole II of the University of Georgia. The research was supported in part by the National Institutes of Health's National Institute of General Medical Sciences (R01GM039345, R01GM066775, P41GM103521, T32GM008267, 9P41GM103310), National Center for Research Resources (2P41RR017573, P41RR016292) and National Institute of Aging (T32AG000266), the National Science Foundation, the Skaggs Institute for Chemical Biology at TSRI and the Buck Institute for Research on Aging.

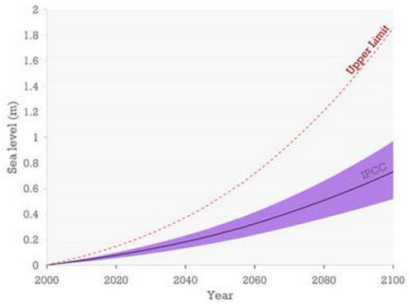
http://www.eurekalert.org/pub_releases/2014-10/uoc--rsl101314.php

Rising sea levels of 1.8 meters in worst-case scenario

The climate is getting warmer, the ice sheets are melting and sea levels are rising – but how much?

The report of the UN's Intergovernmental Panel on Climate Change (IPCC) in 2013 was based on the best available estimates of future sea levels, but the panel was not able to come up with an upper limit for sea level rise within this century. Now researchers from the Niels Bohr Institute and their colleagues have calculated the risk for a worst-case scenario. The results indicate that at worst, the sea level would rise a maximum of 1.8 meters. The results are published in the scientific journal Environmental Research Letters.

What causes the sea to rise is when all the water that is now frozen as ice and lies on land melts and flows into the sea. It is first and foremost about the two large, kilometer-thick ice sheets on Greenland and Antarctica, but also mountain glaciers. In addition, large amounts of groundwater is pumped for both drinking water and agricultural use in many parts of the world and more groundwater is pumped than seeps back down into the ground, so this water also ends up in the oceans. Finally, what happens is that when the climate gets warmer, the oceans also get warmer and hot water expands and takes up more space. But how much do the experts expect the sea levels to rise during this century at the maximum?



The worst-case sea level projections is shown in red. There is 95% certainty that sea level will not rise faster than this upper-limit. Purple shows the likely range of sea level rise as projected in the IPCC fifth assessment report under a scenario with rising emissions throughout the 21st century. **Credit: (Credit: Aslak Grinsted, NBI)**

Melting of the ice sheets

"We wanted to try to calculate an upper limit for the rise in sea level and the biggest question is the melting of the ice sheets and how quickly this will happen. The IPCC restricted their projections to only using results based on models of each process that contributes to sea level. But the greatest uncertainty in assessing the evolution of sea levels is that ice sheet models have only a limited ability to capture the key driving forces in the dynamics of the ice sheets in relation to climatic impact," Aslak Grinsted, Associate Professor at the Centre for Ice and Climate at the Niels Bohr Institute at the University of Copenhagen.

Aslak Grinsted has therefore, in collaboration with researchers from England and China, worked out new calculations. The researchers have combined the IPCC numbers with published data about the expectations within the ice-sheet expert community for the evolution, including the risk for the collapse of parts of Antarctica and how quickly such a collapse would take place.

"We have created a picture of the propable limits for how much global sea levels will rise in this century. Our calculations show that the seas will likely rise around 80 cm. An increase of more than 180 cm has a likelihood of less than 5 percent. We find that a rise in sea levels of more than 2 meters is improbable," Aslak Grinsted, but points that the results only concern this century and the sea levels will continue to rise for centuries to come.

Article in Environmental Research Letters: http://iopscience.iop.org/1748-9326/9/10/104008

http://www.eurekalert.org/pub_releases/2014-10/hzm--tcb100814.php

Thyroid carcinoma: Biomarker reveals cancer cause

CLIP2 serves as a radiation marker: After exposure to radiation from radioiodine, both the genetic activity and the protein expression are increased, as the scientists' studies were able to substantiate.

CLIP2 appears to be particularly significant in the development of tumours in the thyroid gland after radiation exposure.

The team around Martin Selmansberger, Dr. Julia Heß, Dr. Kristian Unger and Prof. Dr. Horst Zitzelsberger from the Radiation Cytogenetics Research Unit at the Helmholtz Zentrum München discovered a connection between high CLIP2 levels and the radiation history of patients with papillary thyroid carcinoma.

"In our study, we were able to verify radiation-associated CLIP2 expression at the protein level in three different cohorts of patients with thyroid carcinoma," reports first author Selmansberger.

The research paper was prepared at the Helmholtz Zentrum München in cooperation with the Institute of Radiation Protection and the Analytical Pathology Research Unit.

Radiation marker CLIP2 allows distinction of cancer cause and risk assessment

"CLIP2 serves as a radiation marker and allows us to distinguish between radiation-induced and sporadic thyroid carcinomas," adds study leader Heß.

In their investigations, the scientists developed a standardized method to determine the CLIP2 biomarker status.

"This biomarker allows us both to draw conclusions about the mechanisms involved in the development of such tumours and to evaluate the risk of thyroid cancer after exposure to high level radiation, for instance, following a radiation accident," reports Heß.

The Helmholtz Zentrum München focuses its work in health research on major widespread diseases. In addition to diabetes and lung diseases, this also includes cancer.

The objective of the Helmholtz Zentrum München is the rapid further development of the results of basic research in order to provide benefits for society.

**CAP-GLY domain containing linker protein 2. The exact function of CLIP2 in the carcinogenesis of thyroid carcinoma is unknown. Reconstruction of the CLIP2 gene regulatory network suggests, however, that CLIP2 is involved in fundamental carcinogenic processes and that it consequently contributes to tumour development.*

Selmansberger, M. et al. (2014). CLIP2 as radiation biomarker in papillary thyroid carcinoma, Oncogene, doi:10.1038/onc.2014.311

http://www.eurekalert.org/pub_releases/2014-10/cru-sfm101414.php

Scientists find molecular 'breadcrumb trail' that helps melanoma spread

Melanoma cells are drawn to follow the 'trail' of a naturally-occurring molecule in the body

Cancer Research UK scientists have discovered that melanoma cells are drawn to follow the 'trail' of a naturally-occurring molecule in the body, which directs this serious type of skin cancer to spread, according to research published today (Tuesday) in PLOS Biology.

The team at the Cancer Research UK Beatson Institute at the University of Glasgow, revealed that melanoma cells give themselves the 'green light' to move using the molecule - a type of fatty chemical called lysophosphatidic acid (LPA). This signal prompts them to travel and spread in the body. The researchers showed in cancer cell lines and mice that tumour cells start their journey by first breaking down a nearby source of LPA molecules. Once nearby levels of LPA are depleted, the cells then move out of the tumour in search of more. This creates a trail leading to the bloodstream and onto a new site in the body.

Unlike other cancers, where cells stick tightly to their neighbours, the structure of melanoma cells means they are primed to spread from the start. So as soon as they have taken the directions given by LPA they start moving. This means the cancer can be difficult to treat because it spreads quickly and aggressively.

The researchers filmed the cells and found that they move at speed, spreading around the body at a pace of a millimetre per day. This speed means a cell can arrive anywhere in the body within a few weeks.

Lead author, Professor Robert Insall, Cancer Research UK scientist at the Beatson Institute at the University of Glasgow, said: "Our exciting findings show that skin cancer cells create their own 'green light' signal to start spreading, and are lured to travel around the body by a trail of these fatty molecules.

"The next step will be to find how the melanoma cells break down the LPA molecules to see if this sparks ideas for new ways to stop the cancer from spreading. At the moment our research is still in early stages but we hope this could help doctors to make sure this cancer doesn't spread."

The rates of people diagnosed with melanoma are five times higher than 40 years ago. Over 13,000 people are diagnosed with melanoma every year in the UK. Each year, around 2,200 people die from the disease.

Professor Nic Jones, Cancer Research UK's chief scientist, said: "Sadly there are few options available for patients whose melanoma has spread, which is especially concerning as this type of cancer has risen rapidly since the 70s.

"Research like this is crucial to find effective ways to limit the spread of tumours and increase the chances for more successful treatment of this horrible disease.

"We can all also reduce our risk of the disease by keeping safe in the sun. When the sun is strong it's best to cover up with clothes and spend time in the shade to protect your skin from sunburn and reduce your risk of skin cancer."

A video about the research can be found here: https://www.youtube.com/watch?v=a_1AW7GswT4&feature=youtu.be

For media enquiries contact Emily Head in the Cancer Research UK press office on 020 3469 6189 or, out of hours, on 07050 264 059.

Insall et al. Melanoma cells break down LPA to establish local gradients that drive chemotactic dispersal. PLOS Biology. DOI: 10.1371/journal.pbio.1001966.

http://www.eurekalert.org/pub_releases/2014-10/w-sir101414.php

Study identifies risk factors for sexual assault, including age and alcohol consumption

Risk factors for sexual assault, including young age and alcohol consumption, must be addressed when considering preventative strategies

Risk factors for sexual assault, including young age and alcohol consumption, must be addressed when considering preventative strategies, suggests a new study, published today (15 October) in BJOG: An International Journal of Obstetrics and Gynaecology (BJOG).

The Danish study used data from all women attending the specialised centre for victims of sexual assault (CVSA) in Copenhagen for sexual assault or attempted sexual assault between March 2001 and December 2010. A total of 2541 women were included in the sample. The study aimed to describe the victims of sexual assault and the circumstances in which the assaults occurred in order to identify risk factors and enable the development of preventative measures. A focus was placed on how age and the relationship between the victim and the perpetrator were associated with the circumstance of the assault.

Over the last decade, it has been increasingly recognised that many patients seen in the healthcare system have a history of sexual assault and in 2002 the World Health Organisation classified sexual violence as a major public health problem and underlined the need for further research in this field.

Results of this study showed that 66% of the women were aged 15-24 years old and 75% had met the perpetrator before the sexual assault with nearly 50% reporting that the perpetrator was a current or former boyfriend, family member or someone they considered a friend.

Women with no previous contact or knowledge of their perpetrator were more likely to report to the police and were at a higher risk of sustaining an injury, the research showed.

Looking specifically at alcohol, the study found that over 40% of women had consumed more than 5 units of alcohol. These women were more often sexually assaulted by a stranger or someone they met within 24 hours prior to the assault. Furthermore, a physical injury was found in 53% of cases and 33% of the victims had suffered a previous sexual assault.

Dr Mie-Louise Larsen, from the Centre for Victims of Sexual Assault Department and the University of Copenhagen and co-author of the study said:

"Our results challenge the typical stereotype of a violent rape attack by a stranger, which is important in creating an environment where women are not reluctant to seek help after a sexual assault.

"We need to raise awareness of the fact that most sexual assaults are perpetrated by someone known to the woman, often in familiar surroundings. Many victims will not sustain a physical or anogenital injury. In order to change the general attitudes towards sexual assault, this information should not only target young people, but also the police, healthcare professionals and the general public."

Patrick Chien, BJOG deputy editor-in-chief said:

"Identifying risk factors for sexual assault is vital for both the prevention of assaults and the improvement of early interventions.

"The results of this study suggest young age and drinking alcohol were risk factors for sexual assault. The study provides us with further insight and explores the circumstances in which sexual assaults occur, which women are vulnerable in which settings and identifies the most important contributory factors to help with the development of measures to prevent sexual assault."

http://www.eurekalert.org/pub_releases/2014-10/uocm-tgs101314.php

Two-faced gene: SIRT6 prevents some cancers but promotes sun-induced skin cancer

SIRT6 inhibits the growth of liver and colon cancers but can promote the development of skin cancers

A new study published in Cancer Research shows SIRT6 - a protein known to inhibit the growth of liver and colon cancers - can promote the development of skin cancers by turning on an enzyme that increases inflammation, proliferation and survival of sun-damaged skin cells. Previously considered protective, SIRT6 is part of a family of seven proteins called sirtuins that help regulate genomic stability and prevent some of the genetic flaws associated with aging. SIRT6 helps repair DNA damage, which can lead to cancer. This study, in the journal's October 15 issue, reveals its activity can vary from one tissue type to another.

"Although SIRT6 suppressed tumor growth in some cell types, we discovered that it encouraged cancer development in others, particularly in skin cells," said study author Yu-Ying He, PhD, assistant professor of medicine at the University of Chicago.

"We found more SIRT6 protein in sun-damaged squamous cell carcinoma cells than in healthy, sun-protected human skin," she said. "When we deleted SIRT6 from skin cells in mice, tumor development decreased."

To understand how SIRT6 contributed to the onset of skin cancer the researchers looked at its effects on COX-2, an enzyme responsible for inflammation. COX-2 also promotes cell proliferation and survival, however, two hallmarks of cancer cells. When the researchers increased expression of SIRT6, COX-2 became more abundant. When they inhibited SIRT6 expression, COX-2 levels decreased.

They also found that exposure to ultraviolet-B light, a cancer-causing component of sunshine, could trigger increased expression of SIRT6 in skin cells. This led to the production of COX-2, which contributed to the development of skin cancers.

"Our findings underscore a critical role for SIRT6 in the skin damage cause by ultraviolet light," He said, "This adds to our understanding of the mechanisms of skin carcinogenesis. It suggests that SIRT6 could provide a useful target for cancer prevention. We are searching for safe and effective ways to inhibit it."

The National Institutes of Health, The American Cancer Society and the University of Chicago Cancer Research Center supported the study. Additional authors were Mei Ming, Weinhong Han, Baozhong Zhao and Mahesh Gupta from the University of Chicago; Nagalongam Sundaresan from the Indian Institute of Science, Bangalore, India; and Chu-Xia Deng, from the National Institute of Diabetes, Digestive and Kidney Diseases (NIH).

http://www.eurekalert.org/pub_releases/2014-10/uops-pmr101314.php

Penn Medicine researchers zero in on psoriasis-hypertension link

Study is the first to use objective measures of psoriasis severity to examine its association with blood pressure

PHILADELPHIA – Patients with more severe psoriasis are also more likely to have uncontrolled hypertension, according to new research by a team at the Perelman School of Medicine at the University of Pennsylvania. Through a cross-sectional study using information collected from a medical records database, the results provide further evidence of a strong link between psoriasis and hypertension. Full results are now available in JAMA Dermatology.

"Over the last several years, studies have shown that psoriasis, specifically severe psoriasis, is an independent risk factor for a variety of comorbidities, putting patients suffering with this common skin disease at an increased risk for other conditions such as heart attack and stroke," says Junko Takeshita, MD, PhD, clinical instructor in the department of Dermatology at Penn Medicine and co-first author on the study. "Knowing that psoriasis is tied to other health conditions, it's vital that we have a better understanding of the systemic effects it has on other

areas of the body so that we can more closely monitor these patients and provide better and preventative care."

Defining uncontrolled hypertension as blood pressure measured as at least 140/90, the researchers found a clear relationship between psoriasis and uncontrolled hypertension in patients with a confirmed diagnosis of psoriasis. Additional finding indicate there is a significant dose-response relationship, meaning that the likelihood of uncontrolled hypertension increases with greater psoriasis severity. Results of the study reveal that the patients with the highest risk of having uncontrolled blood pressure, are those with moderate to severe psoriasis, which is defined as having at least three percent of one's body surface affected by the disease.

Takeshita and colleagues examined data from a random sample of psoriasis patients included in The Health Improvement Network (THIN), an electronic medical database based in the United Kingdom that collects demographic, diagnostic, treatment, and laboratory information from a broad representative sample of the UK population. Takeshita says the psoriasis diagnostic code in the database has been validated through extensive studies looking at the condition.

The researchers concentrated on a specific group within the THIN database called the Incident Health Outcomes and Psoriasis Events (iHOPE) cohort, a random sample of about 9000 patients with a confirmed diagnosis of psoriasis and disease severity classified by their general practitioners using objective measures, specifically body surface area involvement. This permitted a level of analysis not possible in previous studies.

"Most large electronic databases such as THIN do not have information such as body surface area involvement or other direct measures of psoriasis severity, and we usually have to use surrogate measures such as receipt of a treatment that is indicated for more severe psoriasis to define psoriasis severity," Takeshita explains. "The use of surrogate measures to define psoriasis severity is not ideal for multiple reasons. For example, we know that many patients with psoriasis go untreated, so using treatment to define psoriasis severity may incorrectly identify patients who truly have severe disease as having mild disease. Furthermore, when we use treatments to define psoriasis severity, we cannot separate effects of psoriasis itself from potential psoriasis treatment effects on blood pressure control. To our knowledge, ours is the first study to evaluate the effect of objectively determined psoriasis severity on blood pressure control."

Although the work strongly suggests a correlation between hypertension and psoriasis, the cross-sectional nature of the study doesn't allow one important issue to be addressed: the "chicken or egg" question of whether psoriasis may cause hypertension or whether the presence of hypertension contributes to psoriasis. Still, the present study provides an ideal starting point for that next investigative step.

"Determining the cause and effect is something that needs to be evaluated in future longitudinal studies so that we can better assess which condition developed first," Takeshita explains. "Our hypothesis is that the psoriasis and the inflammation that comes with it are making the hypertension worse, but certainly it could go the other way, and understanding which comes first has important implications for how we care for these patients and our understanding of how these two conditions are related."

Other Penn co-authors are Daniel B Shin, MS, Nehal N Mehta, MD, MSCE, Stephen E Kimmel, MD, MSCE, David J Margolis, MD, PhD, Andrea B Troxel, ScD, and Joel M Gelfand, MD, MSCE. The research was completed in collaboration with Shuwei Wang, MD, of Thomas Jefferson University.

The study was supported by grants from the National Heart, Lung and Blood Institute (R01-HL089744), the National Institute of Arthritis and Musculoskeletal and Skin Diseases (K24-AR064310), the Dermatology Foundation Career Development Award, and the National Psoriasis Foundation Fellowship Award.

http://www.eurekalert.org/pub_releases/2014-10/dumc-pcp101014.php

Prostate cancer's penchant for copper may be a fatal flaw

Like discriminating thieves, prostate cancer tumors scavenge and hoard copper that is an essential element in the body. But such avarice may be a fatal weakness.

DURHAM, N.C. – Researchers at Duke Medicine have found a way to kill prostate cancer cells by delivering a trove of copper along with a drug that selectively destroys the diseased cells brimming with the mineral, leaving non-cancer cells healthy. The combination approach, which uses two drugs already commercially available for other uses, could soon be tested in clinical trials among patients with late-stage disease.

"This proclivity for copper uptake is something we have known could be an Achilles' heel in prostate cancer tumors as well as other cancers," said Donald McDonnell, Ph.D., chairman of the Duke Department of Pharmacology and Cancer Biology and senior author of a study published Oct. 15, 2014, in Cancer Research, a journal of the American Association of Cancer Research.

"Our first efforts were to starve the tumors of copper, but that was unsuccessful. We couldn't deplete copper enough to be effective," McDonnell said. "So we thought if we can't get the level low enough in cancer cells to kill them, how about we boost the copper and then use a drug that requires copper to be effective to attack the tumors. It's the old if-you-can't-beat-'em-join-'em approach."

McDonnell and colleagues searched libraries of thousands of approved therapies to identify those that rely on copper to achieve their results. Among those they

found was disulfiram, a drug approved by the FDA to treat alcoholism. Disulfiram had at one time been a candidate for treating prostate cancer – it homes in on the additional copper in prostate cancer tumors – but it showed disappointing results in clinical trials among patients with advanced disease.

The Duke team found that the amount of copper cancer cells naturally hoard is not enough to make the cells sensitive to the drug. But when the Duke researchers added a copper supplement along with the disulfiram, the combination resulted in dramatic reductions in prostate tumor growth among animal models with advanced disease.

And there was another surprise: Androgens, the male hormones that fuel prostate cancer, increase the copper accumulation in the cancer cells. McDonnell said this finding could make the combination of disulfiram or similar compounds and copper especially beneficial for men who have been on hormone therapies that have failed to slow tumor growth.

"Unfortunately, hormone therapies do not cure prostate cancer, and most patients experience relapse of their disease to a hormone-refractory or castration-resistant state," McDonnell said. "Although tremendous progress has been made in treating prostate cancer, there is clearly a need for different approaches, and our findings provide an exciting new avenue to explore."

McDonnell said clinical trials of the combination therapy are planned in upcoming months.

Andrew Armstrong, M.D., associate professor of medicine, was involved with a recent study at Duke testing disulfiram in men with advanced prostate cancer.

"While we did not observe significant clinical activity with disulfiram in men with recurrent prostate cancer in our recent clinical trial, this new data suggests a potential way forward and a reason why this trial did not have more positive results," Armstrong said. "Further clinical studies are now warranted to understand the optimal setting for combining copper with disulfiram or similar compounds in men with progressive prostate cancer, particularly in settings where the androgen receptor is active."

In addition to McDonnell, study authors include Rachid Safi, Erik R. Nelson, Satish K. Chitneni, Katharine J. Franz, Daniel J. George and Michael R. Zalutsky.

The National Institutes of Health funded the study (CA139818, CA42324, RO1GM084176).

http://www.eurekalert.org/pub_releases/2014-10/nsfc-nsf101514.php

NASA study finds 1934 had worst drought of last thousand years

1934 drought was the driest and most widespread of the last millennium

A new study using a reconstruction of North American drought history over the last 1,000 years found that the drought of 1934 was the driest and most widespread of the last millennium.

Using a tree-ring-based drought record from the years 1000 to 2005 and modern records, scientists from NASA and Lamont-Doherty Earth Observatory found the 1934 drought was 30 percent more severe than the runner-up drought (in 1580) and extended across 71.6 percent of western North America. For comparison, the average extent of the 2012 drought was 59.7 percent.

"It was the worst by a large margin, falling pretty far outside the normal range of variability that we see in the record," said climate scientist Ben Cook at NASA's Goddard Institute for Space Studies in New York. Cook is lead author of the study, which will publish in the Oct. 17 edition of Geophysical Research Letters.

Two sets of conditions led to the severity and extent of the 1934 drought. First, a high-pressure system in winter sat over the west coast of the United States and turned away wet weather – a pattern similar to that which occurred in the winter of 2013-14. Second, the spring of 1934 saw dust storms, caused by poor land management practices, suppress rainfall.

"In combination then, these two different phenomena managed to bring almost the entire nation into a drought at that time," said co-author Richard Seager, professor at the Lamont-Doherty Earth Observatory of Columbia University in New York. "The fact that it was the worst of the millennium was probably in part because of the human role."

According to the recent Fifth Assessment Report of the Intergovernmental Panel on Climate Change, or IPCC, climate change is likely to make droughts in North America worse, and the southwest in particular is expected to become significantly drier as are summers in the central plains. Looking back one thousand years in time is one way to get a handle on the natural variability of droughts so that scientists can tease out anthropogenic effects – such as the dust storms of 1934.

"We want to understand droughts of the past to understand to what extent climate change might make it more or less likely that those events occur in the future," Cook said.

The abnormal high-pressure system is one lesson from the past that informs scientists' understanding of the current severe drought in California and the western United States.

"What you saw during this last winter and during 1934, because of this high pressure in the atmosphere, is that all the wintertime storms that would normally come into places like California instead got steered much, much farther north," Cook said. "It's these wintertime storms that provide most of the moisture in California. So without getting that rainfall it led to a pretty severe drought."

This type of high-pressure system is part of normal variation in the atmosphere, and whether or not it will appear in a given year is difficult to predict in computer

models of the climate. Models are more attuned to droughts caused by La Niña's colder sea surface temperatures in the Pacific Ocean, which likely triggered the multi-year Dust Bowl drought throughout the 1930s. In a normal La Niña year, the Pacific Northwest receives more rain than usual and the southwestern states typically dry out.

But a comparison of weather data to models looking at La Niña effects showed that the rain-blocking high-pressure system in the winter of 1933-34 overrode the effects of La Niña for the western states. This dried out areas from northern California to the Rockies that otherwise might have been wetter.

As winter ended, the high-pressure system shifted eastward, interfering with spring and summer rains that typically fall on the central plains. The dry conditions were exacerbated and spread even farther east by dust storms.

"We found that a lot of the drying that occurred in the spring time occurred downwind from where the dust storms originated," Cook said, "suggesting that it's actually the dust in the atmosphere that's driving at least some of the drying in the spring and really allowing this drought event to spread upwards into the central plains."

Dust clouds reflect sunlight and block solar energy from reaching the surface. That prevents evaporation that would otherwise help form rain clouds, meaning that the presence of the dust clouds themselves leads to less rain, Cook said.

"Previous work and this work offers some evidence that you need this dust feedback to explain the real anomalous nature of the Dust Bowl drought in 1934," Cook said.

Dust storms like the ones in the 1930s aren't a problem in North America today. The agricultural practices that gave rise to the Dust Bowl were replaced by those that minimize erosion. Still, agricultural producers need to pay attention to the changing climate and adapt accordingly, not forgetting the lessons of the past, said Seager. "The risk of severe mid-continental droughts is expected to go up over time, not down," he said.

http://www.eurekalert.org/pub_releases/2014-10/du-dsq101514.php

Drexel study questions 21-day quarantine period for Ebola

21 days might not be enough to completely prevent spread of the virus

As medical personnel and public health officials are responding to the first reported cases of Ebola Virus in the United States, many of the safety and treatment procedures for treating the virus and preventing its spread are being reexamined. One of the tenets for minimizing the risk of spreading the disease has been a 21-day quarantine period for individuals who might have been exposed to the virus. But a new study by Charles Haas, PhD, a professor in Drexel's College of Engineering, suggests that 21 days might not be enough to completely prevent spread of the virus.

Haas's study "On the Quarantine Period for Ebola Virus," recently published in PLOS Currents: Outbreaks looks at the murky basis for our knowledge about the virus, namely previous outbreaks in Africa in 1976 (Zaire) and 2000 (Uganda) as well as the first 9 months of the current outbreak.

In both cases, data gathered by the World Health Organization reported a 2-21 day incubation period for the virus –meaning that after 21 days if the individual hasn't presented symptoms they are likely not to be infected or contagious. This is likely the genesis of the Centers for Disease Control and Prevention's 21-day quarantine period, but there is little indication from the CDC as to what other considerations played into this policy.

"Twenty-one days has been regarded as the appropriate quarantine period for holding individuals potentially exposed to Ebola Virus to reduce risk of contagion, but there does not appear to be a systemic discussion of the basis for this period," said Haas, who is the head of the Department of Civil, Architectural and Environmental Engineering at Drexel.

Haas suggests that a broader look at risk factors and costs and benefits should be considered when setting this standard. With any scientific data of this nature there is a standard deviation in results –a percentage by which they may vary. In the case of Ebola's incubation period the range of results generated from the Zaire and Uganda data varied little. This might have contributed to the health organizations' certainty that a 21-day quarantine period was a safe course of action.

But looking more broadly at data from other Ebola outbreaks, in Congo in 1995 and recent reports from the outbreak in West Africa, the range of deviation is between 0.1 and 12 percent, according to Haas. This means that there could be up to a 12 percent chance that someone could be infected even after the 21-day quarantine.

"While the 21-day quarantine value, currently used, may have arisen from reasonable interpretation of early outbreak data, this work suggests reconsideration is in order and that 21 days might not be sufficiently protective of public health," Haas said.

Haas, who has extensive background in analyzing risk of transmitting biological pathogens, explains that these quarantine periods must be determined by looking at the cost of enforcing the quarantine versus the cost of releasing exposed individuals. Looking at the potential tradeoff between costs and benefits as the quarantine time is extended should guide public health officials in determining the appropriate time. Obviously, with more contagious and potentially deadly

diseases the cost of making a mistake on the short side when determining a quarantine is extremely high.

"Clearly for pathogens that have a high degree of transmissibility and/or a high degree of severity, the quarantine time should be greater than for agents with lower transmissibility and/or severity. The purpose of this paper is not to estimate where the balancing point should be, but to suggest a method for determining the balancing point."

Full text of study: http://currents.plos.org/outbreaks/article/on-the-quarantine-period-for-ebola-virus/

http://www.eurekalert.org/pub_releases/2014-10/uom-lei101514.php

Lake Erie increasingly susceptible to large cyanobacteria blooms

Potential to complicate efforts to rein in the problem

ANN ARBOR - Lake Erie has become increasingly susceptible to large blooms of toxin-producing cyanobacteria since 2002, potentially complicating efforts to rein in the problem in the wake of this year's Toledo drinking water crisis, according to a new study led by University of Michigan researchers.

Since the detection of the toxin microcystin left nearly half a million Ohio and Michigan residents without drinking water for several days in early August, discussions of ways to prevent a recurrence have largely focused on the need to reduce the amount of phosphorus fertilizer that washes off croplands and flows into western Lake Erie to trigger harmful cyanobacteria blooms.

In a study published online Oct. 8 in the journal Water Resources Research, scientists from U-M and the National Oceanic and Atmospheric Administration conclude that microcystin-producing cyanobacteria in Lake Erie are becoming more sensitive to phosphorus and that reductions may have to cut far deeper than recently proposed targets.

"Our results suggest that current phosphorus loading targets will be insufficient for reducing the intensity of cyanobacteria blooms to desired levels, so long as the lake remains in a heightened state of bloom susceptibility," said lead author Daniel Obenour of the U-M Water Center. Other authors are Don Scavia of U-M and Andrew Gronewold and Craig Stow of the National Oceanic and Atmospheric Administration.

The paper is a technical analysis of the uncertainties involved in computer modeling studies that use the amount of phosphorus entering Lake Erie in the spring to predict the size of late-summer cyanobacteria blooms, which have grown larger since the mid-1990s.

Though the total amount of phosphorus entering the lake seems to be the best predictor of bloom size, that variable alone doesn't fully explain the observed size increase during the study period examined by the team, 2002 to 2013.

The researchers used a computer model to determine whether rising levels of a special form of phosphorus called dissolved reactive phosphorus or DRP, which is more readily absorbed by algae, could explain the trend toward increased bloom susceptibility. It didn't.

They also looked at water temperatures in Lake Erie. In coming decades, warming waters are expected to exacerbate the lake's harmful algal bloom problem. But from 2002 to 2013, late-summer Lake Erie surface temperatures did not increase significantly, suggesting that some other factor is at work, according to the researchers.

One possibility is that the spread of invasive quagga and zebra mussels in the lake has promoted the dominance of microcystin-producing cyanobacteria and has altered the lake's phosphorus cycle. Recent U.S. Geological Survey studies in western Lake Erie suggest a decrease in zebra mussel numbers but an increase in quagga mussels and total mussel abundance over the last decade.

Quagga and zebra mussels shun toxin-producing Microcystis cyanobacteria and feed instead on other species of phytoplankton at the base of the lake's food chain, including algae.

"We tested to see if the increase in the DRP fraction could be the cause, and it did not pass the test. It also does not look like water temperature is driving the increased susceptibility. We're thinking it may have been the increase in mussels," said U-M aquatic ecologist Scavia, co-author of the study and director of the Graham Sustainability Institute.

Other potential explanations for the reported trend in bloom susceptibility are increasingly calm summer weather conditions, which can also promote cyanobacteria dominance, and a growing reservoir of Microcystis seed colonies at the bottom of Lake Erie.

Whatever the cause, the finding of increased susceptibility suggests that proposed management targets for reduced phosphorus loads in Lake Erie may not go far enough.

In February, the International Joint Commission called on the governments of the U.S. and Canada to adopt new targets for Lake Erie phosphorus levels to curtail harmful algal blooms. The IJC recommended that the total phosphorus target for Ohio's Maumee River, which drains agricultural land and empties into western Lake Erie, be cut 37 percent during the spring.

The IJC said those reductions would "reduce the frequency and severity of harmful algal blooms in the western Lake Erie basin to an acceptable level." But Obenour, Gronewold, Stow and Scavia conclude that because of the increased sensitivity of the Lake Erie system, even the ambitious reductions urged by IJC will likely be insufficient.

"As long as the lake remains in this heightened state of susceptibility, this problem is likely to persist. That means we need to better understand what is driving the increased susceptibility and whether it can be controlled, or if deeper phosphorus reductions are needed," Scavia said.

The Water Resources Research paper is titled "Using a Bayesian hierarchical model to improve Lake Erie cyanobacteria bloom forecasts." Gronewold and Stow are at NOAA's Great Lakes Environmental Research Laboratory in Ann Arbor.

The project was funded by the Great Lakes Restoration Initiative's SOAR (Synthesis, Observations and Response) Project, the U-M Water Center, the Cooperative Institute for Limnology and Ecosystems Research and NOAA. The work is part of a partnership with NOAA's National Ocean Service and its ongoing collaborative work on understanding and forecasting harmful algal blooms.

Water Resources Research is a journal of the American Geophysical Union.

Abstract: http://onlinelibrary.wiley.com/enhanced/doi/10.1002/2014WR015616/

http://wrd.cm/1xYQhJV

Why Bats Are Such Good Hosts for Ebola and Other Deadly Diseases

Scientists trying to understand why have found some promising leads in bat genomes, but others argue bats' notoriety as viral carriers isn't justified

By Nadia Drake

Some of the planet's scariest, most lethal viruses find a natural refuge inside bats, including Ebola, rabies, Marburg and the SARS coronavirus. Many high-profile epidemics have been traced to bats, and scientists are discovering new bat-borne viruses all the time.

The animals seem especially adept at harboring and spreading disease. Scientists trying to understand why have found some promising leads in bat genomes, but others argue bats' notoriety as viral carriers isn't justified.

"Are bats special? I still say it's too early to answer," says Linfa Wang, who leads research groups at CSIRO's Australian Animal Health Laboratory and the Duke-NUS Graduate Medical School in Singapore. He's spent the last two decades studying bat-borne viruses and hunting for characteristics that might make the animals such great viral hosts.

"The question is so important we just can't ignore it anymore," he says.

Bats and other species that chronically harbor viruses, such as rats or mice, are known as disease reservoirs. Most of the time, these reservoirs stay intact, with infected animals rarely showing symptoms of disease. But sometimes they leak, letting a virus infect new, much more vulnerable species. This is almost certainly what happened with the ongoing Ebola outbreak in West Africa, which began with a trickle in December and has since infected at least 8,900 people and killed more than 4,400. Scientists suspect bats are to blame for this epidemic, which has overwhelmed Guinea, Sierra Leone, and Liberia.

Bat Biology

Anecdotally, bats certainly appear to carry a disproportionately high number of scary viruses. But whether this is actually true remains an open question.

Scientists essentially fall into two camps on this issue. One school of thought says bat-related epidemics are simply a numbers game; the idea is there are so many species and so many individuals that the emergence of bat-borne illnesses isn't surprising. The other suggests bats are indeed special, that there's something about their physiology or their lifestyle that makes them exceptionally good viral repositories.

What that something is has yet to be determined, but Wang and his colleagues have spent a good chunk of time trying to sort it out. They began by looking at bat genomes, hoping to find a clue in the bats' immune system, like a set of genes that only bats have.

Instead, the team uncovered a more subtle difference: Even though bat genomes contain many of the same ingredients as other mammals, bats use them differently. In particular, the bat genes coding for proteins that detect and repair damaged DNA are much more prevalent than expected. More simply, those genes are believed to be doing something that helps the bats survive and reproduce, so that those genes are passed on to subsequent generations.

These results, reported in the journal Science in December 2012, correspond with the previous observation that DNA damage repair genes are frequent targets for invading viruses, which could be what is applying the evolutionary pressure. The findings also mesh with the anecdotal observation that bats rarely (if ever) develop tumors—perhaps because the repair genes can outpace any malignant growth.

Since then, Wang and his colleagues have gone a step further. Newer, still-unpublished findings suggest that unlike in humans or mice, where defenses such as anti-tumor and anti-viral genes are activated only in response to a threat, in bats these genes seem to be perpetually turned on. That activity keeps levels of any harbored viruses simmering below the point at which they could cause harm. In other words, evolution has conspired to turn bats' surveillance mechanisms up to 11.

As for why, Wang suggests a link with flight, which boosts a bat's metabolic rate to a level many times higher than when it is resting. Such sustained energy production generates stress that can damage cells and DNA if it isn't quickly detected and repaired.

So perhaps initially, those damage-repair proteins got turned way up to combat the damage caused by bats doing what bats do, which is flying around every night. If true, the ability to carry lethal viruses might have come second, as a sort of coevolutionary accident, Wang says.

Another hypothesis, reported in Emerging Infectious Diseases in May, suggests bat flight might generate enough heat to mimic a fever. As part of the normal immune response in many animals, fevers help combat infection by raising body temperature to levels that will kill or disable invading pathogens. By raising their temperatures, the hypothesis suggests, flying might inadvertently be dialing back bats' viral load each night.

Though no experiments have been done to test the idea, some scientists say it's plausible that one reason bat-borne viruses are so lethal when they spill over into humans or other animals is because they've evolved to withstand the bat's especially active immune system.

"We don't have that sort of immune system," says Angela Luis, a disease ecologist at the University of Montana, and an author of the fever-flight study. Once free from the bat's hyper-vigilant, perpetually turned on defenses, those viruses might have no problem overwhelming more feeble immune systems.

Bat Rap?

Wang isn't yet ready to conclude bats are especially good viral hosts, but believes the scientific field is creeping closer to accepting that possibility.

The other possibility is that what's happening is simply a combination of numbers and opportunity, that bat-borne spillovers are nothing more than statistics at work. With more than 1,200 known species, bats comprise more than 20 percent of the mammal species on Earth. And among mammals, they're outnumbered only by rodents (contrary to popular belief, bats are not rodents). But in many areas, bats are more numerous than rodents, with millions of individuals sometimes living in a single colony.

The perception that bats are somehow special may be colored by high-profile outbreaks and a disproportionate amount of work focused on bats as viral vessels. "The self-fulfilling prophecy, which I would warn against, is that the more we dig, the more viruses we're going to find," said Kevin Olival, a disease ecologist at EcoHealth Alliance.

In a 2013 study, Olival and colleagues examined the virome of a giant bat called the Indian flying fox (*Pteropus giganteus*). In that one species, they detected 55 viruses, 50 of them previously unknown. That's roughly the total number of bat viruses identified in a seminal 2006 study that reviewed all of the relevant research done at the time. In the intervening eight years, though, that number has doubled or tripled or more, depending upon the criteria used to define "known virus."

But Olival argues that trend is not unique to bats. "If you look at the broad spectrum of what we know about mammal virus diversity, all have pretty diverse groups of viruses," he said. "The groups that don't are the ones we haven't looked at enough."

The question, then, is why do we keep hearing about bat-borne epidemics?

"I think the important thing is ecology, and thinking about where these animals live, and how humans are coming into contact with them," Olival says. He suggests that what's really important is the way humans interact bats — or rather, the ways in which humans are interacting with and encroaching upon bat habitat.

http://bit.ly/1tzFkR9

Lockheed Claims Breakthrough on Fusion Energy

Lockheed Martin Corp said on Wednesday it had made a technological breakthrough in developing a power source based on nuclear fusion, and the first reactors, small enough to fit on the back of a truck, could be ready in a decade.

By Andrea Shalal

WASHINGTON (Reuters) - Lockheed Martin Corp said on Wednesday it had made a technological breakthrough in developing a power source based on nuclear fusion, and the first reactors, small enough to fit on the back of a truck, could be ready in a decade.

Tom McGuire, who heads the project, said he and a small team had been working on fusion energy at Lockheed's secretive Skunk Works for about four years, but were now going public to find potential partners in industry and government for their work.

Initial work demonstrated the feasibility of building a 100-megawatt reactor measuring seven feet by 10 feet, which could fit on the back of a large truck, and is about 10 times smaller than current reactors, McGuire said.

In recent years, Lockheed, the Pentagon's top supplier, has been increasingly involved in a variety of alternate energy projects, including several ocean energy projects, as it looks to offset a decline in U.S. and European military spending.

Lockheed's fusion energy project could help in developing new power sources amid increasing global conflicts over energy, and as projections show there will be a 40 percent to 50 percent increase in energy use over the next generation, McGuire told reporters.

If it proves feasible, Lockheed's work would mark a key breakthrough in a field that scientists have long eyed as promising, but which has not yet yielded viable

power systems. The effort seeks to harness the energy released during nuclear fusion, when atoms combine into more stable forms.

"We can make a big difference on the energy front," McGuire said, noting Lockheed's 60 years of research on nuclear fusion as a potential energy source that is safer and more efficient than current reactors based on nuclear fission.

Lockheed sees the project as part of a comprehensive approach to solving global energy and climate change problems. Compact nuclear fusion would also produce far less waste than coal-powered plants, and future reactors could eliminate radioactive waste completely, the company said.

McGuire said the company had several patents pending for the work and was looking for partners in academia, industry and among government laboratories to advance the work.

Lockheed said it had shown it could complete a design, build and test it in as little as a year, which should produce an operational reactor in 10 years, McGuire said.

A small reactor could power a U.S. Navy warship, and eliminate the need for other fuel sources that pose logistical challenges.

U.S. submarines and aircraft carriers run on nuclear power, but they have large fusion reactors on board that have to be replaced on a regular cycle.

"What makes our project really interesting and feasible is that timeline as a potential solution," McGuire said.

http://bit.ly/1vIC461

Wind power is cheapest energy, EU analysis finds

Onshore windfarms far cheaper than coal and gas when health impacts are factored in, report shows

Arthur Neslen

Onshore wind is cheaper than coal, gas or nuclear energy when the costs of 'external' factors like air quality, human toxicity and climate change are taken into account, according to an EU analysis.

The report says that for every megawatt hour (MW/h) of electricity generated, onshore wind costs roughly €105 (£83) per MW/h, compared to gas and coal which can cost up to around €164 and €233 per MW/h, respectively.

Nuclear power, offshore wind and solar energy are all comparably inexpensive generators, at roughly €125 per MW/h.

"This report highlights the true cost of Europe's dependence on fossil fuels," said Justin Wilkes, the deputy CEO of the European Wind Energy Association (EWEA). "Renewables are regularly denigrated for being too expensive and a drain on the taxpayer.

Not only does the commission's report show the alarming cost of coal but it also presents onshore wind as both cheaper and more environmentally-friendly."

The paper, which was written for the European commission by the Ecofys consultancy, suggests that the Conservative party plan of restricting new onshore windfarms will mean blocking out the cheapest source of energy when environmental and health facts are taken into consideration.

It has been suggested the Tory plan could be done through a cap on onshore wind turbines' output, lower subsidies or tighter planning restrictions.

"Any plans to change policy for onshore wind must be looked at in the context of this report," said Oliver Joy a spokesman for EWEA.

"Investors need long-term visibility. 'Stop-start' policies as well as harsh retroactive changes can blindside investors, driving up the risk premium and cost of capital."

The documents' contents may also be unwelcome in some quarters of the commission, which early today published selective results from it that did not include external health and pollution costs.

These showed that renewable energy took €38.3bn of public subsidies in 2012, compared to €22.3bn for gas, coal and nuclear.

The EU did however note that if free carbon allowances to polluters were included in the data, it "would reduce the gap between support for renewables and other power generation technologies."

The Ecofys paper's nuanced evaluation of historical subsidies for coal and nuclear was also not mentioned in the EU press release, which renewable energy associations linked to a fossil fuel lobbying effort ahead of the report's publication.

"Despite decades of heavy subsidies, mature coal and nuclear energy technologies are still dependent on similar levels of public support as innovative solar energy is receiving today," Frauke Thies, the policy director for the European Photovoltaic Industry Association told the Guardian.

"The difference is that costs of solar continue to decrease rapidly. If the unaccounted external costs to society are included, the report demonstrates that support to fossil fuels and nuclear even by far exceeds that to solar."

The EU's energy commissioner, Gunther Oettinger, said that the report was only "a first step" to filling gaps in knowledge about the nature of energy subsidies and more reports are likely in the months ahead.

The figures for the energy sources in the report are all approximate, as the bar chart listing them is counted in units of €25 MW/h.

Last year, a row broke out in Brussels after the German newspaper Suddeutche Zeitung reported that Oettinger had tried to delete figures cited in a commission report showing that in 2011, fossil fuels took €26bn in public subsidies, compared to €35bn for nuclear power and €30bn for renewables.

http://bit.ly/1ntEPW2

NASA's Hubble Telescope Finds Potential Kuiper Belt Targets for New Horizons Pluto Mission

Three Kuiper Belt objects (KBOs) the agency's New Horizons spacecraft could potentially visit after it flies by Pluto

Peering out to the dim, outer reaches of our solar system, NASA's Hubble Space Telescope has uncovered three Kuiper Belt objects (KBOs) the agency's New Horizons spacecraft could potentially visit after it flies by Pluto in July 2015.

The KBOs were detected through a dedicated Hubble observing program by a New Horizons search team that was awarded telescope time for this purpose.

"This has been a very challenging search and it's great that in the end Hubble could accomplish a detection – one NASA mission helping another," said Alan Stern of the Southwest Research Institute (SwRI) in Boulder, Colorado, principal investigator of the New Horizons mission.

The Kuiper Belt is a vast rim of primordial debris encircling our solar system. KBOs belong to a unique class of solar system objects that has never been visited by spacecraft and which contain clues to the origin of our solar system.

The KBOs Hubble found are each about 10 times larger than typical comets, but only about 1-2 percent of the size of Pluto. Unlike asteroids, KBOs have not been heated by the sun and are thought to represent a pristine, well preserved deep-freeze sample of what the outer solar system was like following its birth 4.6 billion years ago. The KBOs found in the Hubble data are thought to be the building blocks of dwarf planets such as Pluto.

The New Horizons team started to look for suitable KBOs in 2011 using some of the largest ground-based telescopes on Earth. They found several dozen KBOs, but none was reachable within the fuel supply available aboard the New Horizons spacecraft.

"We started to get worried that we could not find anything suitable, even with Hubble, but in the end the space telescope came to the rescue," said New Horizons science team member John Spencer of SwRI. "There was a huge sigh of relief when we found suitable KBOs; we are 'over the moon' about this detection."

Following an initial proof of concept of the Hubble pilot observing program in June, the New Horizons Team was awarded telescope time by the Space Telescope Science Institute for a wider survey in July. When the search was completed in early September, the team identified one KBO that is considered "definitely reachable," and two other potentially accessible KBOs that will require more tracking over several months to know whether they too are accessible by the New Horizons spacecraft.

This was a needle-in-haystack search for the New Horizons team because the elusive KBOs are extremely small, faint, and difficult to pick out against a myriad background of stars in the constellation Sagittarius, which is in the present direction of Pluto. The three KBOs identified each are a whopping 1 billion miles beyond Pluto. Two of the KBOs are estimated to be as large as 34 miles (55 kilometers) across, and the third is perhaps as small as 15 miles (25 kilometers).

The New Horizons spacecraft, launched in 2006 from Florida, is the first mission in NASA's New Frontiers Program. Once a NASA mission completes its prime mission, the agency conducts an extensive science and technical review to determine whether extended operations are warranted.

The New Horizons team expects to submit such a proposal to NASA in late 2016 for an extended mission to fly by one of the newly identified KBOs. Hurtling across the solar system, the New Horizons spacecraft would reach the distance of 4 billion miles from the sun at its farthest point roughly three to four years after its July 2015 Pluto encounter. Accomplishing such a KBO flyby would substantially increase the science return from the New Horizons mission as laid out by the 2003 Planetary Science Decadal Survey.

http://phys.org/news/2014-10-myths-brain-hampering.html

How myths about the brain are hampering teaching

Myths about the brain are common among teachers worldwide and are hampering teaching, according to new research published today [15 October].

Teachers in the UK, Holland, Turkey, Greece and China were presented with seven so-called 'neuromyths' and asked whether they believe them to be true.

A quarter or more of teachers in the UK and Turkey believe a student's brain would shrink if they drank less than six to eight glasses of water a day, while around half or more of those surveyed believe a student's brain is only 10 per cent active and that children are less attentive after sugary drinks and snacks.

Over 70 per cent of teachers in all countries wrongly believe a student is either left-brained or right-brained, peaking at 91 per cent in the UK.

And almost all teachers (over 90 per cent in each country) feel that teaching to a student's preferred learning style - auditory, kinaesthetic or visual - is helpful, despite no convincing evidence to support this approach.

The new research from the University of Bristol, published in *Nature Reviews Neuroscience*, calls for better communication between neuroscientists and educators.

Dr Paul Howard-Jones, author of the article from Bristol University's Graduate School of Education, said: "These ideas are often sold to teachers as based on neuroscience – but modern neuroscience cannot be used support them. These ideas have no educational value and are often associated with poor practice in the

classroom." The report blames wishfulness, anxiety and a bias towards simple explanations as typical factors that distort neuroscientific fact into neuromyth. Such factors also appear to be hampering recent efforts of neuroscientists to communicate the true meaning of their work to educators.

Dr Howard-Jones added: "Although the increased dialogue between neuroscience and education is encouraging, we see new neuromyths on the horizon and old ones returning in new forms. "Sometimes, transmitting 'boiled-down' messages about the brain to educators can just lead to misunderstanding, and confusions about concepts such as brain plasticity are common in discussions about education policy."

The report highlights several areas where new findings from neuroscience are becoming misinterpreted by education, including brain-related ideas regarding early educational investment, adolescent brain development and learning disorders such as dyslexia and ADHD.

Hopes that education will draw genuine benefit from neuroscience may rest on a new but rapidly growing field of 'neuroeducational' research that combines both fields. The review concludes that, in the future, such collaboration will be greatly needed if education is to be enriched rather than misled by neuroscience.

More information: *"Neuroscience and education: myths and messages." Nature Reviews Neuroscience (2014) DOI: 10.1038/nrn3817*

http://phys.org/news/2014-10-ancient-mountains-fed-early-life.html

The ancient mountains that fed early life

Scientists have found evidence for a huge mountain range that sustained an explosion of life on Earth 600 million years ago.

The mountain range was similar in scale to the Himalayas and spanned at least 2,500 kilometres of modern west Africa and northeast Brazil, which at that time were part of the supercontinent Gondwana.

"Just like the Himalayas, this range was eroded intensely because it was so huge. As the sediments washed into the oceans they provided the perfect nutrients for life to flourish," said Professor Daniela Rubatto of the Research School of Earth Sciences at The Australian National University (ANU).

"Scientists have speculated that such a large mountain range must have been feeding the oceans because of the way life thrived and ocean chemistry changed at this time, and finally we have found it."

The discovery is earliest evidence of Himalayan-scale mountains on Earth.

"Although the mountains have long since washed away, rocks from their roots told the story of the ancient mountain range's grandeur," said co-researcher Professor Joerg Hermann.

"The range was formed by two continents colliding. During this collision, rocks from the crust were pushed around 100 kilometres deep into the mantle, where the high temperatures and pressures formed new minerals."

As the mountains eroded, the roots came back up to the surface, to be collected in Togo, Mali and northeast Brazil, by Brazilian co-researcher Carlos Ganade de Araujo, from the University of Sao Paulo and Geological Survey of Brazil.

Dr Ganade de Araujo recognised the samples were unique and brought the rocks to ANU where, using world-leading equipment, the research team accurately identified that the rocks were of similar age, and had been formed at similar, great depths. The research team involved specialists from a range of different areas of Earth Science sharing their knowledge, said Professor Rubatto.

http://bit.ly/1t0h5dV

Metal solves mystery of flames that inspired Homer

In southern Turkey, there are fires that never go out.

16 October 2014 by Robin Wylie

The flames have been alight for millennia, but the source of the methane that fuels them was a mystery – until now. The seeping gas feeds dozens of half-metre-high flames at the site, called Yanartas, Turkish for "flaming stone". The flames are believed to have inspired Homer to create the fire-breathing Chimera in his Illiad.

But the gas fuelling the flames was not derived from biological processes – such abiotic methane is only supposed to form at temperatures much higher than conditions at Yanartas.

Now Giuseppe Etiope of the National Institute of Geophysics and Volcanology in Rome, Italy, may have found the answer. Working with Artur Ionescu of the Babes-Bolyai University in Cluj-Napoca, Romania, he has shown that ruthenium, a rare metal found in the igneous rocks beneath the site, can act as a catalyst, allowing methane to form in the lab at temperatures below 100 °C – similar to the temperatures at Yanartas (Geofluids, DOI: 10.1111/gfl.12106).

"These results demonstrate that abiotic methane production is possible at much lower temperatures than is typically suspected," says Michael Whiticar of the University of Victoria in Canada. The experiment is the first to show that the untreated form in which ruthenium occurs at Yanartas can act in this way.

"There could be considerable quantities of abiotic methane elsewhere in the world," says Etiope. "We could be looking at a new source of hydrocarbons."

http://www.eurekalert.org/pub_releases/2014-10/uob-acm101614.php

Adenosine can melt 'love handles'

Researchers at the University of Bonn discover a new signaling pathway to combat excess body weight

The number of overweight persons is greatly increasing worldwide - and as a result is the risk of suffering a heart attack, stroke, diabetes or Alzheimer's disease. For this reason, many people dream of an efficient method for losing weight. An international team of researchers led by Professor Alexander Pfeifer from the University Hospital Bonn, have now come one step closer to this goal. The scientists discovered a new way to stimulate brown fat and thus burn energy from food: The body's own adenosine activates brown fat and "browns" white fat. The results are now being published in the renowned journal "Nature".

"Not all fat is equal," says Professor Alexander Pfeifer from the Institute of Pharmacology and Toxicology of the University Hospital Bonn. Humans have two different types of fat: undesirable white fat cells which form bothersome "love handles", for example, as well as brown fat cells, which act like a desirable heater to convert excess energy into heat. "If we are able to activate brown fat cells or to convert white fat cells into brown ones, it might be possible to simply melt excess fat away" reports the pharmacologist.

The group of Prof. Pfeifer together with an international team from Sweden, Denmark, Finland, as well as from the Helmholtz-Center Dresden-Rossendorf and the University of Düsseldorf now discovered a new signalling molecule capable of activating brown fat cells: adenosine. Adenosine is typically released during stress. Crucial for transmitting the adenosine signal is the adenosine receptor A2A.

Adenosine activates brown adipose tissue

"If adenosine binds to this receptor in brown fat cells, fat burning is significantly stimulated," reports Dr. Thorsten Gnad from Prof. Pfeifer's team. It was previously thought not possible for adenosine to activate brown fat. Several studies with rats and hamsters demonstrated that adenosine blocks brown fat. However, the researchers from the University of Bonn were not mislead by these previous findings. In contrast, using brown fat cells removed from humans during surgery, the scientists investigated the signaling pathway for fat activation using adenosine. The results showed that rats and hamsters react differently than humans in this regard. "The brown fat in mice on the other hand behaves just as in humans," summarizes Prof. Pfeifer.

"Browning" of white fat by adenosine

In addition, the research team investigated the possibility that adenosine transforms white fat cells into brown fat cells - a process termed "browning". White fat cells normally cannot be induced to burn excess fat by adenosine, as they simply lack the A2A receptor. For this reason, the team of scientists transferred the A2A receptor gene from brown fat cells to white fat cells in mice. Consequently, the white fat cells also have A2A receptors and start browning and burning energy.

Clinical application is still far off

As a result, it was possible for the researchers from the University of Bonn to comprehend the significance of adenosine for brown cells in mice and humans for the first time. "Through the administration of adenosine-like substances, the mice actually lost weight," reports Prof. Pfeifer. However, many questions in this regard still need to be investigated. For this reason, clinical application is still far off.

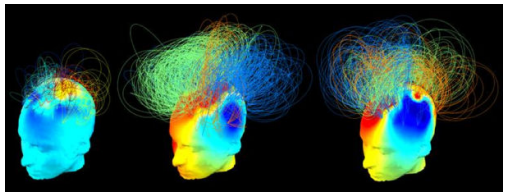
Publication: Adenosine activates brown adipose tissue and recruits beige adipocytes via A2A receptors, "Nature", DOI: 10.1038/nature13816

http://www.eurekalert.org/pub_releases/2014-10/uoc-sf101514.php

Scientists find 'hidden brain signatures' of consciousness in vegetative state patients

Hidden signatures in the brains of people in a vegetative state point to networks that could support consciousness in unconscious and unresponsive patients

Scientists in Cambridge have found hidden signatures in the brains of people in a vegetative state, which point to networks that could support consciousness even when a patient appears to be unconscious and unresponsive.



The study could help doctors identify patients who are aware despite being unable to communicate.

These images show brain networks in two behaviorally similar vegetative patients (left and middle), but one of whom imagined playing tennis (middle panel), alongside a healthy adult (right panel). **Srivas Chennu**

There has been a great deal of interest recently in how much patients in a vegetative state following severe brain injury are aware of their surroundings. Although unable to move and respond, some of these patients are able to carry out tasks such as imagining playing a game of tennis.

Using a functional magnetic resonance imaging (fMRI) scanner, which measures brain activity, researchers have previously been able to record activity in the pre-motor cortex, the part of the brain which deals with movement, in apparently unconscious patients asked to imagine playing tennis.

Now, a team of researchers led by scientists at the University of Cambridge and the MRC Cognition and Brain Sciences Unit, Cambridge, have used high-density electroencephalographs (EEG) and a branch of mathematics known as 'graph theory' to study networks of activity in the brains of 32 patients diagnosed as vegetative and minimally conscious and compare them to healthy adults.

The findings of the research are published today in the journal PLOS Computational Biology. The study was funded mainly by the Wellcome Trust, the National Institute of Health Research Cambridge Biomedical Research Centre and the Medical Research Council (MRC).

The researchers showed that the rich and diversely connected networks that support awareness in the healthy brain are typically – but importantly, not always – impaired in patients in a vegetative state.

Some vegetative patients had well-preserved brain networks that look similar to those of healthy adults – these patients were those who had shown signs of hidden awareness by following commands such as imagining playing tennis.

Dr Srivas Chennu from the Department of Clinical Neurosciences at the University of Cambridge says: "Understanding how consciousness arises from the interactions between networks of brain regions is an elusive but fascinating scientific question. But for patients diagnosed as vegetative and minimally conscious, and their families, this is far more than just an academic question – it takes on a very real significance. Our research could improve clinical assessment and help identify patients who might be covertly aware despite being uncommunicative."

The findings could help researchers develop a relatively simple way of identifying which patients might be aware whilst in a vegetative state. Unlike the 'tennis test', which can be a difficult task for patients and requires expensive and often unavailable fMRI scanners, this new technique uses EEG and could therefore be administered at a patient's bedside. However, the tennis test is stronger evidence that the patient is indeed conscious, to the extent that they can follow commands using their thoughts. The researchers believe that a combination of such tests could help improve accuracy in the prognosis for a patient.

Dr Tristan Bekinschtein from the MRC Cognition and Brain Sciences Unit and the Department of Psychology, University of Cambridge, adds: "Although there are limitations to how predictive our test would be used in isolation, combined with other tests it could help in the clinical assessment of patients. If a patient's 'awareness' networks are intact, then we know that they are likely to be aware of what is going on around them. But unfortunately, they also suggest that vegetative patients with severely impaired networks at rest are unlikely to show any signs of consciousness."

http://www.eurekalert.org/pub_releases/2014-10/uoc--hcp101314.php

Human cancer prognosis is related to newly identified immune cell

A rare population of tumor-associated 'good' cells slows cancer

A newly discovered population of immune cells in tumors is associated with less severe cancer outcomes in humans, and may have therapeutic potential, according to a new UC San Francisco study of 3,600 human tumors of 12 types, as well as mouse experiments. The research is published online October 16, 2014 in the journal Cancer Cell.

Molecules associated with these cells, newly identified by the UCSF researchers, could be the focus of new immunotherapies that are more precisely targeted than current immunotherapies now in clinical trials, said Matthew Krummel, PhD, professor of pathology at UCSF and the leader of the study.

In fact, the UCSF researchers concluded that the presence of these cells may be the reason current immunotherapies aimed at boosting T lymphocyte responses have any effectiveness whatsoever.

Krummel's lab team depleted the population of these already rare cells in mice and demonstrated that the immune system was then unable to control tumors, even when the mice were given immunotherapeutic treatments. "We found a rare cell type, present in most tumors — but very sparsely — that confers immunity and thus assists in immune rejection of the tumor," Krummel said.

Tumors are able to grow large and spread in part because they subvert the immune system. Cancers prevent the activation of T lymphocytes within the immune system that specifically target tumor molecules recognized as abnormal.

Immune cells known as antigen-presenting cells need to activate T lymphocytes to trigger them to attack, but in cancer, cells called tumor-associated macrophages tell T lymphocytes to remain dormant, and also foster the development of blood vessels that feed the growing tumor.

However, the distinct, rare population of cells newly identified by Krummel's lab team persists in trying to activate tumor-targeting T lymphocytes, apparently with enough success despite their scarcity to make a difference in cancer outcomes.

Krummel calls the cells antigen-presenting CD103+ dendritic cells, and they make up fewer than 1 percent of all antigen-presenting cells, he said.

The researchers found specific molecules on the cells that serve as a signature for their identification, and molecules that might be targeted to boost the cells' power to activate T lymphocytes."Patients who have the signature of these cells live consistently longer than those with weak signatures," Krummel said. "These antigen-presenting CD103+ dendritic cells are an important but previously

unrecognized ally in immunity to cancer, and we believe that we can learn to manipulate their numbers for new cancer immunotherapies.

"We have identified proteins that we plan to target in order to enhance the good cells, and conversely, we think we can treat molecules on the surface of the bad cells as targets to eliminate those cells." The association of the signature for antigen-presenting CD103+ dendritic cells with better outcomes was especially strong in head and neck cancers and in breast cancers, Krummel said.

The strength of the association between the CD103+ cell signature and cancer outcomes raises the prospect that researchers might even be able to detect cancer early via an immune response. "We want to find genes that are only present in immune cells in cancer, and not in people without cancer," Krummel said.

The major funding source for the work reported by Krummel's lab group in Cancer Cell is the National Institutes of Health.

http://www.eurekalert.org/pub_releases/2014-10/uol-csh101614.php

Curious signal hints at dark matter

Cutting-edge paper by Professor George Fraser -- who tragically died in March this year -- and colleagues at the University of Leicester provides first potential indication of direct detection of Dark Matter

Space scientists at the University of Leicester have detected a curious signal in the X-ray sky – one that provides a tantalising insight into the nature of mysterious Dark Matter.

The Leicester team has found what appears to be a signature of 'axions', predicted 'Dark Matter' particle candidates – something that has been a puzzle to science for years.

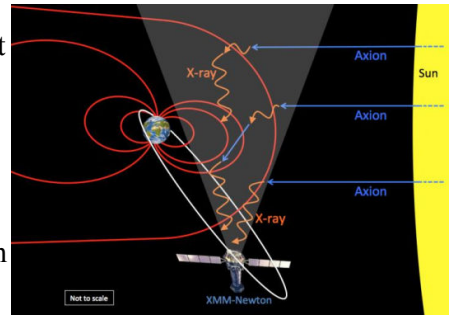
In a study being published on Monday 20 October in the Monthly Notices of the Royal Astronomical Society, the University of Leicester scientists describe their finding of a signal which has no conventional explanation.

As first author Professor George Fraser, who sadly died in March of this year, wrote: "The direct detection of dark matter has preoccupied Physics for over thirty years." Dark Matter, a kind of invisible mass of unknown origin, cannot be seen directly with telescopes, but is instead inferred from its gravitational effects on ordinary matter and on light. Dark Matter is believed to make up 85% of the matter of the Universe.

"The X-ray background - the sky, after the bright X-ray sources are removed - appears to be unchanged whenever you look at it," explained Dr. Andy Read, also from the University of Leicester Department of Physics and Astronomy and now leading the paper. "However, we have discovered a seasonal signal in this X-ray background, which has no conventional explanation, but is consistent with the discovery of axions."

This result was found through an extensive study of almost the entire archive of data from the European Space Agency's X-ray observatory, XMM-Newton, which will celebrate its 15th year in orbit this December. Previous searches for axions, notably at CERN, and with other spacecraft in Earth orbit, have so far proved unsuccessful.

As Professor Fraser explains in the paper: "It appears plausible that axions – Dark Matter particle candidates - are indeed produced in the core of the Sun and do indeed convert to X-rays in the magnetic field of the Earth." It is predicted that the X-ray signal due to axions will be greatest when looking through the sunward side of the magnetic field because this is where the field is strongest.



A sketch (not to scale) showing axions (blue) streaming out from the Sun, converting in the Earth's magnetic field (red) into X-rays (orange), which are then detected by the XMM-Newton observatory. **Copyright: University of Leicester**

Dr. Read concludes: "These exciting discoveries, in George's final paper, could be truly ground-breaking, potentially opening a window to new physics, and could have huge implications, not only for our understanding of the true X-ray sky, but also for identifying the Dark Matter that dominates the mass content of the cosmos."

President of the Royal Astronomical Society Professor Martin Barstow, who is Pro-Vice-Chancellor, Head of the College of Science & Engineering and Professor of Astrophysics & Space Science at the University of Leicester said: "This is an amazing result. If confirmed, it will be first direct detection and identification of the elusive dark matter particles and will have a fundamental impact on our theories of the Universe."

The XMM-Newton observatory, its operations and data archive, constitute a major international collaboration within the European Space Agency (ESA) member states and beyond. The work of a number of authors on the calibration of XMM-Newton was supported by the UK Space Agency (UKSA).

Publication: Potential solar axion signatures in X-ray observations with the XMM-Newton observatory G. W. Fraser (1), A. M. Read (2), S. Sembay (2), J. A. Carter (2), E. Schyns (3) ((1) SSI Group, SRC, University of Leicester, UK, (2) Dept Physics and Astronomy, University of Leicester, UK, (3) Photonis, Brive, France)

Accepted (08/09/14) for publication in Monthly Notices of the Royal Astronomical Society (http://mnras.oxfordjournals.org/)

Paper can be found on arXiv : http://arxiv.org/abs/1403.2436

http://mnras.oxfordjournals.org/lookup/doi/10.1093/mnras/stu1865

XMM-Newton home page : http://xmm.esac.esa.int/

http://www.eurekalert.org/pub_releases/2014-10/uov-nus101614.php

New University of Virginia study upends current theories of how mitochondria began

Mitochondria and first acted as energy parasites in those cells before becoming beneficial

Parasitic bacteria were the first cousins of the mitochondria that power cells in animals and plants – and first acted as energy parasites in those cells before becoming beneficial, according to a new University of Virginia study that used next-generation DNA sequencing technologies to decode the genomes of 18 bacteria that are close relatives of mitochondria.

The study appears this week in the online journal PLOS One, published by the Public Library of Science. It provides an alternative theory to two current theories of how simple bacterial cells were swallowed up by host cells and ultimately became mitochondria, the "powerhouse" organelles within virtually all eukaryotic cells – animal and plant cells that contain a nucleus and other features.

Mitochondria power the cells by providing them with adenosine triphosphate, or ATP, considered by biologists to be the energy currency of life.

The origin of mitochondria began about 2 billion years ago and is one of the seminal events in the evolutionary history of life. However, little is known about the circumstances surrounding its origin, and that question is considered an enigma in modern biology.

"We believe this study has the potential to change the way we think about the event that led to mitochondria," said U.Va. biologist Martin Wu, the study's lead author. "We are saying that the current theories – all claiming that the relationship between the bacteria and the host cell at the very beginning of the symbiosis was mutually beneficial – are likely wrong. "Instead, we believe the relationship likely was antagonistic – that the bacteria were parasitic and only later became beneficial to the host cell by switching the direction of the ATP transport."

The finding, Wu said, is a new insight into an event in the early history of life on Earth that ultimately led to the diverse eukaryotic life we see today. Without mitochondria to provide energy to the rest of a cell, there could not have evolved such amazing biodiversity, he said. "We reconstructed the gene content of mitochondrial ancestors, by sequencing DNAs of its close relatives, and we predict it to be a parasite that actually stole energy in the form of ATP from its host – completely opposite to the current role of mitochondria," Wu said.

In his study, Wu also identified many human genes that are derived from mitochondria – identification of which has the potential to help understand the genetic basis of human mitochondrial dysfunction that may contribute to several diseases, including Alzheimer's disease, Parkinson's disease and diabetes, as well as aging-related diseases. In addition to the basic essential role of mitochondria in the functioning of cells, the DNA of mitochondria is used by scientists for DNA forensics, genealogy and tracing human evolutionary history.

http://annals.org/article.aspx?articleid=1918777

Caring for Patients With Ebola: A Challenge in Any Care Facility

Recent experience with several Ebola-infected patients in the United States provides validation that such patients can be cared for safely in a facility that is adequately prepared.

Mark G. Kortepeter, MD, MPH; Philip W. Smith, MD; Angela Hewlett, MD; and Theodore J. Cieslak, MD

The largest outbreak of Ebola virus continues unabated in West Africa. With the recent death of a patient with Ebola virus disease at a hospital in Dallas, Texas, and the sobering reality that nosocomial spread has occurred in a U.S. facility, U.S. medical centers are coming to grips with the need to prepare for care of patients with this devastating disease. The Centers for Disease Control and Prevention has developed a hospital preparedness checklist, and the latest guidelines continue to express confidence that patients with Ebola can be cared for safely in a conventional medical facility by using barrier methods (standard, contact, and droplet precautions) as the primary means of protecting medical staff [(1–2)]. Recent experience with several Ebola-infected patients in the United States provides validation that such patients can be cared for safely in a facility that is adequately prepared.

Since the first reported outbreaks of Marburg (1967) and Ebola (1976), there has been an evolution in our thinking about the optimal personal protective measures for medical staff caring for patients infected with these viruses. From 1972 to 2010**,** a high-level containment care (HLCC) unit at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), often called “the slammer,” was considered the gold standard for such care. The unit's engineering controls were modeled after a biosafety level–4 (BSL-4) laboratory, with positive-pressure “space” suits, compressed in-line air, HEPA filtration, a decontamination shower, ultraviolet light pass boxes, an airlock, and antiseptic dunk tanks for movement of items in and out of the containment area. Toilet waste was discharged into the laboratory sewer system, and the facility possessed its own autoclave, operating room, and bedside laboratory. These built-in capabilities significantly reduced logistics challenges and provided reassurance that nosocomial spread could be reduced to near zero. Given the relatively high percentage of caregivers who have died of filoviral and other BSL-4 virus infections in the field, and the prior uncertainty in whether such high infection

rates might be caused by droplet or airborne spread, utilization of such a containment facility seemed reasonable. Although used on occasion to quarantine field workers potentially exposed to highly hazardous viruses, the unit was used primarily for isolating individuals exposed to a BSL-4 virus in the laboratory. During the unit's 38 years of operation, 21 patients were quarantined after potential exposures—and none became ill [3].

Over time, we learned that the spread of filoviruses occurs primarily by direct contact with blood and body fluids [1]. Thus, it was determined that a patient care facility with the full panoply of BSL-4 laboratory–like features was no longer needed. The facility was decommissioned and refurbished as a training facility for scientists working in the institute's containment laboratories.

If the USAMRIID HLCC is no longer needed because patients with filoviruses may be managed safely using barrier methods, one might ask whether any HLCC or biocontainment patient facilities are needed at all [4]. Currently, 4 such facilities exist in the United States, operating at a higher level of containment (and possessing more sophisticated engineering controls) than a conventional hospital isolation room and yet lack some BSL-4 features present in the USAMRIID HLCC: Emory University Hospital, Atlanta, Georgia; University of Nebraska Medical Center, Omaha, Nebraska; Saint Patrick's Hospital, Missoula, Montana; and the National Institutes of Health Clinical Center, Bethesda, Maryland. All except the University of Nebraska serve as referral centers for laboratories that work with BSL-4 viruses. Although patients infected with such diseases as Lassa and Marburg have been safely managed in conventional settings, the serious nature of filoviral and arenaviral infections, their rarity and unfamiliarity to clinicians in developed settings, the lack of effective treatments and vaccines, their propensity to infect health care staff, and the infection control challenges they present argue for, in our opinion, specialized containment and treatment facilities.

As many medical centers are no doubt learning in their preparation drills, caring for patients with filovirus and arenavirus infections in a conventional setting presents enormous challenges [5], many of which can be mitigated through the use of specialized facilities with highly trained staff practiced in the nuanced art of safely delivering HLCC. However, in such facilities, it is impossible to completely engineer out human error, eliminate the risk for sharps or needlestick injury, or prevent inadvertent contact contamination. Care for such patients in a conventional setting, therefore, is more than checklists and standard operating procedures. The training, policies, procedures, and logistics necessary for the provision of such care are significant, cannot be assumed, are optimally in place well in advance of actual need, and must be continually reinforced through repetitious training. Every piece of the care continuum must be well-choreographed with significant attention to detail. At a minimum, preparations must be made for patient entry and movement pathways, optimal patient location and access control, safe donning and doffing of personal protective equipment (PPE), handling and testing of laboratory specimens, disposal of significant volumes of waste, safe and unexpected cleanup of spills and bodily waste, and minimizing use of sharps. Donning and doffing of PPE need to be regimented and monitored, with plans in place for peer policing. Lapses inevitably occur in infection control routines in conventional medical settings, but once a patient enters the facility, there is no margin for error. Significant risk for infection control errors occurs especially during doffing of potentially contaminated PPE [6].

While the physical features of high-containment isolation units like that previously housed at USAMRIID [3] are formidable, low-tech measures, such as checklists and the use of doffing partners, may be as important to optimizing the safety of health care workers, whether in an HLCC unit or in a conventional facility. Owing to the very limited number of existing HLCC beds, and given the fact that patients with highly contagious diseases can present unannounced, conventional facilities may be required to triage these patients and even provide definitive care, despite the enormous challenges they would inevitably face. Immediate and thorough preparation is thus imperative.

Despite this necessary reliance on conventional facilities, we recognize the challenges inherent in maintaining a high nationwide state of readiness over the long term. Hence, we envision the need for a network of strategically located regional referral centers serving designated catchment areas tied to BSL-4 laboratories or airport quarantine stations. As such, transport of patients to these referral centers would constitute the preferred clinical option [4]. These units would be associated with major medical centers and provide day-to-day routine care, but they would have the capability for rapid conversion to an HLCC unit without adversely affecting their primary activities. These could serve as national resources, coordinated through the Department of Health and Human Services and Centers for Disease Control and Prevention, with certification (much like trauma centers) to provide a higher level of care. As such, their focus would be on continuous preparation for the next emerging outbreak.

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2 ***Centers for Disease Control and Prevention; Assistant Secretary of Preparedness and Response.*** *Health care provider preparedness checklist for Ebola virus disease. Accessed at*

www.cdc.gov/vhf/ebola/pdf/healthcare-provider-checklist-for-ebola.pdf on 30 September 2014.

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4 **Smith PW, Anderson AO, Christopher GW, Cieslak TJ, Devreede GJ, Fosdick GA, et al.** *Designing a biocontainment unit to care for patients with serious communicable diseases: a consensus statement. Biosecur Bioterror. 2006;4:351-65. [PMID: 17238819]*

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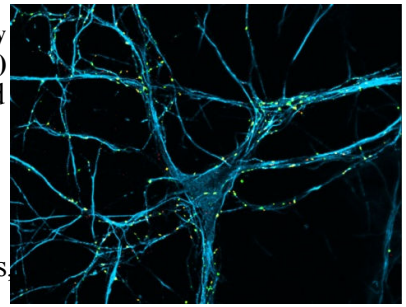
http://bit.ly/1sznWrS

Killer in the brain could help treat Parkinson's

If Wnt is involved in the early stages of Parkinson's, it could create exciting possibilities for new treatment targets

- **07:30 17 October 2014 by Flora Graham**

This glowing blue web of neurons is usually what researchers examine when searching for a cure for Parkinson's. But a new study, part-funded by Parkinson's UK, hones in on the tiny yellow dots. These are the connections between brain cells known as synapses, has discovered a killer that targets these links, potentially paving the way for new treatments.



(Image: Soledad Galli, Parkinson's UK/University College London)

Soledad Galli at University College London and her colleagues have found that the death of synapses in mice may be due to malfunctioning proteins called Wnt proteins. "If we confirm that Wnt is involved in the early stages of Parkinson's, this throws up exciting possibilities not just for new treatment targets, but also for new ways to identify people with Parkinson's early on in their condition," says Galli.

Most patients currently depend on the drug levodopa, which is over 50 years old and can have severe side-effects, in addition to becoming less effective over time. Moreover, it only masks the symptoms: there is no cure for Parkinson's and no way to stop its progression.

Journal reference: Nature Communications, DOI: 10.1038/ncomms5992

http://www.eurekalert.org/pub_releases/2014-10/ehs-poe101614.php

Presence of enzyme may worsen effects of spinal cord injury and impair long-term recovery

Findings suggest MMP-3 disrupts blood-spinal cord barrier and promotes hemorrhage, according to study published in The American Journal of Pathology

Philadelphia, PA – Traumatic spinal cord injury (SCI) is a devastating condition with few treatment options. Studies show that damage to the barrier separating blood from the spinal cord can contribute to the neurologic deficits that arise secondary to the initial trauma. Through a series of sophisticated experiments, researchers reporting in The American Journal of Pathology suggest that matrix metalloproteinase-3 (MMP-3) plays a pivotal role in disruption of the brain/spinal cord barrier (BSCB), cell death, and functional deficits after SCI. This link also presents new therapeutic possibilities.

"Matrix metalloproteinases (MMPs) are enzymes known to degrade the extracellular matrix and other extracellular proteins and are essential for remodeling of the extracellular matrix and wound healing. Excessive proteolytic activity of MMPs can be detrimental, leading to numerous pathological conditions, including blood brain barrier (BBB)/BSCB disruption after injury," explains Tae Young Yune, PhD, of the Department of Biochemistry and Molecular Biology, School of Medicine, Kyung Hee University, Seoul, Korea. Although other MMPs have been linked to SCI (i.e. MMP-2, MMP-9, and MMP-12), there has been no previous direct evidence of a similar role for MMP-3.

By comparing mice that underwent spinal cord injury to a control group, investigators found that both MMP3 messenger RNA (mRNA) and MMP-3 protein levels in spinal cord segments were increased after SCI, peaking one day after surgery in the experimental group, whereas no changes were seen in the controls. MMP-3 immunoreactivity was detected in cells within the lesion site, invading neutrophils, and blood vessel endothelial cells in the area outside of the initial injured area (the penumbra).

Another series of experiments focused on the role of MMP-3 in BSCB permeability, using dye to visualize leakage through the BSCB. Similar to MMP-3 mRNA and protein levels, dye leakage reached a maximum one day after SCI. Leakage was lower in Mmp3 knockout mice that were genetically altered to be deficient in MMP-3 as well as in mice injected with either Mmp3 small interfering RNA (siRNA) or a general MMP inhibitor. Injection of MMP-3 into normal spinal cord also significantly increased dye leakage.

MMP-3 was found to contribute to the degradation of tight junction proteins that are responsible for maintaining the integrity of the BSCB barrier. In addition, the researchers reported that MMP-3 induced blood cell infiltration and hemorrhage after SCI in wild-type mice, but not in Mmp3 knockout mice. MMP-3 also mediated activation of other MMPs (MMP-2 and MMP-9) that are up-regulated after SCI. "This is the first study to demonstrate that MMP-3 is involved in MMP-9 activation in central nervous system injury," says Dr. Yune.

A significant finding was that mice deficient in MMP-3 showed significantly better functional recovery 14 and 28 days after injury than non-deficient mice. Histological analysis showed that after SCI the mice deficient in MMP-3 had smaller volumes of injured tissue and more healthy axons than non-deficient wild-type mice.

"The evidence suggests that BBB/BSCB disruption plays a pivotal role in acute and chronic neurological disorders. The inhibition of MMP-3 may be a promising therapeutic target for human central nervous system disease, including SCI," notes Dr. Yune.

http://www.eurekalert.org/pub_releases/2014-10/ez-eaf101714.php

Emergency aid for overdoses

To date, antidotes exist for only a very few drugs. When treating overdoses, doctors are often limited to supportive therapy such as induced vomiting.

This news release is available in German.

Treatment is especially difficult if there is a combination of drugs involved. So what can be done if a child is playing and accidentally swallows his grandmother's pills? ETH professor Jean-Christophe Leroux from the Institute of Pharmaceutical Sciences at ETH Zurich wanted to find an answer to this question. "The task was to develop an agent that could eliminate many different toxic substances from the body as quickly as possible," he says.

Leroux and his team knew that lipid emulsions can bind to drugs when injected into the blood stream. The researchers pursued this approach in their own studies, developing an agent based on liposomes, which are tiny bubbles with a lipid membrane as an outer layer. Instead of an intravenous injection, the agent is used as a dialysis fluid for so-called peritoneal dialysis. This method of dialysis is less common than haemodialysis, which is mainly used as a long-term form of treatment of kidney failure.

"Washing" toxic substances out of the body

In the case of haemodialysis, the blood is "washed" in a machine at the hospital, whereas peritoneal dialysis involves eliminating toxic substances from within the body. The peritoneum serves as a dialysis membrane. The dialysis fluid is passed through a catheter into the abdominal cavity where it rids the body of toxins through the highly perfused peritoneum. In the case of the new dialysis liquid developed by the ETH researchers, the toxic compounds find their way into the core of the liposomes. Once the solution is loaded with toxins, it is drained out of the abdominal cavity through the catheter. The researchers were able to demonstrate that the new agent is especially effective at this. "Our peritoneal dialysis fluid can extract up to a hundred times more toxins than conventional alternatives," reported the ETH professor.

Their efforts are based on the principle that peritoneal dialysis is an especially attractive method for the emergency treatment of overdoses. Unlike haemodialysis, it does not require sophisticated equipment and can even be employed away from specialized hospitals.

New applications for peritoneal dialysis

Until now, however, peritoneal dialysis has only filled a specific niche. No more than 10 percent of all dialysis patients worldwide use this method, and it is almost never used for overdoses. One reason for this is that cleaning the blood using peritoneal dialysis and currently available dialysis agents has often been less effective than haemodialysis. Secondly, there is a greater risk of infection. The catheter insertion point can become inflamed, and bacteria can infiltrate the abdominal cavity through this opening. Doctors therefore opt for peritoneal dialysis only for a minority of patients whose blood needs to be cleaned due to renal failure caused by toxic metabolic products.

The findings of the ETH researchers may help to discover new applications for peritoneal dialysis in two respects: in the course of their research, Leroux and his team were pleased to find that their dialysis fluid rids the body of both drug residues as well as toxic metabolic products.

Treatment of serious liver diseases

The researchers' findings are especially promising for treating serious liver disease. Leroux has no doubt that there is a need for this because in addition to hepatitis and severe alcoholism, being overweight or obese can lead to liver disease. Given that obesity rates are constantly increasing in the western world, this is quite literally becoming a weightier issue all the time.

The dialysis fluid appears to be especially effective for liver diseases involving the accumulation of ammonia in the blood. Experiments in rats have shown that the substance effectively eliminates toxic ammonia. For example, it might be possible to provide effective emergency aid to infants who are born with metabolic disorders such as urea cycle disorder. "If a baby is not treated within a few hours of birth, there is already a hazard of irreparable brain damage," explains Leroux. Peritoneal dialysis is well-suited for newborns, because venous access for haemodialysis is difficult and there is a high risk of thrombosis.

Following these promising findings, Jean-Christophe Leroux's team now hopes to further develop the agent for actual medical applications. If everything goes as planned, the first clinical trials will be possible within the next five years.

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http://www.eurekalert.org/pub_releases/2014-10/d-ssc101514.php

Study shows children who have had enterovirus infection are around 50 percent more likely to have type 1 diabetes

Children who have been infected with enterovirus are 48% more likely to have developed type 1 diabetes

A new study published in Diabetologia (the journal of the European Association for the Study of Diabetes) shows that children who have been infected with enterovirus are 48% more likely to have developed type 1 diabetes. The study is by Dr Tsai Chung-Li, China Medical University, Taiwan, and colleagues.

"Type 1 diabetes is considered to be caused by complex interaction between genetic susceptibility, the immune system, and environmental factors," say the authors. "Though the cue for genetic predisposition has been elucidated, evidence also points to involvement of enterovirus (EV) infection, including viruses such as poliovirus, Coxsackievirus A, Coxsackievirus B, and echovirus."

To investigate the link between EV infection and subsequent type 1 diabetes, the researchers used nationwide population-based data from Taiwan's national health insurance system. They looked at type 1 diabetes incidence in children aged up to 18 years with or without diagnosis of EV infection during 2000–2008.

Overall incidence of type 1 diabetes was higher in the EV-infected children than in the non-EV infected group (5.73 vs. 3.89 per 100,000 people per year, showing a 48% increased incidence rate in EV-infected versus non-EV-infected children). Hazard ratios of type 1 diabetes increased with age at diagnosis of EV infection, with a more than doubling of the risk of type 1 diabetes (2.18 times increased risk) for children aged over 10 years at entry. No relationship of allergic rhinitis or bronchial asthma to type 1 diabetes was found.

The authors point out that despite countries such as Finland and Sweden having the highest incidence of type 1 diabetes worldwide, they are thought to have low background rates of enterovirus infection, suggesting that genetic factors are a large component of the high type 1 diabetes rates in those countries. But they add: "Regions such as Africa, Asia, South America have a low but increasing incidence of type 1 diabetes and high prevalence of enterovirus infection; environmental factors like enterovirus infection may play a vital role in increasing incidence in these regions."

They add: "Taiwan has relatively low type 1 diabetes incidence; we believe that the marked escalation of the said incidence in recent decades can be largely attributed to the highly endemic spread of enterovirus infection in Taiwanese children, given that there has been little gene flow and genetic drift in such a short period."

They conclude: "This nationwide retrospective cohort study found a positive correlation of type 1 diabetes with EV infection. Our results suggest that preventive strategies, such as an effective vaccine against EV infection, may lessen the incidence of type 1 diabetes in Taiwan."

http://nyti.ms/1wfyLQG

In Conspicuous Success, Senegal Is Declared Ebola-Free

Senegal's achievement comes as the WHO was reported to have internally acknowledged its own stark failure to arrest the disease months ago

By Nick Cumming-Bruce And Rick Gladstone

GENEVA - The World Health Organization declared the West African nation of Senegal to be free of Ebola on Friday, a rare success in dealing with a deadly virus that has rampaged uncontrolled in neighboring countries and prompted alarm around the world.

Senegal's achievement came as the health organization was reported to have internally acknowledged its own stark failure to arrest the disease months ago. The internal document reportedly went far beyond the self-criticism that organization officials have expressed publicly about their response.

The W.H.O. announcement on Senegal officially concluded a monitoring period of 42 days, twice the maximum incubation period for the virus, in which no new infections were found. The last recorded case in the country was a young man who was entering by road from Guinea; he recovered and returned to Guinea last week, the organization announced.

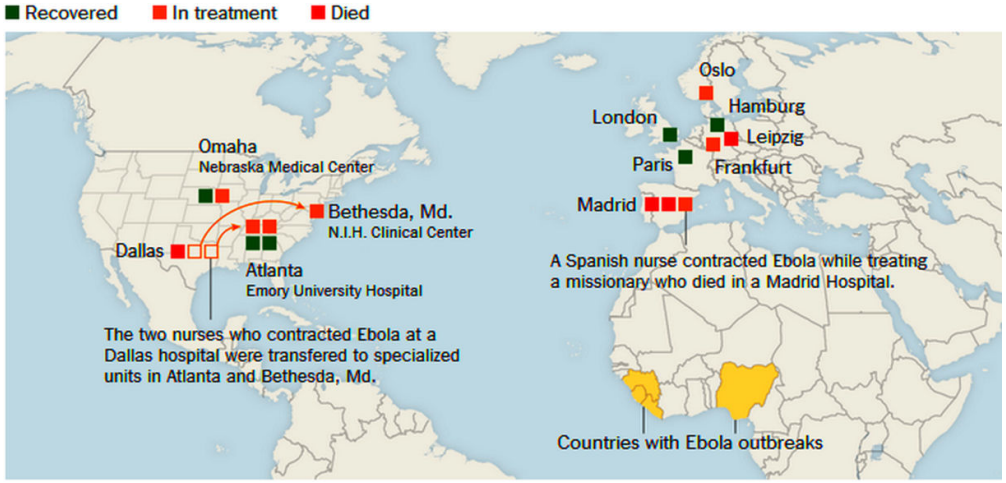
In what would be another conspicuous success, Nigeria, Africa's most populous nation, appeared close on Friday to declaring itself free of Ebola as well. The country would reach the 42-day milestone on Monday, after an outbreak that infected 20 people and resulted in eight deaths. Senegal's proximity to Guinea, Liberia and Sierra Leone, the three countries at the heart of the epidemic, "makes the country still vulnerable to additional imported cases," the organization said.

More than 4,500 people have died from Ebola and more than 9,200 have been infected in the current outbreak, according to the latest W.H.O. tally posted Friday on its website. The number of cases is still doubling every month. Still, Senegal's success in isolating the infection sets an example of good practice at a moment when the organization is trying to strengthen the readiness of 15 other countries in Africa to deal with arriving travelers who are infected with the disease.

The W.H.O., a specialized United Nations agency with its headquarters in Geneva, is responsible for coordinating international responses to contagious diseases.

Dr. Margaret Chan, the director general of the agency, and her top aides have said that all agencies and governments dealing with the Ebola outbreak — including her own — underestimated its severity. But a draft internal document, reported Friday by The Associated Press, uses significantly stronger language in faulting the organization's performance, citing incompetent staff and scant information.

"Nearly everyone involved in the outbreak response failed to see some fairly plain writing on the wall," the news agency quoted the document as saying.



How many Ebola patients have been treated outside of West Africa?

At least 17 cases have been treated in Europe and the United States. Most involve health and aid workers who contracted Ebola in West Africa and were transported back to their home country for treatment. Cases shown below are compiled from reports by the C.D.C., the World Health Organization, Doctors Without Borders and other official agencies.

Tarik Jasarevic, a W.H.O. spokesman in Geneva, declined to comment on the agency's report and said he had not seen the document. "We will have a time to review how the response has been handled and we will certainly do that but for the time being we want to focus on helping countries make their response as efficient as possible," he said. In Sierra Leone, where Ebola's ripple effects have led to severe food shortages and hunger, the World Food Program and its partners began what they called the biggest single food distribution operation to date.

Gon Myers, the program's director in Sierra Leone, said in a statement that more than 800 tons of food had been distributed to 265,000 people on the outskirts of Freetown, the capital, enough to last them for a month. He said the distribution was meant "to prevent this health crisis from becoming a food and nutrition crisis."

Cases of Ebola Outside of West Africa — As of Oct. 16, 2014

United States	Arrival date	
Aid worker	Aug. 2	Recovered
Missionary	Aug. 2	Recovered
Doctor	Sept. 5	Recovered
Doctor	Sept. 9	In treatment
Visitor	Sept. 30*	Died
NBC cameraman	Oct. 6	In treatment
Hospital worker	Oct. 11*	In treatment
Hospital worker	Oct. 15*	In treatment
France		
Nurse	Sept. 19	Recovered
Britain		
Nurse	Aug. 24	Recovered
Spain		
Missionary	Aug. 7	Died
Priest	Sept. 22	Died
Nurse	Oct. 6*	In treatment
Germany		
Doctor	Aug. 27	Recovered
Doctor	Oct. 3	In treatment
U.N. medical worker	Oct. 9	Died
Norway		
Aid worker	Oct. 6	In treatment

*Date of Ebola diagnosis.

At the United Nations, Sarah Crowe, the crisis communications chief for Unicef, told reporters after a five-week visit to Liberia that "Ebola has hijacked every aspect of life" and left 3,700 orphans in the affected countries.

In another ripple effect, the United Nations Population Fund said that health facilities overstretched by Ebola threatened the needs of pregnant women, who are afraid to visit clinics or are turned away.

More than 800,000 women in Guinea, Liberia and Sierra Leone are likely to give birth in the next 12 months, the agency said. "The reality is that pregnant women are facing a double threat - dying from Ebola and from pregnancy or childbirth, due to the devastating impact of Ebola on health workers and health systems," said the agency's executive director, Dr. Babatunde Osotimehin.

http://www.eurekalert.org/pub_releases/2014-10/bcom-wes101614.php

Whole exome sequencing closer to becoming 'new family history'

Quarter of patients whose DNA was submitted for clinical whole exome testing received a diagnosis related to a known genetic disease

HOUSTON – Approximately one-fourth of the 3,386 patients whose DNA was submitted for clinical whole exome testing received a diagnosis related to a known genetic disease, often ending a long search for answers for them and their parents, said researchers from the Baylor College of Medicine departments of molecular and human genetics and pediatrics and the Baylor Human Genome Sequencing Center and the University of Texas Health Science Center at Houston.

In an online report in the Journal of the American Medical Association, the scientists led by Drs. Yaping Yang, laboratory director of the Whole Genome

Laboratory at Baylor, and Christine Eng, professor of molecular and human genetics at Baylor and senior director of Baylor's Medical Genetics Laboratories, found a molecular diagnosis (meaning a genetic mutation or variation linked to a disease) in 25 percent of the large group of cases – confirming in this much larger group of patients the diagnostic yield from their initial report on the first 250 cases that appeared in the New England Journal of Medicine a little more than a year ago.

Eng will also present results of the study on Oct. 21 during the American Society of Human Genetics Annual Meeting in San Diego, Calif.

"The findings in this report, I believe, will forever change the future practice of pediatrics and medicine as a whole," said Dr. James R. Lupski, professor of molecular and human genetics and pediatrics at Baylor and a coauthor of the report. "It is just a matter of time before genomics moves up on the physician's list of things to do and is ordered before formulating a differential diagnosis. It will be the new 'family history' that, better yet, gets you both the important variants inherited from each parent and the new mutations that contribute to disease susceptibility."

In fact, a large percentage of the diagnoses made were patients who inherited a new mutation (in the egg or sperm) that was not previously seen in their parents.

"The routine application of new genome methods in the clinic is not only benefitting patients but changing the way we think about research," said Dr. Richard Gibbs, director of the Baylor College of Medicine Human Genome Sequencing Center and an author of the report.

"It has been wonderful to watch this very large team of colleagues bridging from the patient in clinic to the very most cutting edge genomic technology to give families answers where previously there were none," said Dr. Arthur Beaudet, professor of molecular and human genetics who was chair of the department when the Whole Gene Laboratory was begun and who began the Baylor College of Medicine Medical Genetics Laboratories.

"The diagnostic rate holds for the entire set of undiagnosed 3,386 patients who underwent whole exome sequencing between June 2012 and August 2014," said Eng, who reported on a detailed analysis of 2,000 consecutive patients.

The procedure involved sequencing the DNA of the patients using new sequencing technologies referred to as next generation sequencing and comparing those results to the normal reference. Any disease associated mutations were then also compared with the parent's DNA to determine if the child inherited it from one or both parents to better understand the cause of the disease. In this study, the whole exome sequencing also identified ways in which physicians could intervene clinically to ameliorate or eliminate negative symptoms and to give families more information about the possible disease course.

In addition to confirming the 25 percent diagnostic rate in a much larger group of patients, the newest study shows that rare genetic events contribute in a very big way to disease susceptibility, said Yang, first author of the JAMA study.

Among the major contributors to disease are de novo events in which a single change occurs for the first time in the make-up of a gene (known as a Mendelian mutation) in a patient, uniparental disomy (in which a person inherits two copies of a mutation from the same parent), mosaicism and copy number, she said.

"Clinical exome sequencing can assist diagnosis in a wide range of disorders that are diagnostic dilemmas," said Lupski, a clinical pediatric geneticist at Texas Children's Hospital. Many of the patients in the study were referred from Texas Children's or other medical centers across the United States.

"Rare variants and Mendelian disease are important contributors to disease populations. This is in sharp contrast to the thinking of population geneticists who investigate (by genome wide association studies) how common variants contribute to disease susceptibility. We find 'rare variants' in aggregate actually contribute to disease susceptibility in a big way. The individual diseases may be rare, but there are thousands of such diseases and many more being defined through genomics," said Lupski.

"I expect that in a few years, we will learn of the importance of whole exome sequencing in adult medicine and in fields of pediatrics outside of development," said Dr. Sharon Plon, professor of pediatrics and molecular and human genetics at Baylor, as well as director of the Baylor Cancer Genetics Clinic and a member of the Texas Children's Cancer Center. "We are currently performing an NIH-supported clinical trial of whole exome sequencing in childhood cancer patients to learn of its potential utility for these patients."

In the detailed study of 2,000 patients, 504 patients received a molecular diagnosis of which 280 patients had a single gene mutation that caused disease (autosomal dominant), 181 were autosomal recessive (two mutated genes), 65 were X-linked (mutation on the X chromosome) and one was presumed inherited through the mitochondria. In five cases, the patient inherited two copies of the mutated gene from the same parent (uniparental disomy). Of the dominant mutations, 208 were de novo mutations not inherited from either parent, 32 were inherited and 40 not determined because parental samples were not available for laboratory analysis.

Among the de novo mutations, five demonstrated mosaicism, which suggested that the mutation occurred after fertilization. Mosaicism means that the patient has a small population of cells with a different genetic pattern than most of the cells in the body.

The researchers found 708 presumptive causative variant alleles in the 504 cases, with most of the variants being novel and not previously reported. Of note, almost 30 percent of the diagnoses occurred in disease genes only identified by researchers in the last three years. In 65 cases, there was no available genetic test other than exome sequencing to find the mutated gene at the time the test was ordered.

Twenty-three patients (about 5 percent) had mutations in two different genes, which could account for various aspects of the patient's medical condition.

"Doctors generally try to find one diagnosis that explains all the issues a patient may have. We have found that in some cases, a patient may have a blended phenotype of two different conditions," said Eng. "That patients may have two different rare genetic diseases to explain their condition was an unexpected finding prior to the use of whole exome sequencing."

In the 2,000 cases, incidental findings of medically actionable results that could result in early diagnosis, screening or treatment were found in 92 patients. Three patients had more than one finding.

"For the 25 percent of cases that received a molecular diagnosis, this information ended the diagnostic odyssey, provided more informed medical management and allowed for precise determination of reproductive risks, but in relatively few cases, resulted in specific treatment to reverse the condition," the authors wrote.

Others who took part in this work include: Donna M. Muzny, M.S., Fan Xia, Ph.D., Zhiyv Niu, Ph.D., Richard Person, Ph.D., Yan Ding, Ph.D., Patricia Ward, M.S., Alicia Braxton, M.S., Min Wang, Ph.D., Christian Buhay, B.S., Narayanan Veeraraghavan, Ph.D., Alicia Hawes, B.S., Theodore Chiang, Ph.D., Magalie Leduc, Ph.D., Joke Beuten, Ph.D., Jing Zhang, Ph.D., Weimin He, Ph.D., Jennifer Scull, Ph.D., Alecia Willis, Ph.D., Megan Landsverk, Ph.D. , William J. Craigen, M.D., Ph.D., Mir Reza Bekheirnia, M.D., Asbjorg Stray-Pedersen,M.D., Ph.D., Pengfei Liu, Ph.D. , Shu Wen, Ph.D. , Wendy Alcaraz, Ph.D., Hong Cui, Ph.D., Magdalena Walkiewicz, Ph.D., Jeffrey Reid, Ph.D., Matthew Bainbridge, Ph.D., Ankita Patel, Ph.D., Eric Boerwinkle, Ph.D. Arthur L. Beaudet, M.D. and Richard A. Gibbs, Ph.D. all of Baylor. Boerwinkle is also with UT Health Science Center at Houston.

Partial support for this work came from the National Human Genome Research Institute (Grants U54 HG003273, to Gibbs; U01 HG006485, to Plon; and U54 HG006542 to Lupski) and the National Institute of Neurological Disorders and Stroke (Grant R01 NS058529 to Lupski).

http://www.eurekalert.org/pub_releases/2014-10/aaoo-crg101614.php

Could reading glasses soon be a thing of the past?

Implantable eye devices that improve vision up close could soon be a viable alternative for aging eyes in the United States

CHICAGO – A thin ring inserted into the eye could soon offer a reading glasses-free remedy for presbyopia, the blurriness in near vision experienced by many people over the age of 40, according to a study released today at AAO 2014, the 118th annual meeting of the American Academy of Ophthalmology. A corneal inlay device currently undergoing clinical review in the United States improved near vision well enough for 80 percent of the participating patients to read a newspaper without disturbing far distance vision needed for daily activities like driving.

Presbyopia affects more than 1 billion people worldwide. As people age, the cornea becomes less flexible and bends in such a way that it becomes difficult to see up close. While the most common remedy is wearing reading glasses, a host of new corneal inlay products are in development to treat the condition, with three types currently under review by the U.S. Food and Drug Administration (FDA).

The theoretical advantage of using corneal inlays over wearing reading glasses is that corneal inlays prevent the need for constantly putting on and taking off glasses, depending on whether the person needs to see near or far.

One of the devices is the KAMRA inlay, a thin, flexible doughnut-shaped ring that measures 3.8 millimeters in diameter, with a 1.6 millimeter hole in the middle. When dropped into a small pocket in the cornea covering the front of the eye, the device acts like a camera aperture, adjusting the depth of field so that the viewer can see near and far. The procedure to insert the implant is relatively quick, lasting about 10 minutes, and requires only topical anesthesia.

To test the inlay's efficacy, clinicians conducted a prospective non-randomized study of 507 patients between 45 and 60 years of age across the United States, Europe and Asia with presbyopia who were not nearsighted. The researchers implanted the ring in the patients and followed up with them over the course of three years. In 83 percent of eyes with the implant, the KAMRA corneal inlay allowed presbyopic patients to see with 20/40 vision or better over the three years. This is considered the standard for being able to read a newspaper or drive a vehicle without corrective lenses. On average, patients gained 2.9 lines on a reading chart. The researchers report that the results remained steady over a three-year period.

Complications from corneal inlays in general have included haziness that is treatable with steroids; however, improvements in inlay design have made the effect less common. If necessary, inlays can be removed, making it a reversible treatment, unlike other procedures such as LASIK for presbyopia.

"This is a solution that truly delivers near vision that transitions smoothly to far distance vision," said John Vukich, M.D., author of the poster and a clinical adjunct professor in ophthalmology and vision sciences at the University of Wisconsin, Madison. "Corneal inlays represent a great opportunity to improve vision with a safety net of removability."

The device is sold in regions including Asia, Europe and South America, but is not yet approved by the FDA for use in the United States. There are two other types of corneal inlays, Raindrop Near Vision Inlay and Presbia Flexivue Microlens, also in development for the U.S. market.

Treating Emmetropic Presbyopes with a Small Aperture Inlay: Three Year Results (PO224) was presented at AAO 2014, the 118th annual meeting of the American Academy of Ophthalmology in conjunction with the European Society of Ophthalmology, which is in session October 17-21 at McCormick Place in Chicago. More than 25,000 attendees and 620 companies from 123 countries gather each year to showcase the latest in ophthalmic education, research and technology. To learn more about the place Where All of Ophthalmology Meets, visit http://www.aao.org/2014.

http://phys.org/news/2014-10-japan-sacred-rice-farms.html

Japan's 'sacred' rice farms rotting from inside

Shuichi Yokota may be the future of Japan's struggling rice industry.

The 38-year-old is about half the age of most growers and he relies on cutting-edge technology to cultivate vast paddy fields that eclipse the bulk of the country's rice plots.

And Yokota doesn't fear opening up to foreign competition—taboo in a place where rice is a sacred cow that is protected by subsidies and massive tariffs.

His farm in Ryugasaki, a community north of Tokyo, has ballooned more than five-fold in 15 years into an operation spanning 112 hectares (275 acres)—almost 30 times bigger than the tiny commercial rice fields commonly found in the area.

"This is simply the consequence of retiring farmers asking me to cultivate their rice paddies for them," Yokota said. "I am one of very few full-time farmers in this area, and the people who were retiring didn't have anyone in the family to continue growing rice. But they don't want to sell the land."

While many of Japan's farmers get by with centuries-old farming methods, Yokota and his colleagues share workload information and data such as temperature and water levels—monitored by sensors installed in each paddy—on their smartphones.

Yokota may be an accidental giant among rice growers, but some are betting that people like him are the best hope for fixing an inefficient system, with wider calls for a shake up of Japan's cossetted agricultural sector.

Prices have tumbled as Japan's rice consumption has halved in 50 years, and there are fears the sector is rotting from the inside despite—or some say, because of—decades-old protectionism. Ageing farmers are also facing fresh competition, with the country's largest supermarket chain Aeon jumping into the rice business.

"The situation is extremely serious—this is the dawn of a very difficult time," said Yoshito Yamada, a 66-year-old farmer in the northeastern city of Kitakata.

Rice reverence

Whether it is a bed for a piece of raw fish, an essential component of almost every meal, or the key ingredient in making sake, rice is Japan's unparallelled staple food and enjoys a revered status.

Hundreds of years ago it was a currency, a symbol of wealth and power, and a ritual offering that still forms a key part of the native Shinto religion, as well as tradition-bound Sumo wrestling. "Nothing gets done here without rice," said Sachiko Goto, head of the Tokyo Sushi Academy, a chef-training school. That reverence has translated into strong protections for tiny plots tended by families who inherited land through generations—resulting in a hefty premium in stores.

Tokyo has for decades stabilised prices by controlling supply and penalising over-production to protect farmers—a key voter base—from volatile world markets, This policy, known as "gentan" and referring to small-scale cultivation, effectively made rice farming a part-time job left to older relatives while younger family members worked in other sectors.

But, as with much of the greying nation, many farmers are now retiring—the average is about 66 years old—with few interested in replacing them. That has left some 400,000 hectares of farmland unused across the country, an area almost twice the size of Tokyo.

"What needs to be done is encourage older farmers to retire and then gather small pieces of land into one big lot for someone capable like Yokota," said Masayoshi Honma, an economics professor at Tokyo University.

It is estimated that ditching rice tariffs—which can reach 778 percent—would see local prices fall by about 341 yen ($3.20) per kilogram, according to Japan's agricultural ministry. An average five-kilogram (11-lb) bag in a Tokyo supermarket costs between 1,500-2,000 yen, up to three times a comparable bag in Sydney, Bangkok and Beijing.

Overseas markets

Despite resistance to change by the powerful agricultural lobby, some older rice farmers such as Yamada blame the subsidy system for a now stagnant sector.

Prime Minister Shinzo Abe last year said he would end production quotas from 2018 and abolish some cash handouts to rice farmers while expanding other payments—leading to claims the policy was toothless.

Despite his plan to shake up the economy, Abe has avoided taking an axe to rice tariffs that have long been seen as untouchable.

The levies have kept imports of foreign rice to a trickle—77 tons last year against domestic production of eight million—and they remain a key stumbling block in Tokyo's trade talks, including the US-led Trans-Pacific Partnership (TPP), a proposed 12-nation free-trade bloc.

Despite fears the industry would crumble if it has to compete globally, Yokota insists competition might be an opportunity to tap new markets.

"If our supply exceeds domestic consumption, then we will bring it overseas—the TPP wouldn't be a threat in that sense," he said.

http://www.eurekalert.org/pub_releases/2014-10/uom-mb101714.php

Major breakthrough could help detoxify pollutants

Major breakthrough could lead to more effective methods for detoxifying PCBs and dioxins

Scientists at The University of Manchester hope a major breakthrough could lead to more effective methods for detoxifying dangerous pollutants like PCBs and dioxins. The result is a culmination of 15 years of research and has been published in Nature. It details how certain organisms manage to lower the toxicity of pollutants. The team at the Manchester Institute of Biotechnology were investigating how some natural organisms manage to lower the level of toxicity and shorten the life span of several notorious pollutants.

Professor David Leys explains the research: "We already know that some of the most toxic pollutants contain halogen atoms and that most biological systems simply don't know how to deal with these molecules. However, there are some organisms that can remove these halogen atoms using vitamin B12. Our research has identified that they use vitamin B12 in a very different way to how we currently understand it."

He continues: "Detailing how this novel process of detoxification works means that we are now in a position to look at replicating it. We hope that ultimately new ways of combating some of the world's biggest toxins can now be developed more quickly and efficiently."

It's taken Professor Leys 15 years of research to reach this breakthrough, made possible by a dedicated European Research Council (ERC) grant. The main difficulty has been in growing enough of the natural organisms to be able to study how they detoxify the pollutants. The team at the MIB were finally able to obtain key proteins through genetic modification of other, faster growing organisms. They then used X-ray crystallography to study in 3D how halogen removal is achieved.

The main drive behind this research has been to look at ways of combatting the dozens of very harmful molecules that have been released into the environment. Many have been directly expelled by pollutants or from burning household waste. As the concentration of these molecules has increased over time their presence poses more of a threat to the environment and humanity. Some measures have already been taken to limit the production of pollutants, for example PCBs were banned in the United States in the 1970s and worldwide in 2001.

Professor Leys says: "As well as combatting the toxicity and longevity of pollutants we're also confident that our findings can help to develop a better method for screening environmental or food samples."

http://www.eurekalert.org/pub_releases/2014-10/bc-vpt101614.php

Viagra protects the heart beyond the bedroom

Viagra could be used as a safe treatment for heart disease, finds new research published today in the open access journal BMC Medicine.

The study reveals that long-term daily treatment of Viagra can provide protection for the heart at different stages of heart disease, with few side effects.

Phosphodiesterase-5 inhibitor (PDE5i) is the main ingredient in Viagra and other drugs commonly used to treat erectile dysfunction. The inhibitor blocks the enzyme PDE5, which prevents relaxation of smooth muscle tissue. The presence of PDE5 in the heart has led to previous research on whether the inhibitor could treat non-urological conditions. But despite some promising results, the studies were largely based on animals and the cardioprotective effects of PDE5i remained unclear.

Scientists from the Sapienza University of Rome carried out a meta-analysis of randomized controlled trials by searching for articles published between January 2004 and May 2014 to test the effectiveness of PDE5i in providing cardiac protection, and to find out whether it was well-tolerated and safe. They identified 24 suitable trials for analysis from four research databases: MEDLINE, EMBASE, Cochrane Library and SCOPUS. The trials involved 1622 patients from mixed populations who were treated with PDE5i or a placebo.

For the first time, the scientists conducted a parallel analysis of the effects of the inhibitor on the size and shape of the heart and its performance.

The analysis shows that PDE5i prevented the heart increasing in size and changing shape in patients suffering from left ventricular hypertrophy, a condition which causes thickening of the muscles in the left ventricle. The inhibitor also improved heart performance in all patients with different heart conditions, with no negative effect on the patients' blood pressure.

Lead author of the study, Andrea Isidori said: "We found that the main ingredient in Viagra can be used as an effective, safe treatment for several patients with heart disease. Large clinical trials are now urgently needed to build on these encouraging findings."

The study concludes that the inhibitor could be reasonably administered to men who suffer from heart muscle thickening and early-stage heart failure. However, since most of the studies included in the meta-analysis were on men, the researchers suggest the next step should be a larger trial on sex-specific long-term responses.

Is Chronic Inhibition of Phosphodiesterase type 5 Cardioprotective and Safe? A Meta-Analysis of Randomized Controlled Trials
Elisa Giannetta, Tiziana Feola, Daniele Gianfrilli, Riccardo Pofi, Valentina Dall'Armi, Roberto Badagliacca, Federica Barbagallo, Andrea Lenzi and Andrea M. Isidori BMC Medicine 2014, 12:185

http://www.eurekalert.org/pub_releases/2014-10/bc-hic101614.php

Head injury causes the immune system to attack the brain

Scientists have uncovered a surprising way to reduce the brain damage caused by head injuries - stopping the body's immune system from killing brain cells.

The study, published in the open access journal Acta Neuropathologica Communications, showed that in experiments on mice, an immune-based treatment reduced the size of brain lesions. The authors suggest that if the findings apply to humans, this could help prevent brain damage from accidents, and protect players of contact sports like American football, rugby and boxing.

To date, there are no effective treatments to prevent or reverse the damage sustained after brain injury. The researchers were testing the theory that blows to the head cause brain damage, in part, because of the breakdown of the blood-brain barrier, allowing the immune cells in the blood to come into contact with brain cells and destroy them. They hypothesized that mice missing a vital immune component would have less brain damage from trauma, and that a treatment which blocks a component of the immune system would prevent damage.

The component they were working on was CD74, which plays a crucial part in the immune system's response to disease-causing agents. CD74 is broken into products that fit into the groove of cell surface immune response proteins as part of the chain of events that activates T cells – immune cells that normally attack infected (or damaged) cells in the body. It was thought that these cells might also attack the brain cells if the blood-brain barrier is down. A treatment known as CAP stops the T-cells from being activated, by fitting into the activation site in the proteins and blocking the interaction, meaning that the pathway cannot continue.

They tested this theory by a range of tests involving a total of 32 mice. The mice were divided into groups that had the different combinations of: CD74 deficient mice vs control mice; a sham brain injury or a real brain injury; and the CAP treatment or a saline injection as a control.

To test the hypothesis that the immune system causes brain damage after a trauma, the scientists compared the lesion size in CD74 deficient mice, vs control strain after a real brain trauma, with the saline injection. They found that the control mice with a fully working immune system had larger lesions, which suggests that the immune system is part of the reason for brain cells breaking down after a trauma.

To test whether the CAP treatment reduced brain damage after trauma, they compared control mice with a real brain injury that were given the CAP treatment against similar mice that were given the saline control. The mice that received the CAP treatment had smaller brain lesions, suggesting that it did reduce the damage caused by brain trauma. They found these lesions were as small as those in the CD74 deficient mice, further supporting the hypothesis that the treatment was successful because it stops the immune system from attacking the brain.