http://www.eurekalert.org/pub_releases/2015-10/uoe-hss100515.php

Horse sickness shares signs of human brain disorders, study finds

Horses with a rare nerve condition called equine grass sickness have similar signs of disease as people with conditions such as Alzheimer's

Horses with a rare nerve condition have similar signs of disease as people with conditions such as Alzheimer's, a study has found.

The findings shed new light on the causes of the rare but predominately fatal horse condition and could help to develop new tools for diagnosing the illness.

Scientists say that horses affected by the disease - called equine grass sickness - could also hold clues to human conditions.

Grass sickness attacks nerve cells in horses but the causes of the disease are unknown.

It causes gastric upset and muscle tremor and can kill within days. If diagnosed quickly, animals can sometimes be nursed back to health.

Researchers from the University of Edinburgh's Roslin Institute and Royal (Dick) School of Veterinary Studies looked at nerve tissue from six horses that had died from equine grass sickness in a bid to investigate the causes of the condition.

They found that the horse tissue contained proteins that are commonly seen in the brains of people with Alzheimer's disease - such as the build-up of amyloid protein.

In total, 506 different proteins were found to be altered in nerve tissue from horses with grass sickness, compared with animals that had died from other causes.

This knowledge could help to develop tests for detecting the condition in horses, which can be tricky to diagnose.

Around two per cent of horses die from grass sickness each year in the UK. The disease occurs almost exclusively in grass-fed animals, including ponies and donkeys.

A similar condition is thought to affect cats, dogs, hares, rabbits, llamas and possibly sheep.

The study is published in the journal Molecular and Cellular Proteomics. It was funded by The Equine Grass Sickness Fund.

The Roslin Institute receives strategic funding from the Biotechnology and Biological Sciences Research Council.

Dr Tom Wishart, from the University of Edinburgh's Roslin Institute, who led the study, said: "This is the first study to show similarities between an apparently unrelated neurodegenerative disease of large animals and human neurological conditions.

Although the causes of these conditions are unlikely to be shared, the findings suggest that similar mechanisms could be involved in the later stages of disease."

http://www.eurekalert.org/pub_releases/2015-10/uoo-icf100115.php

Identifying cancer's food sensors may help to halt tumor growth

Protein used by tumors to help them detect food supplies could be targeted to restrict cancerous cells' ability to grow

Oxford University researchers have identified a protein used by tumours to help them detect food supplies. Initial studies show that targeting the protein could restrict cancerous cells' ability to grow.

A team from Oxford University's Department of Physiology, Anatomy and Genetics led by Dr Deborah Goberdhan worked with cancer doctor and researcher, Professor Adrian Harris, to understand the effects of this protein called PAT4.

Dr Goberdhan said: 'We found that aggressive cancer cells manufacture more PAT4, which enables them to make better use of available nutrients than the cells around them - including healthy tissue.'

Cancer cells often have restricted access to the body's nutrient-rich blood supply. The ability to sense and acquire nutrients is critical for a cancer to grow.

Dr Goberdhan's and Prof Harris's groups collaborated to develop an antibody that could be used to highlight PAT4 in human tissue samples. This was then used to study anonymous tumour samples taken from patients with colorectal cancer, a common form of the disease. The results were compared to the known outcomes for the patients. Those who had higher levels of PAT4 in their tumours did less well than those with lower levels - being more likely to relapse and die.

The researchers then looked at what happened when PAT4 levels were reduced. They showed that by reducing PAT4 levels, cancerous tumours grew more slowly.

Dr Goberdhan said: 'These findings support each other. Not only do higher levels of PAT4 mean a worse outcome, but lowering levels improves the situation. This means that we have identified a mechanism, which cancer cells prefer to use and which we might be able to target as part of a combination treatment.'

The research, funded by Cancer Research UK, the Wellcome Trust and the Biotechnology and Biological Sciences Research Council will be published in the science journal Oncogene (doi:10.1038/onc.2015.363) on 5 October 2015. It continues and may eventually provide a way of increasing survival from cancer.

http://www.eurekalert.org/pub_releases/2015-10/jic-aak100215.php

Ancient alga knew how to survive on land before it left water & evolved into first plant

A team of scientists has solved a long-running mystery about the first stages of plant life on Earth

A team of scientists led by Dr Pierre-Marc Delaux (John Innes Centre / University of Wisconsin, Madison) has solved a long-running mystery about the first stages of plant life on earth. The team of scientists from the John Innes Centre, the

University of Wisconsin - Madison and other international collaborators, has discovered how an ancient alga was able to inhabit land, before it went on to evolve into the world's first plant and colonise the earth.

Up until now it had been assumed that the alga evolved the capability to source essential nutrients for its survival after it arrived on land by forming a close association with a beneficial fungi called arbuscular mycorrhiza (AM), which still exists today and which helps plant roots obtain nutrients and water from soil in exchange for carbon.

The previous discovery of 450 million year old fossilised spores similar to the spores of the AM fungi suggests this fungi would have been present in the environment encountered by the first land plants. Remnants of prehistoric fungi have also been found inside the cells of the oldest plant macro-fossils, reinforcing this idea. However, scientists were not clear how the algal ancestor of land plants could have survived long enough to mediate a quid pro quo arrangement with a fungi. This new finding points to the alga developing this crucial capability while still living in the earth's oceans!

Dr Delaux and colleagues analysed DNA and RNA of some of the earliest known land plants and green algae and found evidence that their shared algal ancestor living in the Earth's waters already possessed the set of genes, or symbiotic pathways, it needed to detect and interact with the beneficial AM fungi.

The team of scientists believes this capability was pivotal in enabling the alga to survive out of the water and to colonise the earth. By working with the fungi to find sustenance, the alga was able to buy time to adapt and evolve in a very different and seemingly infertile environment.

Dr Delaux said:

"At some point 450 million years ago, alga from the earth's waters splashed up on to barren land. Somehow it survived and took root, a watershed moment that kick-started the evolution of life on earth. Our discovery shows for the first time that the alga already knew how to survive on land while it was still in the water. Without the development of this pre-adapted capability in alga, the earth could be a very different place today.

"This finding has filled a gap in our collective knowledge about the origins of life on earth. None of this would have been possible without the dedication of a world-wide team of scientists including a tremendous contribution from the 1KP initiative led by Gane KS Wong ."

Professor Jean-Michel Ané, from the University of Wisconsin said:

"The surprise was finding the mechanisms in algae which allow plants to interact with symbiotic fungi. Nobody has studied beneficial associations in these algae."

This research was funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and the US based National Science Federation.

http://www.eurekalert.org/pub_releases/2015-10/cums-li2100115.php

Laws in 25 states put the brakes on high school bullying

First multi-state study identifies most effective legislation that protects youth against bullying behaviors

In the most comprehensive study of the effectiveness of anti-bullying policies to date, researchers found that compliance with the U.S. Department of Education guidelines in antibullying laws reduced rates of bullying and cyberbullying--the most common forms of peer aggression. The study, which uncovered varying rates of bullying reported across the states, has important implications for educators, policy makers, and researchers. Findings will appear online in JAMA Pediatrics.

"Though bullying is the result of a complicated set of social, psychological, and peer impulses, we now see that laws aimed to reduce bullying are successful," said Mark Hatzenbuehler, PhD, associate professor of Sociomedical Sciences at Columbia University's Mailman School of Public Health, who led the study with Marizen Ramirez, PhD, associate professor in the Department of Occupational and Environmental Health in the University of Iowa's College of Public Health and colleagues at the Centers for Disease Control and Prevention. "While policies alone cannot completely eradicate bullying, these data suggest that legislation represents an important part of a comprehensive strategy to prevent bullying."

These findings are significant for many reasons, including giving a "green light" to conduct more granular studies that focus on different combinations of legislation, how implementation of these policies affects their effectiveness, and whether antibullying legislation is effective in protecting students who are most vulnerable to bullying.

Responses of more than 60,000 adolescents in grades 9 to 12 to the 2011 Youth Risk Behavior Surveillance were matched against data on anti-bullying legislation in 25 states obtained from the U.S. Department of Education, which commissioned a review of state law in 2011. Each state was assigned compliance scores for 16 components identified by the Department.

Findings showed there were three critical components to having successful antibullying state laws in terms of reducing both bullying and cyberbullying: a description of where schools can intervene to address bullying -- for example, on school grounds only or beyond; a clear definition of bullying; and a requirement that schools have a local policy or a timeline when a policy must be in place. Training elements, enumerated groups, and communication of the policies were also effective for reducing either cyberbullying or traditional face-to-face bullying. The study controlled for state-level violent crime rates and historical bullying rates, which otherwise may have affected the results.

High school students in states with at least one component in the antibullying law were 24 percent less likely to report acts of bullying and 20 percent less likely to be cyberbullied compared to students in states without legislation. Rates of bullying ranged from a low of 13 percent reported by Alabama to 27 percent for South Dakota. Cyberbullying rates ranged from 12 percent in Alabama to 20 percent in South Dakota and an overall average of 15.5 percent.

Students were considered a target of bullying if they reported being bullied on school property in the past year and a target of cyberbullying if they reported being electronically bullied (e.g., through email, texting, Websites) in the past year.

"Bullying is a common experience among children, and passing legislation to curb bullying is an important prevention strategy," said Ramirez. "However, research on the effectiveness of these laws has been lagging. This research represents an important step in linking public health research with the practice of public health law. Moving forward, this collaboration will help identify what laws are most effective in curbing bullying in schools."

These results follow on earlier findings that revealed far lower rates of suicide attempts among gay and lesbian youths in Oregon counties whose anti-bullying legislation mentioned sexual orientation. In that study, published in 2013, Hatzenbuehler and Katherine Keyes, also of the Mailman School, addressed the county-by-county variability of this legislation and found that more specific policies provided the most protection for lesbian and gay youth.

"Bullying and cyberbullying are significant public health issues that threaten American youth's well-being," said Marci Hertz, MS, lead health scientist, CDC's National Center for Injury Prevention and Control. "Bullying hurts kids physically and emotionally and can affect how well they do in school. This research will help us proactively identify and put in place strategies to protect our children from bullying and bullying-related behaviors using evidence-based strategies."

"Although more research is needed, our study is an important first step in providing guidance to legislators and school administrators about best practices to reduce bullying and to give protection to young people all over the country," *Hatzenbuehler said.*

The study was supported by the Center for Injury Epidemiology and Prevention at Columbia University (Grant 1R49 CE002096) and the University of Iowa Injury Prevention Research Center (Research core grant 5R49 CE002108). Both centers were funded by the National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. No conflicts of interest were reported by the authors.

Video *Are Antibullying Laws Effective?:* https://www.youtube.com/watch?v=wet1ho-cMIc&feature=youtu.be

http://www.eurekalert.org/pub_releases/2015-10/msu-syv100515.php

Surprise: Your visual cortex is making decisions

Suggestions that the brain's visual cortex is more versatile than previously believed

EAST LANSING, Mich. -- The part of the brain responsible for seeing is more powerful than previously believed. In fact, the visual cortex can essentially make decisions just like the brain's traditional "higher level" areas, finds a new study led by a Michigan State University neuroscientist.

The findings, published in Nature Neuroscience, provide another piece of the puzzle in the relatively new quest to unlock the brain's secrets. Jan Brascamp, MSU assistant professor of psychology and lead investigator of the study, noted that the first cognitive psychology textbook didn't come out until the late 1960s.

"As a field, we're only at the beginning of trying to figure out how the brain works, and the visual system is a very good place to start," said Brascamp. "In that light, the current findings, which show that the visual system has a capacity we previously didn't expect, are an important step in the right direction."

Study participants were placed in an MRI scanner and shown two adjacent patterns of dots on a projection screen while their brain activity was monitored. By using a set of prisms, the researchers made sure that, unlike in normal situations, the participant's eyes were each looking at a different dot pattern, each presented on a different part of the screen.

The combination of differing patterns seen by the two eyes creates an optical illusion and perception switches between the two patterns as the brain tries to make sense of the contradictory information the eyes are providing. Previous research using MRI readings indicated the decision to switch perceptions is controlled by the association cortex, which is known for higher-level functions such as making choices, while the visual cortex handles the simpler task of processing visual information.

But in those past studies, participants knew the moment their perception changed because the illusion was obvious (such as the famous duck-rabbit image, meaning they were surprised. And the areas of the brain known to be involved with surprise and those involved with making decisions are very similar.

So Brascamp and colleagues took away the element of surprise by assuring their participants weren't aware the two patterns of dots were different. Although participants' perception went back and forth between the two patterns, the participants didn't notice. Among these participants, the increase in brain activity in the association cortex was gone, indicating the visual cortex was making the choice between perceptions on its own.

"That is one sense in which our study is counterintuitive and surprising," Brascamp said. "The part of the brain that is responsible for seeing, for the apparently 'simple' act of generating the picture in our mind's eye, turns out to have the ability to do something akin to choosing, as it actively switches between different interpretations of the visual input without any help from traditional 'higher level' areas of the brain."

His co-authors are Randolph Blake of Vanderbilt University and Tomas Knapen of the VU University Amsterdam.

http://nyti.ms/1hsrGtI

Health Benefits of Tea? Here's What the Evidence Says

After my Upshot column on the potential health benefits of coffee, the No. 1 request I got was to look into the potential benefits — or harms — of tea.

Aaron E. Carroll

Unlike coffee, tea does not seem to generate negative perceptions. I know many more people who think that tea is beneficial, much more so than coffee. (That is, until my coffee column, I hope.)

As with coffee, a fairly large number of studies have looked at associations between tea and health. Most of the studies don't have the rigor of randomized control trials and don't prove causality. But so many studies were available that I was able to focus on systematic reviews and meta-analyses, or "studies of studies."

Nine prospective cohort studies, three retrospective cohort studies and four cross-sectional studies including more than 800,000 participants have looked at the association between tea and liver disease. Those who drank tea were less likely to have hepatocellular carcinoma, liver steatosis, liver cirrhosis and chronic liver disease. This confirmed the findings in a previous systematic review published in 2008.

Tea has been associated with a lower risk of depression. A 2015 meta-analysis of 11 studies with almost 23,000 participants found that for every three cups of tea consumed per day, the relative risk of depression decreased 37 percent.

Tea was also associated with a reduction in the risk of stroke, with those consuming at least three cups a day having a 21 percent lower risk than those consuming less than a cup a day.

A more recent meta-analysis examined 22 prospective studies on more than 850,000 people and found that drinking an additional three cups of tea a day was associated with a reduction in coronary heart disease (27 percent), cardiac death (26 percent), stroke (18 percent), total mortality (24 percent), cerebral infarction (16 percent) and intracerebral hemorrhage (21 percent).

A 2014 meta-analysis of 15 published studies of more than 545,000 participants found, as with coffee, an inverse relationship between tea consumption and the risk of developing Type 2 diabetes. For each additional two cups per day of tea consumed, the risk of developing diabetes dropped 4.6 percent.

What is tea not associated with? It does not seem to be linked with a reduced risk of fracture. And a systematic review from 2015 found that black tea was not linked to a reduced risk of endometrial cancer.

But increasing green tea consumption by one cup a day could reduce the relative risk by 11 percent. A 2011 meta-analysis found that green tea, but not black tea, was associated with lower rates of prostate cancer. A 2013 meta-analysis could not find a significant association between tea consumption and the risk of glioma, a form of brain or spinal tumor.

The science is even more equivocal about cancer prevention. A Cochrane systematic review examined all the studies, regardless of type, that looked at associations between green tea and the risk of cancer incidence or mortality. They found 51 studies containing more than 1.6 million participants. Only one was a randomized control trial, however. Results were conflicting.

Moreover, most of the studies were done in Asia, where things might not be generalizable to the United States in terms of tea drinking. Regardless, the authors felt there was insufficient evidence to give any firm recommendations. A more recent study agrees.

Again, these are all mostly data from observational studies, and as such, they can't prove causality and should be taken with a grain of salt. We've been burned many times before by assuming that what we see in associations in cohort studies will turn out to be truly causal when behavior changes, only to see that fall apart in randomized controlled trials.

The majority of studies have been done in Asian countries where tea drinking is much more common than in the United States. It's possible that the people who don't drink tea in those countries are different from those who do in a way that doesn't translate to people in the United States.

Finally, there seems to be less of a dose response than in the studies of coffee: Few of the studies could detect any response with fewer than three cups of tea a day.

There are some randomized studies, however, that don't have most of these limitations. Green tea has been claimed to help people lose weight. Enough people believe this that 18 randomized controlled trials with 1,945 participants have been reviewed.

Half of these trials took place in Japan, and only one in the United States. The evidence found that green tea produced a small weight loss in overweight and obese adults. But the difference was not significant. And green tea also didn't help with the maintenance of weight loss previously achieved.

Green tea catechins, antioxidants found in the drink, had no effect on HDL cholesterol, triglyceride levels or C-reactive protein concentrations. Two more meta-analyses confirmed these findings.

But 11 trials that included 821 patients found that green tea and black tea can reduce other cardiovascular risk factors. Both were found to reduce low-density lipoprotein an average of 0.5 mmol/L, systolic blood pressure 2.3 mmHg, and diastolic blood pressure 2.8 mmHg. These results should be interpreted with caution, however, as they focus on risk factors and not necessarily outcomes. There were also few studies contributing to each of these findings, so the results may not stand up to further scrutiny or replication.

At the end of all of this, I'm a little less impressed with the body of evidence regarding tea than I was with that of coffee. I admit that this is an interpretation, and others may disagree. The lack of a dose response in many of these trials, coupled with the fact that so many were performed in countries with markedly different tea consumption from our own, makes these results less generalizable than those of coffee were.

But the conclusions I would make are similar. I wouldn't strongly recommend that anyone take up tea based on these findings. But there seem to be some potential benefits, and there don't seem to be harms. Drink it if you like it. It, too, seems to be a completely reasonable addition to a healthful diet.

http://bit.ly/1PjRLJw

Japanese Universities Are Shuttering Social Sciences and Humanities Departments

Just how valuable is that degree in literature?

By Erin Blakemore

Most higher education institutions offer a wide range of topics, from engineering and science to literature, history and sociology have long been a backbone of . But, as Alex Dean reports for *The Guardian*, that is changing in Japan as over 50 universities reduce or eliminate their humanities and social sciences departments entirely.

The change comes after Hakuban Shimomura, Japan's education minister, urged national universities and institutes of higher education to "take active steps to abolish [social science and humanities departments] or to convert them to serve areas that better meet society's needs," writes ICEF Monitor.

It's a move that's sending "shivers down academic spines" worldwide, says Dean. Shimomura's criticism of humanities education aligns with the "utilitarian" priorities of Japanese prime minister Shinzo Abe, writes *TIME's* Nash Jenkins: In an attempt to rebuild Japan's stature, Abe has urged his government to focus on vocational education.

Inside Japan, the announcement that dozens of universities intend to leave behind the humanities has horrified some academics — even those in the sciences. "The university is both an educational and a research institution," wrote the Executive Board of the Science Council of Japan in a statement. "Any devaluation of the [humanities and social sciences] in higher education could result in narrowing the opportunity for academics to fully exercise their scholarly expertise. This would in turn discourage those who aspire to be academics and hereby hamper the balanced progress of academic knowledge."

The "softer sciences" and arts have long been stigmatized as useless, frivolous and impractical. But that view could be changing, at least outside of Japan's government: Recent research shows that liberal arts majors can close much of the pay gap with those who specialize in STEM over time, and humanities degrees are now in high demand among high-profile startups.

http://bit.ly/1L1FiXR

Scientists Can Now Sequence a Human's Genome in 26 Hours

New tools cut sequencing time almost in half

Scientists have figured out how to cut the time it takes to sequence a human genome nearly in half.

By Danny Lewis

Researchers from Children's Mercy Hospital in Kansas City, MO and Edico Genome, a biotech company, have devised a way to sequencing a human genome in just 26 hours. The previous fastest device took about 50 hours to complete and was developed by the same group. In a paper published this week in the journal *Genome Medicine*, the researchers note that cutting down the time it takes to perform a whole genome sequencing could mean the difference between life and death for some patients.

"In some babies, we have minutes or hours. If a baby's blood sugar is low, basically you are counting the number of minutes without sugar," lead author Stephen Kingsmore tells Claire Maldarelli for *Popular Science*. "In those cases, any delays can result in disease complications."

While the machine can be used to help diagnose older patients in need of acute care for diseases like cancer, infants don't have the ability to tell a doctor where they hurt or what feels wrong. And it's not an uncommon problem – according to *Newsweek's* Conor Gaffey, genetic defects are responsible for almost 30 percent of postnatal deaths in developed countries.

In order to speed up the processing time, the scientists custom-built the first data processor to ever be solely designed for genome sequencing, called DRAGEN. Using DRAGEN Kingsmore and his colleagues were able to cut data analysis time from 22.1 hours down to 41 minutes using the machine, Maldarelli writes.

"At the end of the day, we have to deliver the information to generalist physicians in a way that they can grab it and use it," Kingsmore tells Maldarelli.

After using DRAGEN to sequence the genetic codes of 35 babies under four months old, the group said that they were not only getting results comparable to the 50-hour method, but the cost of the analysis would drop significantly. By using current technology and reducing the number of technicians needed to operate the device and analyze the data, DRAGEN could lower the cost of genetic sequencing from about $3 million to $6,500 per test, Maldarelli writes. Kingsmore believes that artificial intelligence might eventually be incorporated into the system to further speed up data analysis and translation.

While the device hasn't been used in a hospital setting yet, Kingsmore and his group are embarking on a three-month trial period at Children's Mercy, as well as Rady's Children's Hospital in San Diego, where Kingsmore is CEO of the hospital's Pediatric Genomics and Systems Medicine Institute. If DRAGEN works as well in the field as it did in the lab, Kingsmore says it could be ready for public use by the end of the year.

http://nyti.ms/1Lb5fSz

Mummification Practiced in Bronze Age Britain

Mummification was widely practiced in what is now Britain throughout the Bronze Age, a new study reports.

By SINDYA N. BHANOO

Archaeologists used microscopic bone analysis to study 34 human remains from Britain dating to the Bronze Age, spanning from 2200 B.C. to 750 B.C., and compared them with known mummies in northern Yemen and Ireland. The pattern of erosion in 16 of the British skeletons was consistent with that of the known mummies.

A mummified skeleton from the Bronze Age found in Britain. **Credit Geoff Morley**

"Since it was widespread in Britain, there's no reason to think that it wasn't a common practice in Bronze Age societies across Europe," said Tom Booth, an archaeologist at the Natural History Museum in London and one of the study's authors. The research was part of his doctoral work at the University of Sheffield. He and his colleagues published their findings in the journal Antiquity.

Ancient Britons may have buried their dead in peat bogs for a time to mummify them, Dr. Booth said. They may have also used evisceration, a process in which the organs are removed after death.

Bronze Age mummies may have been kept above ground on display, Dr. Booth added. In this way, the dead remained part of living societies.

For instance, they "may have been used to legitimize power or ownership of land," Dr. Booth said. "It could be a way of saying: 'My ancestor farmed the land: Here he is now, and he farmed it years ago.' "

The researchers hope to look at more samples in Britain as well as in continental Europe. "It would be interesting to see just how far it went," Dr. Booth said.

http://bit.ly/1FWv0Jx

Earthquake algorithm picks up the brain's vibrations

An algorithm normally used to study earthquakes has been adapted to help spot tumours

By Jessica Hamzelou

Your brain is buzzing. Analysing those natural vibrations might help spot tumours and other abnormalities, and now an algorithm normally used to study earthquakes has been adapted to do just that.

The elasticity of different parts of the body is a useful way to tell if something is wrong. Lumps can be a sign of cancer, of course, and stiffness in certain organs can indicate disease. Ultrasound scans that measure the elasticity of the liver, for example, can show up cirrhosis.

It is more difficult to measure the elasticity of the brain. Ultrasound isn't an option, because it can't pass through the skull. Doctors are limited to touching the brain directly when a section of the skull has been removed during surgery. "Doctors can only feel a few centimetres deep, so only have information about the elasticity of the surface of the brain," says Stefan Catheline at INSERM in Paris, France.

Catheline's team, and others around the world, have been working on a way to use modified MRI scanners to measure brain elasticity. MRI usually works by measuring water content, but with modification it can be made to measure the movement of water molecules. This allows them to pick up on movements in tissues when they are shaken up.

Shake it up

But such devices haven't made it to the clinic yet, in part because they aren't very comfortable to use, says Catheline. "It's not pleasant," he says. "It is also difficult to shake the entire skull using a vibrator." Some teams have tried using vibrating teeth moulds, which have given participants headaches. More recently groups have developed vibrating pillows.

Now Catheline is trying another approach. Instead of physically shaking the head, why not simply take advantage of the brain's natural vibrations? "We tend to

think of the brain as a static organ, but there is a lot of movement," he says. "When blood is pumped into the brain it pulsates, and induces vibrations."

The idea came to Catheline after he spent time working with seismologists, who study how to extract information from the seismic waves created by earthquakes. He borrowed the algorithm his colleagues used to analyse the Earth's vibrations, and incorporated it into his modified MRI scanner. As a result, his team were able to measure the natural vibrations in the brains of two healthy volunteers – information normally dismissed as "noise".

The body's noise

"It is an intriguing approach," says Armando Manduca at the Mayo Clinic in Rochester, Minnesota. "There could potentially be great value in using what has been considered the body's noise, which is usually seen as a problem."

Such scans will be able to reveal a lot more information about what's going on in the brain than traditional MRI scans, says Neil Roberts at the University of Edinburgh, UK. The water content of our cells doesn't tend to vary much, but the mechanical properties do. So while a bit of brain tissue might look like it's made up of identical cells on an MRI, an elastography scan could reveal huge variation in stretchiness, hardness or gloopiness. "Being able to essentially touch inside the brain is going to be much more discriminatory than conventional MRI," he says. "It opens up a rich world for study and diagnosis."

Catheline hopes his technique will eventually help doctors diagnose diseases and monitor the success of their treatment. The plaques found in some forms of dementia, for example, have more elasticity than normal brain tissue – the new technique might be able to detect those differences.

Manduca thinks that the first clinical application will probably be to assess the hardness of an existing tumour. This can be useful before surgery, he says: while a soft mass can be swiftly sucked away, harder tumours must be painstakingly dissected out, sometimes taking several hours. Such applications are probably still a few years away, he adds.

Journal reference: PNAS, DOI: 10.1073/pnas.1509895112

http://www.eurekalert.org/pub_releases/2015-10/hms-pws100515.php

Predicting which soldiers will commit severe, violent crimes

Study suggests that soldiers at high risk for perpetrating severe violent crimes can be identified using big data predictive analytics

Workplace violence perpetrated by military personnel is a major concern of the U.S. Department of Defense (DoD). Although programs have been implemented to teach violence prevention strategies to all military personnel, such programs are much less intensive than others developed in settings for people judged to be at high risk of violent behavior.

But what is the best way to predict who is at high risk for committing violent acts? A new report published online today in Psychological Medicine suggests that big data predictive analytic methods might help provide an answer. The report describes research funded by the DoD and conducted in collaboration with the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS), a multicomponent epidemiological-neurobiological study of Army suicides and related behavioral health outcomes.

The report describes the development of a machine learning model based on an analysis of administrative data available for all 975,057 Regular U.S. Army soldiers on active duty from 2004 to 2009. The model was constructed to predict which soldiers would subsequently commit a severe physical violent crime.

Hundreds of potential predictors were examined using the extensive administrative records available for all soldiers. The 5 percent of soldiers classified by the final model as having the highest predicted risk accounted for 36.2 percent of all major physical violent crimes committed by men and 33.1 percent by women over the six years of study. When the model was applied to a more recent cohort from 2011 to 2013, the 5 percent of soldiers with highest predicted risk accounted for 50.5 percent of all major physical violent crimes.

"These numbers are striking," said Ronald Kessler, the McNeil Family Professor of Health Care Policy at HMS and principal investigator on the project. "They show us that predictive analytic models can pinpoint the soldiers at highest violence risk for preventive interventions. Targeting such interventions might be the best way to bring down the violent crime rate in the Army."

"The fact that the model identifies such a high proportion of violent crimes is especially exciting because the variables used in the model are routinely collected administrative data the Army can use to identify high-risk soldiers without carrying out expensive one-on-one clinical assessments," said Anthony Rosellini, a postdoctoral fellow at HMS and the lead author of the paper.

John Monahan, the John S. Shannon Distinguished Professor of Law at the University of Virginia School of Law, another study author, cautioned that "it is important to recognize that severe violent crimes are uncommon even in this high-risk group. This means that implementing intensive high-risk preventive interventions would make sense only if the interventions are shown to be highly efficient--something that has not yet been demonstrated."

The study was carried out by researchers at HMS as part of the research project Behavioral-Based Predictors of Workplace Violence in the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). The project was funded by the U.S. Department of Defense, Office of the Assistant Secretary of Defense for Health Affairs, Defense Health Program (OASD/HA).

Behavioral-Based Predictors of Workplace Violence in the Army STARRS is led by principal investigator Ronald C. Kessler, PhD (HMS) and funded by the U.S. Department of Defense, Office of the Assistant Secretary of Defense for Health Affairs, Defense Health Program [if !supportAnnotations][S1][endif] (OASD/HA), awarded and administered by the U.S. Army Medical Research & Materiel Command (USAMRMC) at Fort Detrick, Md. Army STARRS is funded by the U.S. Army and the National Institute of Mental Health. The Army STARRS study is led by co-principal investigators Robert J. Ursano, MD (Uniformed Services University of the Health Sciences) and Murray B. Stein, MD, MPH (University of California, San Diego), with site investigators Steven G. Heeringa, PhD (University of Michigan) and Ronald C. Kessler, PhD (HMS) and with collaborating scientists Lisa J. Colpe, PhD, MPH (NIMH) and Michael Schoenbaum, PhD (NIMH).

http://bit.ly/1LDIr3e

There Is a Fine Line between Love and Drunk

Oxytocin, known as the "love hormone," has a dark side—and it looks like alcohol intoxication

By Jessica Schmerler | Aug 13, 2015

Many studies trumpet the positive effects of oxytocin. The hormone facilitates bonding, increases trust and promotes altruism. Such findings earned oxytocin its famous nickname, the "love hormone." But more recent research has shown oxytocin has a darker side, too: it can increase aggression, risk taking and prejudice. A new analysis of this large body of work reveals that oxytocin's effects on our brain and behavior actually look a lot like another substance that can cut both ways: alcohol. As such, the hormone might point to new treatments for addiction.

Researchers led by Ian Mitchell, a psychologist at the University of Birmingham in England, conducted the meta-analysis, which reveals that both oxytocin and alcohol reduce fear, anxiety and stress while increasing trust, generosity and altruism. Yet both also increase aggression, risk taking and "in-group" bias—favoring people similar to ourselves at the expense of others, according to the paper published in August in Neuroscience and Biobehavioral Reviews.

The scientists posit that these similarities probably exist because oxytocin and alcohol act at different points in the same chemical pathway in the brain. Oxytocin stimulates release of the neurotransmitter GABA, which tends to reduce neural activity. Alcohol binds to GABA receptors and ramps up GABA activity. Oxytocin and alcohol therefore both have the general effect of tamping down brain activity—perhaps explaining why they both lower inhibitions.

Clinical trials have uncovered further interplay between the two in demonstrating that a nasal spray of oxytocin reduces cravings and withdrawal symptoms in alcoholics. These findings inspired a new study, published in March in the Proceedings of the National Academy of Sciences USA, which suggests oxytocin and alcohol do more than just participate in the same neural pathway: they may physically interact. The researchers showed that oxytocin prevented drunken motor impairment in rats by blocking the GABA receptor subunit usually bound by alcohol. Mitchell speculates this interaction is specific to brain regions that regulate movement, thereby "sparing the usual motor deficits associated with alcohol but still influencing social and affective processes."

These findings suggest getting "love drunk" may impede a person from getting truly drunk—or at least make getting drunk less appealing. They also offer a possible biological explanation for why social support is so effective at helping people beat addictions. The researchers' biggest hope for now is that in the near future, the similarity between these two chemicals will allow scientists to develop oxytocin-based treatments for alcoholics.

http://www.eurekalert.org/pub_releases/2015-10/lu-tps100615.php

The predator survives -- but the ecosystem crashes

Overexploitation of resources may lead to extinction cascade, theoretical study shows

What do killer whales, polar bears and humans have in common? They are adaptable predators with the ability to select new prey when their favourite food is in low supply. But this change can disrupt entire ecosystems.

"If the predator is efficient at killing its prey, such a change can lead to negative effects in the long term, for the entire food web, even if in the short term it benefits the predator's survival," says David Gilljam, doctoral student in theoretical biology, who joined with Professor Bo Ebenman and PhD Alva Curtsdotter to publish a new model-based study in Nature Communications.

By working with both natural and computer-generated food webs, the researchers can show how the overexploitation of resources caused by predators changing their prey can, in the worst case, lead to an extinction cascade, where species after species is wiped out in a domino effect.

A dramatic example of this is the killer whale, whose main prey was newborn whale calves. When whale populations fell dramatically due to intensive hunting, they began to hunt seal instead. Then when the seal population was quickly eradicated, the killer whales moved on to sea otters. This reduced the pressure on sea urchins, the preferred diet of the sea otters. As a result, the sea urchins grazed down the kelp beds that have served as nurseries for many different fish species and small marine animals.

"Think of a rope that's made of a number of twisted fibres. When force is applied to the rope, the force is spread across all the fibres. If one fibre breaks, the remaining fibres take all the force, with more force on each individual fibre. If more break, eventually the whole rope will fail," says Prof Ebenman.

A few examples from the real world:

As the ice in the Arctic melts, it gets more and more difficult for the polar bears to hunt seal - their natural prey. Instead they have started to venture onto the land, to feed on the eggs and young of ground-nesting birds, which are already the prey of other

predators such as arctic foxes. The risk is that the predatory pressure on these birds will be too great.

West-African fishermen are abandoning their fishing grounds in times of poor supply - which is caused by industrial-scale fishing. Instead they are hunting on nature reserves, which leads to drastic reductions to the populations of prey animals there. Humans are an extremely flexible, efficient predator, who have massive impact on ecosystems.

The theoretical simulations presented by the LiU biologists completely contradict what we previously believed took place, when a predator loses its favourite prey.

"The belief was that an extinction cascade would be avoided if the predator is adaptable and can shift to another prey. Our new results indicate that the opposite can occur, and the consequences can be even worse. A change in prey is a double-edged sword - in the short term it can help a flexible predator survive, but long term it can negatively affect the entire existance of the food web," says Prof Ebenman.

Article: Adaptive rewiring aggravates the effects of species loss in ecosystems, by D. Gilljam, A. Curtsdotter & B. Ebenman. Nature Communications 6:8412, September 2015. DOI: 10.1038/ncomms9412

http://www.eurekalert.org/pub_releases/2015-10/aga-rcf100615.php

Research calls for stricter screening recommendations for family history of colon cancer

If you have a close family member with colorectal cancer, don't delay screening

Bethesda, MD - All relatives of individuals with colorectal cancer are at increased risk for this cancer, regardless of the age of diagnosis of the index patient in the family, according to a study published online in Clinical Gastroenterology and Hepatology, the official clinical practice journal of the American Gastroenterological Association. These findings may impact future guidance regarding colorectal cancer screening.

"Most surprising, we identified a more than two-fold increase in risk of colorectal cancer among young first-degree relatives (under 50 years of age) of individuals diagnosed with colorectal cancer at advanced ages (60 to 80 years)," said lead study author N. Jewel Samadder, MSc, MD, from Huntsman Cancer Institute at the University of Utah. "This risk is not currently appreciated. Increased awareness of this risk may serve as incentive to increase screening intensity for all patients with a first-degree family history of colorectal cancer."

The researchers conducted a population-based case-control study in Utah identifying 18,208 index patients from the Utah Cancer Registry diagnosed with colorectal cancer between 1980 and 2010; age- and sex-matched cancer-free individuals were selected to form the comparison group. Increased risk was observed in all relatives regardless of age of the family member's cancer diagnosis, although the risk was greatest for young relatives (under 50 years) of individuals who were diagnosed with colorectal cancer before 40 years of age. However, familial risk was increased in first-degree relatives even when the index case was diagnosed with cancer at an advanced age (older than 80 years).

These findings support the current screening guidelines for patients with a family history of colorectal cancer, primarily more aggressive screening for first-degree relatives of persons with colorectal cancer at an age younger than 60 years. However, because colorectal cancer diagnosis even in an older patient can be a predictor of higher risk of this cancer in their relatives, relatives might benefit from knowing this moderate risk and thus avoiding known modifiable risk factors and consider preventative measures.

Colorectal cancer is the fourth most common cancer in the U.S. and is the second leading cause of cancer-related mortality. Heritability is one of the strongest risk factors for colorectal cancer. Learn more in the AGA colorectal cancer patient brochure.

Review the AGA guidelines on screening for colorectal cancer and diagnosis and managemenet of Lynch syndrome, the most common heritable colorectal cancer syndrome.

The study authors disclose the following conflicts: Randall W. Burt is a consultant for Myriad Genetics. N. Jewel Samadder is a consultant for Cook Medical and Covidien Medical. Harminder Singh is consultant for Medial Cancer Screening Ltd. The remaining authors disclose no conflicts.

http://www.eurekalert.org/pub_releases/2015-10/uom-rat100615.php

Repeating aloud to another person boosts recall

Repeating aloud boosts verbal memory, especially when you do it while addressing another person

Repeating aloud boosts verbal memory, especially when you do it while addressing another person, says Professor Victor Boucher of the University of Montreal's Department of Linguistics and Translation. His findings are the result of a study that will be published in the next edition of Consciousness and Cognition. "We knew that repeating aloud was good for memory, but this is the first study to show that if it is done in a context of communication, the effect is greater in terms of information recall," Boucher explained.

To demonstrate this, Boucher and Alexis Lafleur asked 44 French-speaking university students to read a series of lexemes on a screen. A lexeme is a word such as it is found in a dictionary. During the task, the participants wore headphones that emitted "white noise" to mask their own voices and eliminate auditory feedback. The subjects were submitted to four experimental conditions: repeating in their head, repeating silently while moving their lips, repeating aloud

while looking at the screen, and finally, repeating aloud while addressing someone. After a distraction task, they were asked to identify the lexemes they recalled having said from a list that included lexemes not used in the test.

The results show a clear difference when the exercise was performed aloud in the presence of someone else, even though the participants had heard absolutely nothing. Repeating in one's head without gesturing was the least effective way to recall information. "The simple fact of articulating without making a sound creates a sensorimotor link that increases our ability to remember, but if it is related to the functionality of speech, we remember even more," Boucher said.

Previous studies conducted at Professor Boucher's Phonetic Sciences Laboratory have shown that when we articulate a sound, we create a sensory and motor reference in our brain, by moving our mouth and feeling our vocal chords vibrate. "The production of one or more sensory aspects allows for more efficient recall of the verbal element. But the added effect of talking to someone shows that in addition to the sensorimotor aspects related to verbal expression, the brain refers to the multisensory information associated with the communication episode," Boucher explained. "The result is that the information is better retained in memory."

Evoking one's memory of sensory episodes is in part the phenomenon to which French writer Marcel Proust alluded when he referred to "the madeleines of his childhood." The texture and flavour of these little cakes rekindled in him an emotional connection that reminded him of his mother. But what do we keep in memory? How does episodic and multisensory memory work? These questions are at the heart of Professor Boucher's work. Challenging the formal approaches in linguistics, particularly the analysis of spoken language through writing, he has endeavoured for several years to build bridges between his discipline and neuroscience.

Lafleur, a former student who is now a doctoral student in neuropsychology, and Boucher conducted another experiment. "This time, we used sequences of syllables that do not form lexemes in French, i.e., non-words," said the professor. As the researchers expected, their data showed no difference between the various experimental conditions. Subjects did not recall the sequences of "non-words" any better - whether they produced them aloud, silently, or when speaking to someone. According to the professor, the fact that the information cannot be grafted to verbal elements in memory and involving a sensory reference explains the absence of effects between the conditions of production. "The results of our research confirm the importance of motor sensory experiences in memory retention and help to better define sensory episodes associated with verbal expression," Boucher concluded.

http://www.eurekalert.org/pub_releases/2015-10/uow-arr100615.php

Ancient rocks record first evidence for photosynthesis that made oxygen

A new study shows that iron-bearing rocks that formed at the ocean floor 3.2 billion years ago carry unmistakable evidence of oxygen.

MADISON, Wis. -- The only logical source for that oxygen is the earliest known example of photosynthesis by living organisms, say University of Wisconsin-Madison geoscientists.

"Rock from 3.4 billion years ago showed that the ocean contained basically no free oxygen," says Clark Johnson, professor of geoscience at UW-Madison and a member of the NASA Astrobiology Institute. "Recent work has shown a small rise in oxygen at 3 billion years. The rocks we studied are 3.23 billion years old, and quite well preserved, and we believe they show definite signs for oxygen in the oceans much earlier than previous discoveries."

The most reasonable candidate for liberating the oxygen found in the iron oxide is cyanobacteria, primitive photosynthetic organisms that lived in the ancient ocean. The earliest evidence for life now dates back 3.5 billion years, so oxygenic photosynthesis could have evolved relatively soon after life itself.

Until recently, the conventional wisdom in geology held that oxygen was rare until the "great oxygenation event," 2.4 to 2.2 billion years ago.

The rocks under study, called jasper, made of iron oxide and quartz, show regular striations caused by composition changes in the sediment that formed them. To detect oxygen, the UW-Madison scientists measured iron isotopes with a sophisticated mass spectrometer, hoping to determine how much oxygen was needed to form the iron oxides.

"Iron oxides contained in the fine-grained, deep sediment that formed below the level of wave disturbance formed in the water with very little oxygen," says first author Aaron Satkoski, an assistant scientist in the Geoscience Department. But the grainier rock that formed from shallow, wave-stirred sediment looks rusty, and contains iron oxide that required much more oxygen to form. The visual evidence was supported by measurements of iron isotopes, Satkoski said. The study was funded by NASA and published in Earth and Planetary Science Letters.

The samples, provided by University of Johannesburg collaborator Nicolas Beukes, were native to a geologically stable region in eastern South Africa.

Because the samples came from a single drill core, the scientists cannot prove that photosynthesis was widespread at the time, but once it evolved, it probably spread. "There was evolutionary pressure to develop oxygenic photosynthesis," says Johnson. "Once you make cellular machinery that is complicated enough to do

that, your energy supply is inexhaustible. You only need sun, water and carbon dioxide to live."

Other organisms developed forms of photosynthesis that did not liberate oxygen, but they relied on minerals dissolved in hot groundwater -- a far less abundant source than ocean water, Johnson adds. And although oxygen was definitely present in the shallow ocean 3.2 billion years ago, the concentration was only estimated at about 0.1 percent of that found in today's oceans.

Confirmation of the iron results came from studies of uranium and its decay products in the samples, says co-author Brian Beard, a senior scientist at UW-Madison. "Uranium is only soluble in the oxidized form, so the uranium in the sediment had to contain oxygen when the rock solidified."

Measurements of lead formed from the radioactive decay of uranium showed that the uranium entered the rock sample 3.2 billion years ago. "This was an independent check that the uranium wasn't added recently. It's as old as the rock; it's original material," Beard says. "We are trying to define the age when oxygenic photosynthesis by bacteria started happening," he says. "Cyanobacteria could live in shallow water, doing photosynthesis, generating oxygen, but oxygen was not necessarily in the atmosphere or the deep ocean."

However, photosynthesis was a nifty trick, and sooner or later it started to spread, Johnson says. "Once life gets oxygenic photosynthesis, the sky is the limit. There is no reason to expect that it would not go everywhere."

http://bit.ly/1Lz3dec

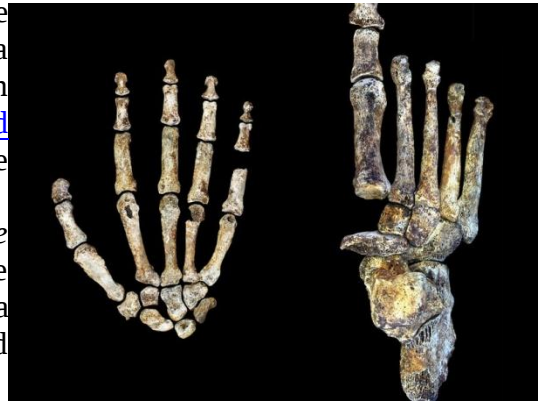
The Increasingly Muddled Origins of Homo Naledi

Detailed analyses of Homo naledi shows a mosaic of both early and modern human features

By Marissa Fessenden

The recent discovery of a new human ancestor in the Rising Star cave system of South Africa shook the family tree. The newest member—*Homo naledi*—has a mash-up of ancient and modern human features, and the announcement stirred some controversy over whether the specimens are truly a new species.

Two studies published today in *Nature Communications* only intensify the debate, suggesting that *H. naledi* was a tree climber, long-distance strider and potential tool-user.



The hand and foot of Homo naledi (Peter Schmid/Will Harcourt-Smith.)

H. naledi's skull is closest to that of *Homo erectus*—the earliest human ancestor with many modern human traits—according to an initial study of the remains. But some of the bones in the trunk, shoulder, pelvis and femur are more similar to those of *Australopithecus*, an even older group of relatives known for the famed Lucy. But according to new research *H. naledi's* wrists, hands, feet and lower limbs are more like modern humans than these ancient ancestors.

In the first new study, a team of researchers described *H. naledi* feet using 107 bones, Jeremy DeSilva an anthropologist with Dartmouth College, describes in a press release. The team compared the bones from the South African cave to the foot and leg of *Australopithecus sediba*, an early human precursor found in a cave just a few miles from Rising Star. But *H. naledi's* foot looked more modern, with only subtle differences from humans today, DeSilva says.

"*Homo naledi* had the most human-like foot of any known early humans except for Neanderthals," he tells George Dvorsky for *Gizmodo*. These new members of our family tree probably "walked a lot like humans do today," he says.

For the second paper, a research team poured over 150 hand bones. Like modern humans and Neanderthals, *H. naledi* sports a long, strong thumb and a robust wrist—features suitable for manipulating tools. But like Australopiths and other early human ancestors, the finger bones are longer and more curved than modern human digits. This means that tree climbing was still a large part of *H. naledi*'s lifestyle.

As both a walker and tree-climber, the proposed activities for *H. naledi* may mean that ancient humans lost their ape-like features in their feet long before they did in their upper limbs. "There were lots of different experiments happening within hominins - it wasn't just a linear route to how we walk today," William Harcourt-Smith, lead author of the paper on *H. naledi*'s feet, says in a press release.

Whether the specimens are truly another species, or an early form of *H. erectus*, as some experts have contended, the findings have already started to "change the human story."

http://nyti.ms/1OruO7Y

Mass Killings Are Seen as a Kind of Contagion

As mass shootings have become ever more familiar, experts have come to understand them less as isolated expressions of rage and more as acts that build on the blueprints of previous rampages.

By ERICA GOODE and BENEDICT CAREY OCT. 7, 2015

Experts in violence prevention say that many, if not most, perpetrators of such shootings have intensively researched earlier mass attacks, often expressing admiration for those who carried them out. The publicity that surrounds these

killings can have an accelerating effect on other troubled and angry would-be killers who are already heading toward violence, they say.

The killing of nine people at an Oregon community college last week was a textbook example. Before opening fire, the gunman, Christopher Harper-Mercer, 26, reportedly uploaded a video about the 2012 massacre at Sandy Hook Elementary School in Newtown, Conn.

The perpetrator of the Sandy Hook murders was himself a student of earlier shootings — in 1999 at Columbine High School in Colorado, where 13 people were killed, and in 2011 in Norway, where 77 people were killed.

And three days after the Oregon shootings, the F.B.I. warned colleges and universities in Philadelphia of a threat posted on the same website used by Mr. Harper-Mercer.

The potential for cultural contagion, many experts say, demands a public health response, one focused as much on early detection and preventive measures as on politically charged campaigns for firearm restrictions. But in some cases, efforts to identify and monitor potentially violent people can raise concerns about civil liberties.

“You’re balancing public welfare and personal privacy,” said J. Reid Meloy, a forensic psychologist in San Diego who consults on threat assessment for schools and corporations.

Some people have also suggested changes in the way the news media covers mass attacks.

“If you blast the names and faces of shooters on news stations and constantly repeat their names, there may be an inadvertent process of creating a blueprint,” said Dr. Deborah Weisbrot, an associate clinical professor of psychiatry at Stony Brook University, who has interviewed hundreds of mostly teenage boys who have made threats.

Criminal histories and documented mental health problems did not prevent at least eight of the gunmen in 14 recent mass shootings from obtaining their weapons.

But anyone interested in the mechanics of such killings can reconstruct them easily through a quick Internet search of news reports, websites and social media. One website lists rampage killings around the world.

The gunman who killed 12 people at a movie theater in Aurora, Colo., in 2012 had a fan club on Tumblr.

“You’d have a hard time finding someone who didn’t do some research about those who went before,” said Robert A. Fein, a psychologist whose specialty is targeted violence and an author of a 2002 report by the Secret Service on school shootings.

In a study of nine school shootings in Germany, Dr. Meloy and his colleagues found that a third of the killers had “consciously imitated and emulated what had happened in Columbine.”

Other mass killers have visited Columbine or written online of their admiration for the two perpetrators there.

It is easy to see why Mr. Harper-Mercer might have identified with the Sandy Hook shooter.

Both young men lived with their mothers, with whom they shared a passion for guns and even went to firing ranges to shoot. Mr. Harper-Mercer’s mother said he had Asperger’s syndrome; the Sandy Hook killer had received a similar diagnosis.

“The more they identify with the characteristics of the story, the more it will increase their level of risk,” said J. Kevin Cameron, the director of the Canadian Center for Threat Assessment and Trauma Response, who has consulted on school shootings in the United States.

At least one study suggests that mass killings, like teenage suicides, may “cluster,” with one highly covered case quickly followed by others. In a recent analysis of hundreds of killings from 1997 to 2013, researchers found that the probability of another attack was highest in the two weeks after a killing hit the news.

Some in law enforcement have begun to suggest that the news media adopt standards in reporting about such events that are similar to guidelines in place for reporting on teenage suicides.

Pete Blair, the director of the Advanced Law Enforcement Rapid Response Training Center at Texas State University, has started a campaign, endorsed by the F.B.I., called “Don’t Name Them” — a policy that Sheriff John Hanlin of Douglas County, Ore., asked the news media to follow in the Oregon case, with little success.

Dr. Meloy said that it might be more important to avoid photographs and phrases like “lone wolf” that “convey a certain cool pose to young people.”

The New York Times ran a photograph of Mr. Harper-Mercer on its front page and featured it prominently online. Matthew Purdy, a deputy executive editor, said such images were not meant to glorify the perpetrators. “Our job is to explain and explore, and these images help to do that,” he said.

Most mass killers “leak” their intentions, dropping hints in conversation or on social media. Mr. Harper-Mercer, for example, reportedly wrote in a blog post, “Seems the more people you kill, the more you’re in the limelight.”

Parents, teachers, classmates, friends and others are in the best position to pick up on these clues, but they often dismiss or ignore them. So “see something, say something” strategies, like those developed in New York after the Sept. 11, 2001, terrorist attacks, can help encourage people to speak up, Dr. Meloy said.

Equally important is breaking down barriers among local agencies — law enforcement and mental health departments, for example — and developing a system to monitor threats and determine if the people who made them are simply troubled or "on a path to violence," experts in threat assessment said.

Several localities have adopted broad and coordinated prevention measures. In Los Angeles County, law enforcement, the county mental health department and educational institutions share information and train staff members to recognize and report worrisome behavior.

The county has intervened in numerous cases in which students had weapons and elaborate plans to use them, said Tony Beliz, a consultant to schools and corporations on violence prevention who for many years ran the mental health side of the effort. In the weeks immediately after a mass killing, they closely monitor young people they believe pose a risk.

After the Sandy Hook shootings, for example, they checked on a 16-year-old boy who liked bomb-making chemicals and who had told the county workers two years before, "I have to get rid of the bad people in this world."

They also called the mother of a teenager who was fascinated by weapons and killing, had access to firearms and had extensively researched school shootings.

Yet such programs can sometimes collide with individual rights, especially when no crime has been committed.

Dr. Beliz and other experts said that mental health professionals and educators were often reluctant to share information about students or clients who exhibited worrisome behavior, under the misapprehension that privacy laws prohibit such disclosures.

Part of the task, they said, is to educate teachers, principals and therapists, explaining the provisions in the laws that allow information to be shared if public safety is involved.

Dr. Beliz said there had been no school shootings in places where the Los Angeles program operated.

But, he added, "unfortunately, some campuses and law enforcement agencies are still in this state of denial where they don't believe it's going to happen in their community."

The biggest obstacle experts may have to overcome, though, is the reluctance of people to recognize and report signs that someone they know might be dangerous.

After Columbine, "we believed that the biggest problem we were going to deal with was overreaction to minor situations," Mr. Cameron said.

"But the biggest problem we still deal with is underreaction to often blatant indicators that someone is moving on a pathway to violence."

http://www.eurekalert.org/pub_releases/2015-10/tju-tpm100615.php

The perfect match might be the imperfect one

When it comes to treating blood cancers like leukemia and lymphomas, new research shows that a half-matched donor bone marrow transplant may be just as good as a full match, in the first apples to apples type comparison of its kind

PHILADELPHIA - Bone marrow transplantation is a life-saving therapy for many patients with blood cancers like leukemias and lymphomas. Currently, the gold standard blood-generating stem cells are obtained from a donor, a sibling, with a perfect match to the patient in order to minimize the chance of rejection and other complications. However, not all patients will have a perfectly matched sibling. Some cancer centers have begun to explore whether half-matched donors might work just as well.

In the first apples-to-apples comparison, researchers have shown that half-matched donor recipients do just as well as full-match recipients, which could be a major advance for minorities, and others without good access to full-match donors. The study was published in the journal Biology of Blood and Marrow Transplantation.

"This is the first study to compare the gold standard to a half-match using an identical protocol," says Neal Flomenberg, M.D., Chair of the Department of Medical Oncology at Thomas Jefferson University and a senior author on the study. "The field has debated whether the differences in outcomes between full and partial matches were caused by the quality of the match or by all the procedures the patient goes through before and after the donor cells are administered. We haven't had a clear answer," he adds.

In this study, the researchers compared 3-year outcomes data from half-match donor recipients who had been transplanted using the Jefferson Two-Step protocol with full-matched donors receiving the same Two-Step approach. Three years after transplant approximately 70 percent of the patients in both groups were still alive and cancer free.

If it's as good, but not better, what's the advantage of a half-match? First, not everyone will have a full match in their family. In fact, according to the National Marrow Donor Program, only 30 percent of patients will have a family member whose cells are a full match. Unrelated donor registries, or cord blood registries, can be an alternate source, but the process can be expensive and time consuming for patients who may only have a short window in which to be treated (bone marrow transplants are most successful while a patient is in remission). Half-match donors are much easier to find among a patient's relatives, and can be ready to donate within days. Registries also tend to lack matches for minorities.

Although there are several methods for performing a half-match, also known as a haploidentical transplant, the jury is still out about the most effective approach. "There are some major advantages to the two step approach," says first author Sameh Gaballa, M.D., Assistant Professor in the Department of Medical Oncology at Thomas Jefferson University and a researcher at the Sidney Kimmel Cancer Center at Thomas Jefferson University. First, rather than extracting stem cells from the bone marrow, which can be painful and risky for donors who can sometimes require blood transfusions, the Two-Step method uses stem cells harvested from the blood. Using the blood as a source of stem cells is not only easier for the donor, but it gives physicians the ability to control the exact number of immune cells, called T cells, which fight the cancer, and donor stem cells that replenish the patient's depleted blood supply (the two donor components of the therapy). "Making sure we have just the right amount of T cells makes a difference. Too few and you might not control the cancer, resulting in a relapse or rejection of the transplant. Too many and you run the risk of severe graft-versus host disease, which can endanger the patient," says Dr. Gaballa.

Rather than administer both the T cells and the stem cells at once, the Two-Step method staggers them, so that the patients first receive the cancer-fighting T cells, followed by the drug cyclophosphamide, that helps keep those cell from becoming over reactive. The stem cells that replenish the patient's immune system are given next. In preliminary results presented at the American Society of Bone and Marrow Transplantation meeting in 2014, the Two-Step protocol resulted in engraftment of donor cells 3-4 days earlier than with a one-step procedure. "That could translate to shorter hospital stays for patients, less time that the patient is without an immune system, and less risk of infection," says Dolores Grosso, D.N.P., Assistant Professor in the Department of Medical Oncology at Jefferson and last author on the study.

"The results of the current study are certainly encouraging, and suggest that outcomes from a half-matched related donor are similar to fully matched donors. It might be time to reassess whether half-matched related transplants can be considered the best alternative donor source for patients lacking a fully matched family member donor," says Dr. Gaballa. "For that, we'll need more evidence from a randomly controlled prospective trial, rather than studies that look at patient data retrospectively, to help solidify our findings here."

The authors report no conflicts of interest.

Paper reference: S. Gaballa, et al., "A 2-Step Haploidentical Versus A 2-Step Matched Related Allogeneic Myeloablative Peripheral Blood Stem Cell Transplantation," Biol Blood Marrow Transplant, doi: 10.1016/j.bbmt.2015.09.017, online Sep 25th , 2015.

http://wb.md/1VLAbDe

New STD Guidelines for 2015

Hello. I am Dr Kimberly Workowski, infectious diseases specialist in the Division of STD Prevention at the Centers for Disease Control and Prevention (CDC), and lead author of the recently released 2015 **Sexually Transmitted Disease (STD) Treatment Guidelines.**[1]

Kimberly Workowski, MD

Over the next few minutes, I will highlight some new information from the 2015 guidelines. To review the document in its entirety, please visit www.cdc.gov/std.

The STD Treatment Guidelines were developed through a rigorous evidence-based peer-review process and were created to assist healthcare providers in the appropriate management and treatment of sexually transmitted infections. Although these guidelines emphasize treatment, prevention strategies and diagnostic evaluation are also discussed.

What's new for 2015? First, gonorrhea has progressively developed antimicrobial resistance to previously recommended regimens, and current treatment options are severely limited. The recommended treatment for urogenital gonorrhea is a single dose of 250 mg of intramuscular (IM) ceftriaxone in combination with 1 g of oral azithromycin.

Two new dual treatment regimens may now be considered as alternative treatment regimens for uncomplicated urogenital gonorrhea in persons with a cephalosporin allergy. Dual treatment with a single dose of 320 mg of oral gemifloxacin plus 2 g of oral azithromycin, or dual treatment with a single dose of 240 mg of IM gentamicin plus 2 g of oral azithromycin, are alternative treatment options in the setting of a cephalosporin allergy. However, some study participants experienced gastrointestinal discomfort with these regimens, which may limit their use.

Next, the use of highly sensitive and specific tests is recommended for the diagnosis of trichomoniasis. Nucleic acid amplification tests (NAATs) are highly sensitive and can detect more infections than wet-mount microscopy.

In the 2015 *STD Treatment Guidelines*, a new section has been added on "Emerging Issues." One section includes information about the association of *Mycoplasma genitalium* with urethritis and cervicitis. *M genitalium* diagnostic considerations are discussed, along with treatment implications due to differences in antibiotic effectiveness.

Also included in the "Emerging Issues" section is a discussion concerning the sexual transmission of hepatitis C virus, especially among persons with HIV infection, and particularly in men who have sex with men. Hepatitis C screening should be considered at least yearly and more frequently depending on specific circumstances.

Additional treatment options for dosing genital warts include either imiquimod 3.75% or 5% cream. Podophyllin resin is no longer a recommended regimen because there are safe and effective alternative regimens, and there have been reports of severe systemic toxicity when podophyllin resin was applied to large areas of friable tissue and not washed off within 4 hours.

The guidelines now include updated recommendations for the diagnostic evaluation of urethritis. Gram staining of urethral secretions demonstrating two or more white blood cells per oil immersion field is a point-of-care diagnostic test that can be used to document urethritis. Methylene blue or gentian violet staining of urethral secretions can be used as an alternative point-of-care diagnostic test with performance characteristics similar to Gram staining.

Additionally, the 2015 STD Treatment Guidelines include updated chlamydia and gonorrhea testing recommendations for women that are consistent with the US Preventive Services Task Force's September 2014 recommendations.[2] These guidelines recommend that all sexually active women younger than age 25, or older women at increased risk for infection (such as those with a new sex partner, more than one sex partner, or a sex partner with concurrent partners), should request, or receive, annual chlamydia and gonorrhea tests. Additionally, high-intensity behavioral counseling is recommended for all sexually active adolescents and adults at increased risk for sexually transmitted infections and HIV.

The guidelines also include recently updated CDC guidance that affects persons who have, or are at risk for, STDs. This includes a March 2015 *Morbidity and Mortality Weekly Report* that summarized all human papillomavirus (HPV) vaccine-related recommendations,[3] a reorganized HPV counseling section, HPV prevention section, and a genital warts counseling section. In addition, there is a new section on the management of persons who are transgender, as well as retesting recommendations for persons with chlamydia, gonorrhea, or trichomonas infections.

The complete treatment guidelines can be viewed and downloaded at www.cdc.gov/std. Wall charts, pocket guides, a link to the STD Treatment Guidelines app, and updates or errata are available at www.cdc.gov/std/treatment.

Web Resources *2015 Sexually Transmitted Diseases Treatment Guidelines*

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http://www.eurekalert.org/pub_releases/2015-10/ou-rai100715.php

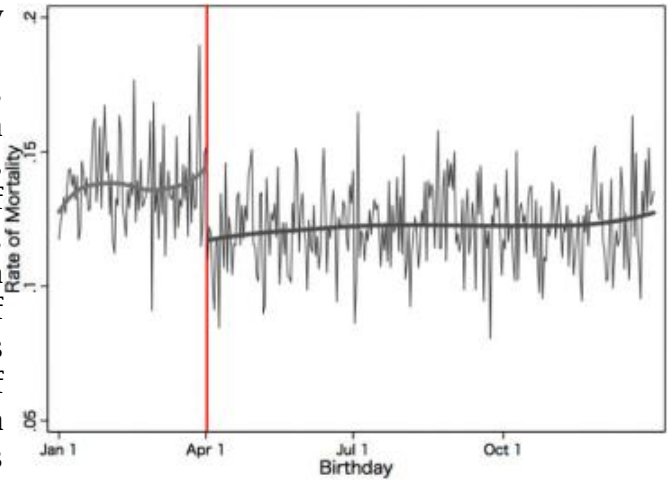
Relative age in school and suicide among young individuals in Japan

Those born right before the school cutoff day have 30 % higher suicide mortality rates than their peers

This news release is available in Japanese.

Researchers from Osaka University, Japan, and Syracuse University, USA, found for the first time that those who were born right before the school cutoff day and thus youngest in their cohort have 30 % higher mortality rates by suicide, compared to their peer who were born right after the cutoff date and thus older. They also found that those with relative age disadvantage tend to follow a different career path that those with relative age advantage, which may explain their higher suicide mortality rates.

Tetsuya Matsubayashi, associate professor of Osaka University and Michiko Ueda, research assistant professor of Syracuse University, examined how relative age in a grade affects suicide rates of adolescents and young adults between 15 and 25 years of age using individual death records in the Vital Statistics of Japan.



The rate of suicide is plotted against the date of birth. The red line denotes the school entry cutoff date (i.e., Aprils 2nd) in Japan. The gray thick line represents a locally weighted regression line fitted separately before and after the cutoff date. The data include individuals aged between 15 and 25 at the time of death that occurred between 1989 and 2010. Source: Birth records (1974 - 1985) and death records (1989 - 2010), the Vital Statistics of Japan. **Credit: Osaka University**

Implementing a regression discontinuity design, they verified that those who were born right before the school cutoff day and thus youngest in their cohort have higher mortality rates by suicide, compared to their peer who were born right after the cutoff date and thus older. This study showed that the relative age at school entry affects mortality rates by suicide, not just academic performance and

economic outcomes as the previous research has demonstrated. This study highlighted the importance of policy intervention that alleviates the relative age effect. Given that education at the early stage of life plays an important role in people's future well-being, the arbitrary cutoff of school entry will generate a life-time disadvantage by the timing of birth for a non-trivial number of people. This study suggested that policy intervention that alleviates the relative age effect can be important.

http://www.bbc.com/news/science-environment-34475464

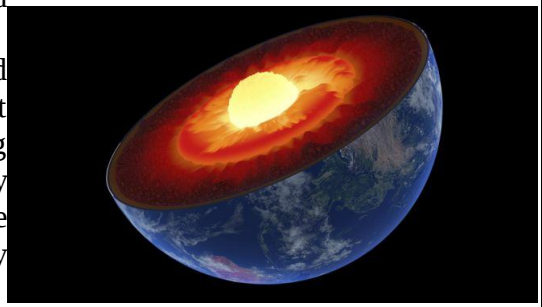
Ancient recording of Earth core's birth

A reassessment of ancient rocks has led scientists to estimate that Earth's inner core started to form earlier than was previously thought, around 1.3 billion years ago.

By Simon Redfern Science writer

As it started to freeze, the core began generating a bigger magnetic field, which continues to today. The work is reported in Nature journal.

Earth's active core contrasts sharply with that of our neighbour Mars, whose strong early magnetic field died around four billion years ago.



Our planet's magnetic field is generated deep in the planet by the turbulent motion of the electrically conducting molten iron of the outer core. We may have to revise our ideas about the core yet againDr Richard Harrison, University of Cambridge

Earth's inner core began its freeze-up earlier than previously recognised, suggests the study **Thinkstock**

It aligns compass needles north-south, but also protects Earth from the solar storms that the Sun throws out relentlessly. At the poles, these storms produce Aurora - northern or southern lights. But they can also work destructively to strip away ozone in the upper atmosphere, an important shield against the Sun's harmful ultraviolet radiation.

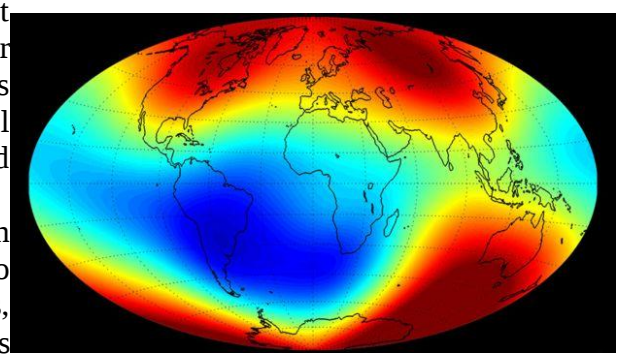
It has been suggested that life on Earth has thrived because the magnetic field has allowed this protective atmosphere to persist over hundreds of millions of years.

The turbulent motion of iron in the liquid outer core is partly generated by excess heat in the centre of the Earth being transferred upwards and outwards by convection, and partly by the slow solidification of the solid inner core at the very heart of the planet.

As the iron at the centre of the Earth freezes, forming the inner core, it expels light and buoyant impurities into the liquid outer core. They rise and boost convection in the outer core, amplifying the magnetic field.

An increase in magnetic field is a signature that scientists have been searching for in the rocks of the deep geological past: a recording of the onset of core solidification.

The lead author of the paper, Dr Andy Biggin of the University of Liverpool, UK, commented: "The timing of the first appearance of solid iron or 'nucleation' of the inner core is highly controversial, but is crucial for determining the properties and history of the Earth's interior."



The question of when molten iron in the heart of the planet started to freeze and form the inner core has, recently, been the topic of vigorous scientific discussion.

The Earth's magnetic field is good for at least another billion years (Image snapshot of field strength. Red is strong; blue is weak) **ESA/SWARM/DTU SPACE**

Estimates and models of inner core formation rely on understanding the properties of iron under the extreme conditions at the centre of the Earth - pressures of more than three million atmospheres, and temperatures of around 6,000C.

Dr Biggin added: "The theoretical model which best fits our data indicates that the core is losing heat more slowly than at any point in the last 4.5 billion years and that this flow of energy should keep the Earth's magnetic field going for another billion years or more."

Dr Richard Harrison of the University of Cambridge, who was not involved in the study, told the BBC: "Studying the magnetism of ancient rocks is a huge scientific challenge, because old rocks can lose their magnetic memory, or the magnetic signals they carry can become overwritten and corrupted (just like the files on your hard drive).

"However, it is one of the best ways to look for concrete evidence of when the core started to solidify. "Although data are scarce, this study applied strict quality controls to decide which data were the most reliable and then used statistics to demonstrate that a boost to Earth's the magnetic field occurred 1,300 million years ago. If this turns out to be the elusive signature of inner core growth, then we may have to revise our ideas about the core yet again!".

http://www.eurekalert.org/pub_releases/2015-10/uoia-rw100715.php

'Psychic robot' will know what you really meant to do

What if software could steer a car back on track if the driver swerves on ice? Or guide a prosthesis to help a shaky stroke patient smoothly lift a cup?

Bioengineers at the University of Illinois at Chicago have developed a mathematical algorithm that can "see" your intention while performing an ordinary action like reaching for a cup or driving straight up a road -- even if the action is interrupted. The study is published online in the journal PLOS ONE.

"Say you're reaching for a piece of paper and your hand is bumped mid-reach -- your eyes take time to adjust; your nerves take time to process what has happened; your brain takes time to process what has happened and even more time to get a new signal to your hand," said Justin Horowitz, UIC graduate student research assistant and first author of the study.

"So, when something unexpected happens, the signal going to your hand can't change for at least a tenth of a second -- if it changes at all," Horowitz said.

In a first test of this concept, Horowitz employed exactly the scenario he described -- he analyzed the movement of research subjects as they reached for an object on a virtual desk, but had their hand pushed in the wrong direction. He was able to develop an advanced mathematical algorithm that analyzed the action and estimated the subject's intent, even when there was a disturbance and no follow through.

The algorithm can predict the way you wanted to move, according to your intention, Horowitz said. The car's artificial intelligence would use the algorithm to bring the car's course more in line with what the driver wanted to do.

"If we hit a patch of ice and the car starts swerving, we want the car to know where we meant to go," he said. "It needs to correct the car's course not to where I am now pointed, but [to] where I meant to go."

"The computer has extra sensors and processes information so much faster than I can react," Horowitz said. "If the car can tell where I mean to go, it can drive itself there. But it has to know which movements of the wheel represent my intention, and which are responses to an environment that's already changed."

For a stroke patient, a "smart" prosthesis must be able to interpret what the person means to do even as the person's own body corrupts their actions (due to muscle spasms or tremors.) The algorithm may make it possible for a device to discern the person's intent and help them complete the task smoothly.

"We call it a psychic robot," Horowitz said. "If you know how someone is moving and what the disturbance is, you can tell the underlying intent -- which means we could use this algorithm to design machines that could correct the course of a swerving car or help a stroke patient with spasticity."

James Patton, professor of bioengineering, is principal investigator on the PLOS ONE research article. The study was performed at the Rehabilitation Institute of Chicago and supported by National Institute of Neurological Disorders and Stroke grant NS053606.

http://bit.ly/1VLEbnb

How to spot the warning signs and prevent mass shootings

The US experienced yet another school shooting last week, when a student at a community college in Oregon opened fire on his English class, killing nine people. How can we thwart such crimes?

It may sound a little "*kumbaya*", but research on planned shootings that were prevented, as well as the psychology of loneliness, suggest that we have had the wrong idea about the role of mental health in these situations. Sorting out our thinking would help us identify individuals who may commit mass shootings, and empower communities to respond appropriately when suspicions arise.

A common stereotype is that the perpetrators are mentally ill, but that is not usually the case, says Eric Madfis, a sociologist and professor of criminal justice at the University of Washington, Tacoma.

"The majority of people who are violent are not mentally ill, and the majority of people who are mentally ill are not violent," he says.

But one stereotype does seem to stand up: mass shooters tend to be isolated. Those who knew the Oregon gunman described him as "withdrawn and quiet" and an "awkward loner" – and that's not an unusual profile.

Negative trigger

The shootings are rarely impulsive, but they are often precipitated by a negative event, like losing a job or the break-up of a relationship.

"A lot of these folks are failing in both love and work," says Reid Meloy, a psychologist at the University of California, San Diego. That failure turns to humiliation, which for some people turns to anger. "Of course, we've all experienced grievances, and most people pick up and move on. But there are a very, very few where it becomes the beginning of a pathway for violence."

Research suggests that social isolation is bad for your health in a variety of ways: it can lead to heart trouble, altered immune responses and premature death, as well as increased anxiety and hostility. But there are many other factors that play into whether someone will commit a mass murder, including access to weapons.

Some researchers have homed in on the statistic that 95 per cent of mass murderers are male. Most are also middle-class, heterosexual, white – all indicators of relative privilege in the US – and either in teenage or middle age. Madfis has argued that the "triple privilege of white heterosexual masculinity" makes failure and loss more unexpected and shameful for these men, who subsequently try to reassert their masculinity through violence.

"I think part of it has to do with male adjustment, notions of acceptable ways to perform your masculinity in the contemporary world," he says.

Still, very few of the men who fit this broad profile actually try to commit a mass shooting. How do you stop the ones who do?

Threat assessment

Meloy works in an emerging field called threat assessment, which combines psychology, social work and law enforcement to identify potentially dangerous individuals and intervene before they carry out their plans.

His research suggests that people who end up committing a mass shooting exhibit certain behaviours in the preceding days and weeks. Combining those features with the fact that most shootings are planned gives hope that they can be averted.

"People take the position that you can't predict these events because the base rate is so small, and therefore you can't prevent them," he says. But just as a cardiologist can offer strategies to help prevent a heart attack even if they can't predict who will have one, threat assessments can help reduce risk even if it can't predict who will go on a rampage.

In a recent study, Meloy and his colleagues studied nine cases of school shootings in Germany, and 31 other "students of concern" who did not end up shooting people.

Warning behaviours

Of the eight common warning behaviours they identified, five turned out to be significantly more common among students who went on to commit a shooting than among those who did not:

Pathway warning behaviour: ***anything that is part of the research, planning or implementation of an attack;***

Fixation: ***preoccupation with a person or a cause, often with an angry undertone;***

Identification: ***whether with a soldier or warrior mentality or with previous attackers or assassins;***

Novel aggression: ***an act of violence that seems unrelated to anything the person has done before; and***

Last resort: ***evidence that the person thinks there is no alternative to violence and is feeling desperate.***

"The science is very new in this area but I think we're doing some stuff that may be of use for people to be aware of," Meloy says. Another such behaviour is telling a third party about a plan to carry out an attack, which researchers call "leakage". The gunman in Oregon allegedly posted his plans on an online message board, for instance. "That's classic leakage," Meloy says.

Given that would-be shooters are prone to giving away their intentions, encouraging others to voice their concerns may be crucial, especially in close-knit environments like schools. Madfis studied 11 schools in the north-east US where a shooting had been forestalled, and found that in each case, the thing that helped was a student reporting the planned attack.

That stands in contrast to most schools' responses to the threat of violence on the premises: armed guards, metal detectors and punitive zero tolerance policies.

"Those just makes kids trust administrators less and not go to them," Madfis says. "Having an environment where people believe they can trust people in the school, whether that's at a high school or at a college campus, can diminish the code of silence."

Some groups are picking up on this, and trying to spread a "if you see something, say something" campaign to avert campus violence. A group called Sandy Hook Promise, founded after the 2012 shooting at Sandy Hook Elementary School in Connecticut that killed 12 children, is launching a similar scheme called "Say Something". And an app called Live Safe aims to make it easy to report suspicious activity on campus.

"When you focus on bolstering social support networks you're tapping into the human desire, if not hunger, for attachment to other people," Meloy says. "We know that that mitigates risk of violence. It's not a predictor, but it's a common thread, that threat managers can use to buffer risk."

http://bit.ly/1LziNX6

Migraines triggered by protein deep in the brain

Migraine may be triggered by a protein deep in the brain that stimulates the neurons controlling facial sensations

It can start with flashing lights, a tingling sensation and a feeling of unease, followed by excruciating pain. Migraines can be triggered by lack of food or too much stress but their underlying cause has remained a mystery. Now researchers have found that a migraine may be triggered by a protein deep in the brain that stimulates the neurons controlling facial sensations.

The discovery creates a potential new target for safer migraine medicines and adds weight to the theory that neurons, not blood vessels, are responsible for migraine attacks. "Where a migraine starts is a key question," says Debbie Hay at the University of Auckland in New Zealand. "There has been a great deal of debate around the mechanisms of migraine. If we can pin this down, we may have better chances of preventing it."

To investigate, Simon Akerman at New York University and Peter Goadsby at Kings College London, UK, studied two neuropeptides released by neurons thought to play a role in the pain associated with migraine.

These protein-like molecules, called VIP and PACAP, first raised suspicion after they were found to be elevated in blood drained from the brains of people having

a migraine attack. When researchers administered these peptides to volunteers, they found that they could cause a headache or migraine about two hours later.

Both peptides widen blood vessels, which was thought to be significant in migraine. In fact, the only drugs specifically developed for migraine that are in use today – triptans – were designed to shrink blood vessels in the brain. As a result, they cannot be used by people with cardiovascular disorders.

The root of the problem

Akerman and Goadsby studied the effects of VIP and PACAP on a set of neurons that innervate the head and face, which are known to trigger a headache. The pair measured the electrical activity of these neurons in anaesthetised rats and studied blood vessels in the rodents' brain to identify when they dilated or constricted.

Some rats were then given PACAP, while others were treated with VIP. Only PACAP caused the neurons to increase their activity – about an hour and a half after it was administered. This suggests that the peptide is responsible for kick-starting a migraine, says Akerman.

To block the effect, Akerman and Goadsby used molecules that block the receptors that PACAP binds to. The drugs made no difference when they were given to the rats intravenously, but when they were injected directly into the brain, the neurons responsible for a headache no longer surged with activity. "These receptors could genuinely represent a new therapeutic target for migraine," says Akerman. "It appears that these receptors are indeed important, and this is definitely vital to helping us understand migraine and for developing new treatments," says Hay, who wasn't involved with the work. "The receptors are a new and exciting target for migraine."

In need of relief

New therapies are desperately needed. Triptans don't work for half the people who try them, says Akerman. At any rate, their development was based on a misunderstanding of how migraine works.

In their study, Akermand and Goadsby found that both VIP and PACAP caused blood vessels to dilate, but that this effect only lasted for about 10 minutes. And in the case of PACAP, the widening of blood vessels did not happen at the same time as the overactivity of neurons. In other words, the dilation of blood vessels doesn't seem to have anything to do with migraine.

Although triptans are prescribed as vasoconstrictors – drugs that shrink blood vessels – other research suggests that they also block the release of peptides like PACAP from neurons. Why this is only effective in half the people who take the drug is still a mystery. What's clear, is that vasoconstriction does not help migraine, says Akerman. "Triptans are effective, but for the wrong reasons."

Journal reference: Science Translational Medicine DOI: 10.1126/scitranslmed.aaa7557

http://www.bbc.com/news/world-africa-34471234

Ebola countries record first week with no new cases

The three West African countries at the heart of the Ebola epidemic recorded their first week with no new cases since the outbreak began in March 2014.

The outbreak has so far killed more than 11,000 people in Guinea, Liberia and Sierra Leone, according to the World Health Organization (WHO). New cases have fallen sharply in 2015, but the WHO has warned that the disease could break out again.

The epidemic is the worst known occurrence of Ebola in history. More than 500 people believed to have had dangerous contact with an Ebola patient remain under follow-up in Guinea, the WHO said in a report. It also said several "high-risk" people linked to recent patients in Guinea and Sierra Leone had been lost track of.

Liberia has already been declared free of Ebola transmission after 42 days without a new case. It is the second time the country received the declaration, following a flare-up in June. Sierra Leone released its last known Ebola patients on 28 September and must now wait to be declared free of Ebola transmission. Guinea's most recent cases were recorded on 27 September.

http://bit.ly/1jmSAom

New heart attack test could identify two-thirds of patients at very low risk of heart attack in the emergency department

Optimal level of a protein called troponin that could rule out a diagnosis of heart attack

Using a high sensitivity blood test[1], researchers have identified the optimal level of a protein called troponin that could rule out a diagnosis of heart attack for two-thirds of people attending the emergency department, according to new research published in The Lancet. Using this threshold in routine practice could potentially double the number of patients suitable for immediate discharge directly from the emergency department, say the authors.

"Until now there were no quick ways to rule out a heart attack within the emergency department," explains lead author Dr Anoop Shah from the University of Edinburgh in the UK. "We have identified a cardiac troponin concentration (less than 5 nanograms per deciliter; <5 ng/L) below which patients are at very low risk of heart attack either during the admission or in the ensuing 30 days. These patients are therefore potentially suitable for immediate and safe discharge from the emergency department. These findings could dramatically reduce unnecessary hospital admissions and provide substantial cost savings for healthcare providers."[2]

One of the most common causes of hospitalisation worldwide is acute chest pain. In the UK alone, chest pain is responsible for around 1 million visits to the emergency department every year. International guidelines recommend that individuals presenting with chest pain are admitted to hospital for testing for very high levels of troponin (above the 99th percentile)--a sign that a heart attack has occurred. Current approaches for assessing patients with suspected heart attacks either require admission into hospital or lengthy stays in the emergency department for repeat testing. Until now, whether new high-sensitivity cardiac troponin tests could identify very low-risk patients who may be suitable for immediate and safe discharge from the emergency department was unknown.

The test used in this study is more sensitive than the standard version and can detect far lower levels of troponin in the blood. Using this test, troponin levels were measured in over 6000 patients with chest pain admitted to four hospitals in Scotland and the USA. Dr Shah and colleagues prospectively evaluated the negative predictive value (the probability that patients were not at risk) of heart attack or subsequent death from a heart condition after 30 days for a range of troponin concentrations.

The researchers found that a troponin threshold of <5 ng/L at presentation identified around two-thirds (61%) of patients at very low risk of heart attack and may have been eligible for early, safe discharge--with a high negative predictive value of 99.6%. This high negative predictive value persisted irrespective of age, sex, cardiovascular risk factors, or prior cardiovascular disease. At one year, these patients had a three times lower risk of heart attack and cardiac death than those who had troponin levels 5 ng/L or higher.

According to Dr Shah, "Over the last two decades the number of hospital admissions due to chest pain has tripled. The overwhelming majority of these patients do not have a heart attack. This study shows that low plasma cardiac troponin concentrations at presentation identify up to two-thirds of patients who are at very low risk of heart attack and could be safely discharged from the Emergency Department. Use of this approach is likely to have major benefits for both patients and healthcare providers."[2]

Writing in a linked Comment, Louise Cullen and William Parsonage from the Royal Brisbane and Women's Hospital, Queensland, Australia, and Martin Than from Christchurch Hospital, New Zealand, say, "The ultimate validation for the safety and efficacy of discharging patients with cardiac troponin concentrations less than 5 ng/L will be the report of clinical outcomes after this threshold is implemented in routine clinical practice...Finally, what further assessment, if any, is needed for those patients identified as low risk and suitable for early discharge? Trials are needed to assess the safety and effectiveness of clinical pathways that involve no further testing for such patients."

This study was funded by the British Heart Foundation and Chief Scientists Office (Scotland).

[1] *A troponin test measures the level of troponin proteins in the blood. These proteins are released when the heart muscle has been damaged, like during a heart attack. The more damage there is to the heart, the greater the amount of troponin there will be in the blood. Even a slight increase in the troponin level will often mean there has been some damage to the heart. Very high levels of troponin are a sign that a heart attack has occurred.*

http://bit.ly/1MleZK3

Speech recognition AI identifies you by voice wherever you are

The latest smartphones can recognise you by your voice. What happens when technology can pick us out from the crowd just by listening?

NOW your phone knows you better than ever. The latest version of Apple's mobile operating system learns what your voice sounds like, and can identify you when you speak to Siri, ignoring other voices that try to butt in.

Siri, the intelligent personal assistant, is not the only one who knows your voice. As learning software improves, voice-identification systems have started to creep into everyday life, from smartphones to police stations to bank call centres. More are probably on the way. In a paper published at the end of September, researchers at Google unveiled an artificial neural network that could verify the identity of a speaker saying "OK Google" with an error rate of 2 per cent.

Voice is a "physiological phenomenon" shaped by your physical characteristics and the languages you speak, says Roger Moore at the University of Sheffield in the UK. A passphrase such as "Hey Siri" or "OK Google" is a powerful way to verify that you are who you say you are, he adds.

"My voice is different from your voice, which is different from your mother's voice, which is different from someone on the far side of the world," Moore says. "The latest machine-learning techniques can tease apart the tiny differences."

For machines, recognising individual voices is different from understanding what they are saying. The recognition software has been fuelled by massive sets of vocal data built into a huge model of how people speak. This allows measurements of how much a person's voice deviates from that of the overall population, which is the key to verifying a person's identity. Changes to someone's voice due to sickness or stress can throw off the software.

The technology is already being used in criminal investigations. Last year, when journalist James Foley was beheaded, apparently by ISIS, police used it to compare the killer's voice with that of a list of possible suspects. And the banks JP Morgan and Wells Fargo have reportedly started using voice biometrics to figure out whether people calling their helplines are scam artists.

Your voice doesn't just give away who you are, but what you're like and what you're doing, says Rita Singh at Carnegie Mellon University in Pittsburgh, Pennsylvania. "Your speech is like your fingerprints or your DNA."

Singh is figuring out how to build profiles of a stranger from audio recordings. A voiceprint gives insight into the speaker's height and weight, their demographic background, and even what their environment is like. She is working with doctors in Massachusetts and Ohio to detect a person's likely diseases or psychological state through voice analysis.

Having devices in the home that recognise voices does raise security concerns, especially if they understand what you're saying. Speech and voice algorithms often aren't embedded in the device itself; instead, what you say is sent to a server somewhere else for analysis, and then ported back quickly. For example, Samsung fell into hot water this year with the revelation that its smart TVs could record private conversations.

"There are privacy concerns everywhere," says Singh. "There is no device out there that ensures privacy."

http://www.eurekalert.org/pub_releases/2015-10/osu-nss100715.php

New study shows that varying walking pace burns more calories

Looking for a simple way to burn more calories while walking? Change up your pace.

COLUMBUS, Ohio - In a study published in the September 2015 issue of the journal Biology Letters, engineering researchers at The Ohio State University found that walking at varying speeds can burn up to 20 percent more calories compared to maintaining a steady pace.

The study is one of the first to measure the metabolic cost, or calories burned, of changing walking speeds.

"Most of the existing literature has been on constant-speed walking. This study is a big missing piece," said Manoj Srinivasan, co-author of the study and professor of mechanical and aerospace engineering. "Measuring the metabolic cost of changing speeds is very important because people don't live their lives on treadmills and do not walk at constant speeds. We found that changing speeds can increase the cost of walking substantially."

Their results show that by using traditional methods, people may be underestimating the number of calories burned while walking in daily life or playing sports. The very act of changing speeds burns energy, Srinivasan explained, but that cost is not generally accounted for in calorie-burning estimations. The researchers found that up to eight percent of the energy we use during normal daily walking could be due to the energy needed to start and stop walking.

"Walking at any speed costs some energy, but when you're changing the speed, you're pressing the gas pedal, so to speak. Changing the kinetic energy of the person requires more work from the legs and that process certainly burns more energy," explained Nidhi Seethapathi, first author of the study and doctoral fellow in mechanical engineering.

The researchers measured the cost of changing walking speeds by having people change their walking pace on a treadmill while its speed remained steady. Participants alternated between walking quickly to move to the front of the treadmill belt, or slowly to move to the back of the treadmill (watch a video demonstration). Prior experiments by other researchers changed the treadmill speed directly, which, it turns out, makes such experiments not applicable to real-world walking, Srinivasan explained. When the treadmill speed is changing, the treadmill itself is doing some of the work, instead of the person walking.

The study also confirmed the researchers' prediction that people walk slower when covering shorter distances and increase their pace as distance increases. This finding could have implications for the field of physical therapy and rehabilitation, where measuring the speed it takes to cover a certain distance is used as an indicator of a patient's progress.

"What we've shown is the distance over which you make them walk matters," said Seethapathi. "You'll get different walking speeds for different distances. Some people have been measuring these speeds with relatively short distances, which our results suggest, might be systematically underestimating progress."

For more tips on how to burn more calories when walking, Srinivasan, who leads the Movement Lab at Ohio State, offers some simple advice: walk in a way that feels unnatural.

"How do you walk in a manner that burns more energy? Just do weird things. Walk with a backpack, walk with weights on your legs. Walk for a while, then stop and repeat that. Walk in a curve as opposed to a straight line," he said.

This work was supported by funding from the National Science Foundation (Award 1254842).

http://bit.ly/1VLITMm

Could ancient textbooks be the source of the next medical breakthrough?

Can we hope to find new remedies by studying ancient medical texts

Laurence Totelin Senior Lecturer in Ancient History, Cardiff University

The discovery that won the latest Nobel Prize for Medicine wouldn't have been much of a revelation to doctors in ancient China. Pharmaceutical chemist Tu Youyou established that the compound artemisinin could treat malaria in the early 1970s. But the plant the chemical comes from, Artemisia annua L. (sweet

wormwood), was used to treat fevers perhaps caused by malaria as early as the third or fourth century CE.

Tu discovered the properties of artemisinin (qinghaosu in Chinese) after reading traditional Chinese texts that dated to this era listing medicinal herb preparations. The route to the discovery and its dissemination was not easy due to both the difficulties of trawling through and testing hundreds of plant samples and the political climate in China in the 70s. Fortunately, persistence paid off and artemisinin is now a key antimalarial drug.

While this story might be unusual in modern medicine, artemisinin is far from the only compound used today that was initially derived from plants. For example, another malaria treatment, quinine, is derived from the bark of South American rainforest tree Cinchona officinalis L. The painkiller morphine comes from the opium poppy Papaver somniferum L. And the poison strychnine comes from the Strychnos nux-vomica L. tree. Those plants had been in use for centuries, even millennia, before chemists isolated their most active constituents.

So can we hope to find new remedies by studying ancient medical texts, as Tu did so successfully? The answer to that question is complex and unfortunately cannot be an unmitigated, resounding "yes". Ancient pharmacological texts, whether they are written in Chinese, Arabic or Greek (or any other ancient language) are not easy to navigate for several reasons.

Ancient cookery books

These pharmacological texts normally present themselves as a series of recipes without much information as to whether they were used or not. Think of your favourite cookery book: you probably do not make all the recipes in it and if you do not annotate it then nobody would know which ones you used and how much you enjoyed them (or not). We rarely find annotations on ancient pharmacological texts.

It is often difficult to know exactly which plants are listed in an ancient recipe. Nowadays, the international Linnaean plant nomenclature is used worldwide to name plants, with each given a genus and a species name, as well as an author's name. For instance, in "Artemisia annua L.", "Artemisia" refers to the genus, "annua" refers to the species, and "L" refers to Linnaeus, the famous Swedish botanist.

But before the Linnaean system became widely accepted, plant nomenclature was extremely unstable and various local names could be used to refer to the same plant. This means it is not always possible to know for sure which plants are referenced in ancient texts. If we cannot translate ancient recipes accurately, how can we evaluate their efficacy?

Definitions of diseases are culturally bound. This means that each culture will define its diseases in a different way. For instance, the Greeks and the Romans considered fever to be a disease, whereas we would think of it as one symptom of a disease.

In Greek and Roman texts, there are many descriptions of "intermittent fevers", fevers that reoccur every few days. Now, intermittent fevers are a symptom of malaria, but they are also symptomatic of other diseases. Should scientists test all ancient Greek and Roman remedies for "intermittent fevers" in their search for new antimalarial drugs?

Holistic medicine

Perhaps most importantly, historians of medicine believe that every medical system should be considered in its entirety. That means, from a historian's point of view, it is problematic only to focus on aspects of ancient medicine that are successful by modern standards and reject the rest as uninteresting.

While there are many ancient medicines that are effective by modern standards, many are not or are frankly dangerous. For instance, very few of us would think it wise to purge ourselves of a disease by overdosing on hellebore, as the Greeks often did.

With all these provisos in mind, I would still argue that there is much potential for discoveries of new drugs in ancient medical texts. This will require collaborations between pharmacologists, historians and ethno-pharmacologists (who study traditional medicine use by different ethnic groups).

Such collaboration will prove challenging as everyone will feel they are speaking a different language. But the wonderful example of Tu Youyou should remind us that the rewards can be high, especially when they lead to advances in the fight against such widespread diseases.

http://www.eurekalert.org/pub_releases/2015-10/uouh-we100615.php

Why elephants rarely get cancer

Potential mechanism identified that may be key to cancer resistance

SALT LAKE CITY - Why elephants rarely get cancer is a mystery that has stumped scientists for decades. A study led by researchers at Huntsman Cancer Institute (HCI) at the University of Utah and Arizona State University, and including researchers from the Ringling Bros. Center for Elephant Conservation, may have found the answer.

According to the results, published today in the Journal of the American Medical Association (JAMA), and determined over the course of several years and a unique collaboration between HCI, Primary Children's Hospital, Utah's Hogle Zoo, and the Ringling Bros. Center for Elephant Conservation, elephants have 38 additional modified copies (alleles) of a gene that encodes p53, a well-defined

tumor suppressor, as compared to humans, who have only two. Further, elephants may have a more robust mechanism for killing damaged cells that are at risk for becoming cancerous. In isolated elephant cells, this activity is doubled compared to healthy human cells, and five times that of cells from patients with Li-Fraumeni Syndrome, who have only one working copy of p53 and more than a 90 percent lifetime cancer risk in children and adults. The results suggest extra p53 could explain elephants' enhanced resistance to cancer.

"Nature has already figured out how to prevent cancer. It's up to us to learn how different animals tackle the problem so we can adapt those strategies to prevent cancer in people," says co-senior author Joshua Schiffman, M.D., pediatric oncologist at Huntsman Cancer Institute, University of Utah School of Medicine, and Primary Children's Hospital.

According to Schiffman, elephants have long been considered a walking conundrum. Because they have 100 times as many cells as people, they should be 100 times more likely to have a cell slip into a cancerous state and trigger the disease over their long life span of 50 to 70 years. And yet it's believed that elephants get cancer less often, a theory confirmed in this study. Analysis of a large database of elephant deaths estimates a cancer mortality rate of less than 5 percent compared to 11 to 25 percent in people.

In search of an explanation, the scientists combed through the African elephant genome and found at least 40 copies of genes that code for p53, a protein well known for its cancer-inhibiting properties. DNA analysis provides clues as to why elephants have so many copies, a substantial increase over the two found in humans. The vast majority, 38 of them, are so-called retrogenes, modified duplicates that have been churned out over evolutionary time.

Schiffman's team collaborated with Utah's Hogle Zoo and Ringling Bros. Center for Elephant Conservation to test whether the extra gene copies may protect elephants from cancer. They extracted white blood cells from blood drawn from the animals during routine wellness checks and subjected the cells to treatments that damage DNA, a cancer trigger. In response, the cells reacted to damage with a characteristic p53-mediated response: they committed suicide.

"It's as if the elephants said, 'It's so important that we don't get cancer, we're going to kill this cell and start over fresh,'" says Schiffman. "If you kill the damaged cell, it's gone, and it can't turn into cancer. This may be more effective of an approach to cancer prevention than trying to stop a mutated cell from dividing and not being able to completely repair itself."

With respect to cancer, patients with inherited Li-Fraumeni Syndrome are nearly the opposite of elephants. They have just one active copy of p53 and more than a 90 percent lifetime risk for cancer. Less p53 decreases the DNA damage response in patients with Li-Fraumeni Syndrome, and Schiffman's team wondered if more p53 could protect against cancer in elephants by heightening the response to damage. To test this, the researchers did a side-by-side comparison with cells isolated from elephants (n=8), healthy humans (n=10), and from patients with Li-Fraumeni Syndrome (n=10). They found that elephant cells exposed to radiation self-destruct at twice the rate of healthy human cells and more than five times the rate of Li-Fraumeni cells (14.6%, 7.2%, and 2.7%, respectively). These findings support the idea that more p53 offers additional protection against cancer.

"By all logical reasoning, elephants should be developing a tremendous amount of cancer, and in fact, should be extinct by now due to such a high risk for cancer," says Schiffman. "We think that making more p53 is nature's way of keeping this species alive." Additional studies will be needed to determine whether p53 directly protects elephants from cancer.

"Twenty years ago, we founded the Ringling Bros. Center for Elephant Conservation to preserve the endangered Asian elephant for future generations. Little did we know then that they may hold the key to cancer treatment," said Kenneth Feld, Chairman and CEO of Feld Entertainment.

"The incredible bond our staff has with these majestic animals, and the hands-on care provided at the Center for Elephant Conservation, allows us to easily provide the blood samples Dr. Schiffman needs to further his research," said Alana Feld, executive vice president of Feld Entertainment and producer of Ringling Bros. and Barnum & Bailey. "We look forward to the day when there is a world with more elephants and less cancer."

The elephant story represents one way that evolution may have overcome cancer. Other evidence suggests that naked mole rats and bowhead whales have evolved different approaches to the problem. Schiffman plans to use what he's learned in elephants as a strategy for developing novel cancer-fighting therapies.

Schiffman and co-authors, Lisa Abegglen, Ashley Chan, Kristy Lee, Rosann Robinson, Michael Campbell, and Srividya Bhaskara are from Huntsman Cancer Institute and the University of Utah, Aleah Caulin and Shane Jensen are from the University of Pennsylvania, Wendy Kiso and Dennis Schmitt are from the Ringling Bros. Center for Elephant Conservation, Peter Waddell is from the Ronin Institute in West Lafayette, Indiana, and Carlo Maley, senior co-author, is from Arizona State University. Also contributing to the research was Eric Peterson, elephant manager at Utah's Hogle Zoo.

"Participating in the research is not only amazing but a win-win for humans and elephants," said Peterson. "If elephants can hold the key to unlocking some of the mysteries of cancer, then we will see an increased awareness of the plight of

elephants worldwide. What a fantastic benefit: elephants and humans living longer, better lives."

"The animal kingdom undoubtedly holds information that could help lead to cures for many human illnesses," said Craig Dinsmore, executive director, Utah's Hogle Zoo. "The blood samples from our elephants at Utah's Hogle Zoo are aiding Dr. Schiffman in his research, and we are proud to be a part of his ground-breaking work."

"Potential mechanisms for cancer resistance in elephants and comparative cellular response to DNA damage in humans" will be published in JAMA online on October 8, 2015. For a copy of the paper, email the JAMA Network media relations department at mediarelations@jamanetwork.org.

The work was supported by Huntsman Cancer Institute, the National Cancer Institute, Huntsman Cancer Foundation, Intermountain Healthcare Foundation, Primary Children's Hospital Foundation, Soccer For Hope, Utah's Hogle Zoo, Ringling Bros. and Barnum & Bailey Circus, U.S. Department of Energy, and the Department of Defense.

http://www.eurekalert.org/pub_releases/2015-10/mu-tfe100715.php

The father effect

Discovery of how environmental memories may be transmitted from a father to his grandchildren

If you have diabetes, or cancer or even heart problems, maybe you should blame it on your dad's behaviour or environment. Or even your grandfather's. That's because, in recent years, scientists have shown that, before his offspring are even conceived, a father's life experiences involving food, drugs, exposure to toxic products and even stress can affect the development and health not only of his children, but even of his grandchildren.

But, despite a decade of work in the area, scientists haven't been able to understand much about how this transmission of environmental memories over several generations takes place. McGill researchers and their Swiss collaborators think that they have now found a key part of the molecular puzzle. They have discovered that proteins known as histones, which have attracted relatively little attention until now, may play a crucial role in the process.

They believe that this finding, which they describe in a paper just published in Science, has the potential to profoundly change our understanding of how we inherit things. That's because the researchers show that there is something apart from DNA that plays an important role in inheritance in general, and could determine whether a father's children and grandchildren will be healthy or not.

Taking a new direction

In the past, most of the research in this area, which is known as epigenetics, has focused on a process involving DNA and certain molecules (known as methyl groups) that attach to DNA and act a bit like a dimmer switch - turning up or down the expression of specific genes.

The researchers were curious about whether histones might play a role in transmitting heritable information from fathers to their offspring because they are part of the content of sperm transmitted at fertilization. Histones are distinct from our DNA, although they combine with it during cell formation, acting a bit like a spool around which the DNA winds.

So, to test their theory about the possible role of histones in guiding embryo development the researchers created mice in which they slightly altered the biochemical information on the histones during sperm cell formation and then measured the results. (It's a bit like putting a nick in a spool of thread and seeing how it affects the way the thread then loops around the spool.) They then studied the effects on the offspring.

There's more than just DNA involved in inheritance

What they discovered was that there were dire consequences for the offspring both in terms of their development e.g. where offspring were prone to birth defects and had abnormal skeletal formation, and in terms of their surviving at all. Moreover, what was most surprising, was that these effects could still be seen two generations later.

"When we saw the decreased survivability across generations and the developmental abnormalities we were really blown away as it was never thought that altering something outside the DNA, i.e. a protein, could be involved in inheritance," said Sarah Kimmins, from McGill's Dept. of Animal Science, and one of the lead authors on the paper. Kimmins is also the Canada Research Chair in Epigenetics, Reproduction and Development.

Kimmins added, "These findings are remarkable because they indicate that information other than DNA is involved in heritability. The study highlights the critical role that fathers play in the health of their children and even grand-children. Since chemical modifications on histones are susceptible to environmental exposures, the work opens new avenues of investigation for the possible prevention and treatment of diseases of various kinds, affecting health across generations."

Experts who have commented or are willing to be interviewed about the paper:

John R. McCarrey, Robert and Helen Kleberg Distinguished Chair in Cellular & Molecular Biology, Department of Biology, University of Texas at San Antonio

Prof. Marisa Bartolomei, Dept. of Cell and Developmental Biology, Perelman School of Medicine, University of Pennsylvania

"While there is substantial evidence that fathers can transmit diseases and adverse phenotypes to their children in the absence of genetic mutations, this is the first

study that shows a feasible mechanism by which this can happen. This gives researchers confidence to pursue histone retention in the male germ cells as a mechanism of inheritance....and it also will serve as a reminder to fathers to be diligent protectors of their germline."

The research was funded by: Canadian Institutes of Health Research (CIHR), Genome Quebec, the Reseau de Reproduction Quebecois, Fonds de recherche Nature et technologies (FRQNT), Boehringer Ingelheim Fond, Swiss National Science Foundation and the Novartis Research Foundation.

http://www.eurekalert.org/pub_releases/2015-10/uog-rrn100815.php

Research reveals new clues about how humans become tool users

Nonhuman primates and humans complete spatial reasoning tasks differently

Athens, Ga. - New research from the University of Georgia department of psychology gives researchers a unique glimpse at how humans develop an ability to use tools in childhood while nonhuman primates--such as capuchin monkeys and chimpanzees--remain only occasional tool users.

Dorothy Fragaszy, a psychology professor in the Franklin College of Arts and Sciences and director of the Primate Behavior Laboratory at UGA, created two studies to look at how nonhuman primates and human children differ in completing simple spatial reasoning tasks.

Much like a game of Operation, human children ages 2, 3 and 4 and adult nonhuman primates were asked to fit a stick, a cross and a tomahawk into a matching cutout space on a tray. Children were also given an opportunity to complete this task by placing the sticks on a mat with a drawing of the matching shape, as well as into a space on a tray.

"We did the study with nonhuman primates specifically to look at the management of objects in space," Fragaszy said. "I wanted to give them a spatial reasoning task that was not a tool-using task. We wanted to look at how they worked with these objects and arranged them in relation to features of another surface and from that gain some insight as to how they use objects as tools.

"In the case of the children, we wanted to see how they completed the same spatial reasoning task, but with a developmental dimension to it that is not present with our study of nonhuman primates because they were all adults."

What they found, she said, was a clear age effect in the children. Two-year-olds were able to fit the straight stick and the cross-shaped stick properly into the cutout most of the time. Three- and 4-year-olds were even better at it.

However, when it came time to fit the tomahawk stick into the cutout, 2-year-olds were unable to complete the task most of the time, while 3- and 4-year-olds were also challenged.

Children were adept at using sight to help figure out how an object should be aligned to fit it into the space.

Sometimes some of the 3- and 4-year-olds would hold the object, especially the cross or tomahawk stick, a little bit above the tray and move it in the air as if they were aligning it visually before they put it down.

Instead of depending on sight, nonhuman primates often used their sense of touch, known as their haptic senses, to feel how the object fit into the space.

"Adult chimps and capuchin monkeys are among the most accomplished spatial problem solvers among the nonhuman primates, but even the 2-year-olds are much better than they are at alignment," Fragaszy said.

Between 16-18 months and 2 years, humans develop a new relationship between vision and action. Prior to this development, they have trouble orienting another object that's not their own body in space.

When asked to complete the task in a two-dimensional version that involved visually aligning an object in the correct place, children were less successful and made fewer attempts than with the three-dimensional tasks.

"This makes sense if you think about the contribution of haptic perception to what's going on," Fragaszy said.

"You can feel when a three-dimensional object hits the edge of a cutout. You don't feel anything with a flat two-dimensional object such as a disk. It indicates again that vision is not enough for young children. The haptic component is also helpful for them. For nonhuman primates, the haptic component is essential."

Humans use what's known as a vision for action system. Visual information is integrated into planning action and guiding movements of the body in space, especially to use the hands to reach for and grasp objects and manipulate them in space.

Researchers have studied what happens if part of that system doesn't work very well, but researchers haven't known much about how that system develops until now.

"People have thought for a long time about what makes tool use difficult for nonhuman primates and easy for humans, but they haven't thought about it in this way," she said.

"I'm hopeful that this will generate further research on this, both with humans and nonhuman primates, to clarify the answer to this question."

The study, "'Vision for Action' in Young Children Aligning Multi-Featured Objects: Development and Comparison with Nonhuman Primates," appears in the journal PLOS ONE and can be viewed at
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0140033

http://bit.ly/1WUpOtZ

Zika Disease: Another Reason to Hate Mosquitoes

Experts are concerned that the illness, which is increasingly linked to a disorder that causes paralysis, may become a problem in the U.S.

By Dina Fine Maron | October 8, 2015

By the time the 48-year-old man showed up at a clinic in New York City he had been sick for almost two weeks. A blotchy, red rash still blanketed his torso and his body ached. He had just gotten over a triple-digit fever, intense lower back pain and a painful eye infection. Five weeks earlier he had embarked on a long vacation to South America and Polynesia but during his trip he had felt fine. He had hopscotched from country to country until he capped his stint through French Polynesia with a trip to Mooréa, an island about 16 kilometers northwest of Tahiti. The South Pacific paradise was teeming with some hungry mosquitos. But he wasn't worried about the bites. He knew he was up on all his travel vaccinations.

Even after a handful of telltale bumps erupted on his skin he was all right for several days. Then, some 12 hours after leaving Mooréa, he was not. First, he started to feel tired and developed an intransigent rash on the back of his neck. The rash appeared right where his camera strap often rubbed, so at first he did not think much about it. "It was like a mosquito bite gone rogue," he says. But then the rash started to creep downward across his body. His fatigue grew and his temperature spiked. Soon his eyes turned swollen and red and dripped stringy mucous. His lower back hurt, too, and popping painkillers offered little relief. A tough week followed. Some nine days later he felt better but still had a pernicious red rash that had crept across his back, arms and legs. Soon he made an appointment at a clinic.

Once there, his doctors struggled to make a diagnosis. Mosquitoes can carry a raft of diseases like malaria, dengue, West Nile or chikungunya. But none of those diagnoses seemed to be a perfect fit. Although he had aches and pains typical of dengue or chikungunya, his medical team believed it was unlikely he had contracted those ailments based on where he traveled. His lab test results were equally puzzling. Blood tests showed he had antibodies for West Nile virus and dengue. Yet his team could not even trust those findings. The two viruses come from the same family as several other mosquito-borne pathogens so the lab test may have detected the antibodies – possible holdovers from a yellow fever vaccination or earlier infections – and then falsely indicated he had those maladies instead of one of their viral cousins. That phenomenon, called cross-reactivity, could allow the real disease to fly under the radar, his team said.

Without any definitive, immediate answers he was advised to drink plenty of fluids to replenish liquids he lost through sweat and to take over-the-counter pain medications like Tylenol, as necessary. Soon the rash cleared up. But a month after the man started to feel ill another round of blood tests revealed something new. His levels of antibodies against dengue and West Nile were still elevated. But the amount of antibodies against a rare tropical disease called Zika had increased fivefold between his first clinic visit and his follow-up tests. The spike in Zika antibodies confirmed what both the patient and the clinic workers suspected: He had the dubious honor of being the first American tourist with a documented case of Zika. His experience was described in the *Journal of Travel Medicine* earlier this year.

Now, the U.S. Centers for Disease Control and Prevention are steeling themselves for many more Zika cases. The disease is generally pretty mild—on par with flu—but health workers have recently found that a small number of patients seem to go on to develop an autoimmune disorder that can cause nerve damage and paralysis called Guillain–Barré syndrome. "This is a pretty troubling finding," says Scott Weaver, an expert on mosquito-borne viral diseases at The University of Texas Medical Branch at Galveston. Exactly how many Zika patients have that extreme reaction remains unknown because doctors only linked the two maladies in the past couple years. And because Zika is so often missed—thanks to lab complications or patients' choice not to seek care—it is challenging to prepare for the possibility of Guillain–Barré syndrome, too.

Few accounts linking Zika and the autoimmune disease have made it into the peer-reviewed literature. Last March researchers wrote in the journal *Eurosurveillance* that in French Polynesia the incidence of Guillain–Barré had increased 20-fold since Zika outbreaks began there in the past couple years—but no official data has yet been released. What's more, Zika is prone to heavy mosquito-driven outbreaks. In 2007, the archipelago of Yap in Micronesia acquired the disease—and, shockingly, roughly 70 percent of its population was infected. (The nation's total population was about 7,000.) But that outbreak also complicates the picture for the Guillain–Barré/Zika link: There did not appear to be a surge in cases of Guillain–Barré—or at least none that made it into official reports.

Yet certain facts do remain clear. Outside of the U.S. the incidence of Zika is becoming harder to ignore—boosting the chances that the U.S. could soon be faced with its own uptick. In just the past decade Zika has shored up its foothold in new territories. In the past two years more than 28,000 cases have been reported across French Polynesia. There is no routine testing for the virus and, like Ebola, the cases did not stop at those countries' borders. Tourists have now brought cases back to Thailand, Germany, Japan, Australia and elsewhere. Then, in May 2015 public health authorities confirmed that Zika had also reached the

Americas. Brazilian officials said that the disease had cropped up in the northeastern part of the country. Making matters worse, this pattern has the disturbing echo of familiarity: Before dengue began showing up in the U.S., cases had appeared in the Pacific islands and Brazil, too. The similarities are fueling concern among global health experts that the U.S. could face its own Zika outbreaks—the question is when.

Until recently cases of Zika were few and usually sputtered out quickly. The viral disease was first isolated in 1947 from a sick rhesus monkey in the Zika Forest of Uganda and only caused small outbreaks in Africa and Southeast Asia for more than 50 years. Yet the number of such cases has ballooned in the past couple years. The major reason: global travel. When the disease shows up in new populations that do not have any immunity to the disease it can more readily spread from person to person, at least as long as mosquitoes are around. There is no vaccine to protect against it or any cure.

Even as the disease becomes more pervasive, there are also few weapons left in our arsenal against it. The mosquitoes that transmit the virus from person to person typically bite during the day, rendering mosquito nets largely useless. Mosquitoes are also increasingly developing resistance to common insecticides. And the mosquitoes that carry the disease are widespread. "Anywhere with these vectors—*Aedes aegypti* mosquitoes and to some degree *Aedes albopictus*—could get this virus and have local transmission," says Erin Staples, a medical epidemiologist and expert in mosquito-borne diseases at the U.S. Centers for Disease Control and Prevention. Right now that would be in the southeastern U.S. and into the Southwest, similar to where we currently may see cases of dengue or chikungunya, she says. Although travelers going to areas where Zika is common can help protect themselves by applying repellents that contain DEET, wearing clothes that cover their arms and legs, and using air-conditioning or window screens to try to keep bugs outside, none of those approaches are guaranteed—the American traveler with Zika had been wearing insect repellent with 30 percent DEET.

At home, there are some lifestyle factors that help protect against Zika. For one, in the U.S. many people do not spend much time outdoors or keep their windows open, helping prevent mosquito bites. "Transmission may be somewhat limited because of how we live our lives—going from air-conditioning at work to a car with air-conditioning so we may not be in the environment that much," Staples says. But there is also much scientists do not know about the disease. For example, there is one reported case where the disease—at least circumstantially—appears to have been passed between humans via sexual transmission. A couple newborns in French Polynesia also tested positive for the virus within the first couple days of life, suggesting it may be possible for the virus to be passed from mother to child.

Primed for paralysis

The Guillain–Barré complication is just another wrinkle in an already formidable health problem: We do not have a true sense of how common Zika has become. "We don't even know much about how far the virus has spread in Brazil. It may be in other parts of South America already but it won't be detected unless blood samples are sent to a lab," Weaver says.

What's the holdup? Zika virus itself could be detected in a patient's blood within the first week or so of a patient's illness (before the antibodies develop). But because the disease's symptoms are so mild patients often do not seek immediate medical care. By the time patients show up and get blood work done, the virus is often no longer detectable and the antibodies that could be picked up by a CDC lab may look like those for the more common dengue.

Difficulties tallying Zika cases are more than a matter of inaccurate paperwork. Zika and dengue, for example, have different treatment plans. Dengue can lead to its more serious and life-threatening dengue hemorrhagic fever, where patients bleed profusely, so a dengue patient should avoid common painkillers like aspirin, ibuprofen and naproxen (Aleve) that could worsen the bleeding for patients. Yet with Zika doctors do recommend taking those painkillers to help with the fever and pain. And, longer-term, misdiagnosing Zika as dengue has another complication: Patients may not be on the lookout for the weakness that could signal the early onset of the associated autoimmune disorder; Guillain–Barré has no cure but there are several therapies they could tap that are known to help speed recovery—involving blood removal or injections of donor proteins.

As Zika becomes more widespread, the risk grows that an American traveler could bring it back to the U.S. and fuel a local outbreak or even—although much less likely—that infected mosquitoes may make their way overland to the U.S. For his part, the infected tourist likens his experience with Zika to a "tough flu that kicks your ass, makes your muscles sore and Advil barely made a dent." It is not an experience he wants to repeat.

http://bit.ly/1jn06zq

The Draconid Meteor Shower Peaks This Week

Clear skies and little moonlight make for great meteor watching

By Danny Lewis

Stargazers are in for a treat this week as the annual Draconid meteor shower peaks just ahead of a new moon. Thanks to the dark skies, meteor watchers will have a lucky chance to watch the show without worrying about the moon's glare.

This year, the Draconid meteor shower will peak late Thursday night and continue into Friday morning. If skies stay clear, the meteors should still be visible Friday night, Andrew Fazekas writes for *National Geographic*. Every 6.6 years, a comet called 21P/Giacobini-Zinner orbits the solar system, leaving trails of tiny particles in its wake. While the Earth occasionally drifts into these streams throughout the year, the annual meteor display comes from a massive cloud of debris the comet released in 1900, according to a NASA description.

Like most meteor showers, the Draconids get their name from the constellation that they appear to originate—in this case, the Draco constellation in the Northern Hemisphere. Typically, about 10 to 20 meteors an hour can be seen during the shower's peak, but there have been several times during the last hundred years when hundreds of meteors blazed the skies. During the 2011 Draconids, the comet swung past the sun, ejecting more debris than usual. NASA astronomers recorded rates of up to 300 meteor strikes that year, but the brightness of the moon blocked out all but the most spectacular impacts, Fazekas writes.

While the Draconids are a treat to watch from the ground, satellite operators must protect sensitive equipment from the meteor shower's sandblast. Some satellites are shielded enough to ride out the storm, but others may have to maneuver their more delicate equipment—like cameras—away from the cloud, according to NASA.

There's no need to worry about the astronauts on the International Space Station, though: The station is heavily shielded against meteors and the astronauts won't set foot outside until after the shower subsides. "Most years, we pass through gaps between filaments, maybe just grazing one or two as we go by," NASA's Meteoroid Environment Office chief Bill Cooke said in a 2011 statement. "Occasionally, though, we hit one nearly head on—and the fireworks begin."

The Draconids' peak will start around 1:40 a.m. EST Thursday night, with the best viewing weather in the mid-Atlantic Seacoast, Tennessee Valley and the northern plains and Rockies, according to Accuweather.com. But don't worry if the skies are too cloudy tonight—the Orionid meteor shower is scheduled for later this month on October 21 and 22.

http://www.eurekalert.org/pub_releases/2015-10/uoq-acm100815.php

Antioxidants cause malignant melanoma to metastasize faster

Fresh research at Sahlgrenska Academy has found that antioxidants can double the rate of melanoma metastasis in mice.

The results reinforce previous findings that antioxidants hasten the progression of lung cancer. According to Professor Martin Bergö, people with cancer or an elevated risk of developing the disease should avoid nutritional supplements that contain antioxidants.

Researchers at Sahlgrenska Academy, University of Gothenburg, demonstrated in January 2014 that antioxidants hastened and aggravated the progression of lung cancer. Mice that were given antioxidants developed additional and more aggressive tumors. Experiments on human lung cancer cells confirmed the results.

Given well-established evidence that free radicals can cause cancer, the research community had simply assumed that antioxidants, which destroy them, provide protection against the disease. Found in many nutritional supplements, antioxidants are widely marketed as a means of preventing cancer. Because the lung cancer studies called the collective wisdom into question, they attracted a great deal of attention.

Double the rate

The follow-up studies at Sahlgrenska Academy have now found that antioxidants double the rate of metastasis in malignant melanoma, the most perilous type of skin cancer. Science Translational Medicine published the findings on October 7.

"As opposed to the lung cancer studies, the primary melanoma tumor was not affected," Professor Bergö says. "But the antioxidant boosted the ability of the tumor cells to metastasize, an even more serious problem because metastasis is the cause of death in the case of melanoma. The primary tumor is not dangerous per se and is usually removed."

Confirmed the results

Experiments on cell cultures from patients with malignant melanoma confirmed the new results. "We have demonstrated that antioxidants promote the progression of cancer in at least two different ways," Professor Bergö says.

The overall conclusion from the various studies is that antioxidants protect healthy cells from free radicals that can turn them into malignancies but may also protect a tumor once it has developed.

Avoid supplements

Taking nutritional supplements containing antioxidants may unintentionally hasten the progression of a small tumor or premalignant lesion, neither of which is possible to detect.

"Previous research at Sahlgrenska Academy has indicated that cancer patients are particularly prone to take supplements containing antioxidants," Dr. Bergö says. Our current research combined with information from large clinical trials with antioxidants suggests that people who have been recently diagnosed with cancer should avoid such supplements."

High mortality rate

One of the fastest expanding types of cancer in the developed world, malignant melanoma has a high mortality rate - which is one reason that researchers at Sahlgrenska Academy were so anxious to follow up on the lung cancer studies.

"Identifying factors that affect the progression of malignant melanoma is a crucial task," Professor Bergö says.

Lotions next

The role of antioxidants is particularly relevant in the case of melanoma, not only because melanoma cells are known to be sensitive to free radicals but because the cells can be exposed to antioxidants by non-dietary means as well.

"Skin and suntan lotions sometimes contain beta carotene or vitamin E, both of which could potentially affect malignant melanoma cells in the same way as antioxidants in nutritional supplements," Professor Bergö says.

Other forms of cancer

How antioxidants in lotions affect the course of malignant melanoma is currently being explored. "We are testing whether antioxidants applied directly to malignant melanoma cells in mice hasten the progression of cancer in the same way as their dietary counterparts," Professor Bergö says.

He stresses that additional research is badly needed.

"Granted that lung cancer is the most common form of the disease and melanoma is expanding fastest, other forms of cancer and types of antioxidants need to be considered if we want to make a fully informed assessment of the role that free radicals and antioxidants play in the process of cancer progression."

http://www.eurekalert.org/pub_releases/2015-10/btif-nsp100915.php

New study provides key insights into aspirin's disease-fighting abilities

Researchers have found that salicylic acid targets the activities of HMGB1, an inflammatory protein associated with a wide variety of diseases, offering hope that more powerful aspirin-like drugs may be developed.

ITHACA, N.Y.-- Aspirin is one of the oldest and most commonly used medicines, but many of its beneficial health effects have been hard for scientists and physicians to explain. A recent study conducted by researchers at the Boyce Thompson Institute (BTI), in collaboration with colleagues at Rutgers University and San Raffaele University and Research Institute, shows that aspirin's main breakdown product, salicylic acid, blocks HMGB1, which may explain many of the drug's therapeutic properties. The findings appear Sept. 23, 2015 in the journal Molecular Medicine.

"We've identified what we believe is a key target of aspirin's active form in the body, salicylic acid, which is responsible for some of the many therapeutic effects that aspirin has. This protein, HMGB1, is associated with many prevalent, devastating diseases in humans, including rheumatoid arthritis, heart disease, sepsis and inflammation-associated cancers, such as colorectal cancer and mesothelioma," said senior author Daniel Klessig, a professor at BTI and Cornell University.

Aspirin's pain relieving effects have long been attributed to its ability to block the enzymes cyclooxygenase 1 and 2, which produce prostaglandins--hormone-like compounds that cause inflammation and pain--a discovery that netted its discoverer, John Vane, a Nobel prize. However, the body rapidly converts aspirin to salicylic acid, which is a much less effective inhibitor of cyclooxygenase 1 and 2 than aspirin. Nonetheless, it has similar pharmacological effects as aspirin, suggesting that salicylic acid may interact with additional proteins.

"Some scientists have suggested that salicylic acid should be called 'vitamin S', due to its tremendous beneficial effects on human health, and I concur," said lead author Hyong Woo Choi, a research associate at BTI.

In the current study, researchers discovered the interaction between salicylic acid and HMGB1 by screening extracts prepared from human tissue culture cells to find proteins that could bind to salicylic acid. They identified one of these proteins as HMGB1. These screens have also identified a key suspect in neurodegenerative diseases such as Alzheimer's and Parkinson's diseases, plus approximately two dozen additional candidates that have yet to be characterized.

In the body, HMGB1 is normally found inside the nucleus, but can enter the blood stream when released from injured tissues or secreted by certain immune or cancer cells. The protein in the blood stream triggers inflammation by recruiting immune cells involved in preventing infections and repairing damaged tissues. HMGB1 also activates these recruited immune cells to express genes that code for pro-inflammatory cell-signaling proteins called cytokines.

To further investigate the interactions between salicylic acid and HMGB1's role in the body, Klessig worked with Marco Bianchi of San Raffaele University and Research Institute, who initially discovered that HMGB1 is a trigger of inflammation. Using assays that measured the effects of salicylic acid on the recruitment and activation of immune cells, they showed that salicylic acid could block both of these functions at concentrations similar to those found in people on low-dose aspirin.

"We've found that HMGB1 is involved in countless situations where the body confronts damage to its own cells, which occur in many disease conditions. In retrospect, it's almost obvious that a very general anti-inflammatory compound blocks a very general inflammation trigger," said Bianchi.

Klessig also teamed up with biophysicist Gaetano Montelione at Rutgers, The State University of New Jersey, to not only confirm that salicylic acid can bind to HMGB1, but also to identify the salicylic acid binding sites.

The Klessig group identified two derivatives of salicylic acid, which are far more effective than salicylic acid in blocking HMBG1's pro-inflammatory activities. They synthesized one compound in the lab, while a second was isolated from a licorice plant used as a Chinese medicinal herb.

"We've identified both synthetic and natural derivatives of salicylic acid which are 50 to 1000 times more potent than salicylic acid or aspirin in suppressing the pro-inflammatory activity of extracellular HMGB1," said Klessig, "thereby providing proof of concept that more effective salicylic acid-based drugs are attainable."

"Our analyses of these derivatives revealed that appropriate modifications of salicylic acid can enhance the strength of its interaction with HMGB1, providing the basis for rational design of new aspirin-like molecules," said Montelione.

http://www.eurekalert.org/pub_releases/2015-10/gi-bcp100915.php

Blood clotting protein triggers immune attack on the brain

Disruption of the blood-brain barrier triggers a cascade of events that results in autoimmunity and brain damage characteristic of multiple sclerosis

A new study from the Gladstone Institutes shows that a single drop of blood in the brain is sufficient to activate an autoimmune response akin to multiple sclerosis (MS). This is the first demonstration that introduction of blood in the healthy brain is sufficient to cause peripheral immune cells to enter the brain, which then go on to cause brain damage.

A break in the blood-brain barrier (BBB) allows blood proteins to leak into the brain and is a key characteristic of MS, a disabling autoimmune disease of the brain and spinal cord. However, it was unclear whether the BBB disruption caused the autoimmune response or resulted from it.

In the current study, published in Nature Communications, the scientists created a new animal model of disease to determine if BBB leakage can cause autoimmunity. They discovered that injecting just one drop of blood into the brain set off the brain's immune response, kick-starting a chain reaction that resulted in inflammation and myelin damage. Myelin is the protective sheath that insulates nerve fibers in the brain, and it is the primary site of injury in MS. What's more, the scientists were able to pinpoint a specific protein in the blood, the blood-clotting factor fibrinogen, as the trigger for the disease-causing process.

"These findings offer a completely new way of thinking about how the immune system attacks the brain--it puts the blood in the driver's seat of the onset and progression of disease," says senior author Katerina Akassoglou, PhD, a senior investigator at the Gladstone Institutes and professor of neurology at the University of California, San Francisco. "This opens up the possibility for new types of therapies that target blood coagulation factors, upstream of autoimmune processes."

Fibrinogen activated the brain's immune cells, called microglia, and caused them to send out signals summoning peripheral immune cells from other parts of the body to the brain. When these peripheral immune cells--macrophages and T cells--entered the brain, they attacked myelin.

"Our results provide the first evidence that blood promotes T cell responses against the brain," says first author Jae Kyu Ryu, PhD, a staff research scientist at the Gladstone Institutes. "Not only did we confirm that the presence of blood in the brain recruits peripheral immune cells to the area, which is sufficient to cause myelin destruction, we also identified fibrinogen as the critical protein driving this process."

To confirm their findings, the scientists deleted the fibrinogen receptor (complement receptor 3 or CD11b/CD18) on microglia, thereby preventing fibrinogen from activating the cells. Inhibiting this interaction blocked the autoimmune process, stopping the microglia from signaling to the peripheral immune cells and averting myelin damage and inflammation. The researchers are now attempting to block fibrinogen using biological and small-molecule approaches as potential new therapies to suppress autoimmunity directed against the brain, dampening inflammation caused by microglia and T cells.

"These findings question a long-held paradigm that myelin-specific T cells initiate inflammation in the brain through activation of microglia and brain macrophages," says Scott Zamvil, MD, PhD, a professor of neurology at the University of California, San Francisco and co-author on the paper. "This study demonstrates that the original paradigm may also occur in reverse. Namely, initial activation of microglia and brain macrophages may activate T cells."

The scientists say that having a model of blood-induced brain inflammation is a valuable tool, as it can be used to screen new drugs. These mechanisms may occur not only in autoimmune disorders, but also in other brain diseases that involve inflammation or a break in the BBB, including traumatic brain injury, stroke, Alzheimer's disease, and other dementias.

Scientists from the Medical University of Vienna and the University of Cincinnati College of Medicine also took part in the research. Funding was provided by the National Institute of Neurological Disorders and Stroke; National Multiple Sclerosis Society; American Heart Association; National Heart, Blood, and Lung Institute; Pediatric Scientist Development Program; and the Howard Hughes Medical Institute Medical Research Fellowship. Additional funding sources include the University of California San Francisco-Gladstone Institute of Virology and Immunology Center for AIDS Research; the Mouse Pathology Core of the UCSF Helen Diller Family Comprehensive Cancer Center; the Guthy Jackson Charitable Foundation; and the Maisin Foundation.

http://nyti.ms/1K1cJFZ

Nobel Renews Debate on Chinese Medicine

As China basks in its first Nobel Prize in science, few places seem as elated, or bewildered, by the honor as the China Academy of Chinese Medical Sciences.

By IAN JOHNSON OCT. 10, 2015

BEIJING —Located on a shady street in the Old City, the academy is spread over a city block and welcomes visitors with an incongruous juxtaposition: a six-foot high quotation from Chairman Mao facing bronze statues of gowned doctors from antiquity who devised esoteric theories to heal the human body. These contrasts are part of a bigger, century-long debate in China that has been renewed by the award on Monday to one of the academy's retired researchers, Tu Youyou, for extracting the malaria-fighting compound Artemisinin from the plant *Artemisia annua*. It was the first time China had won a Nobel Prize in a scientific discipline.

Traditionalists say the award, in the "physiology or medicine" category, shows the value of Chinese medicine, even if it is based on a very narrow part of this tradition. "I feel happiness and sorrow," said Liu Changhua, a professor of history at the academy. "I'm happy that the drug has saved lives, but if this is the path that Chinese medicine has to take in the future, I am sad."

The reason, he said, is that Dr. Tu's methods were little different from those used by Western drug companies that examine traditional pharmacopoeia around the world looking for new drugs.

In fact, in its award, the Nobel committee specifically said it was not honoring Chinese medicine, even though Artemisia has been in continuous use for centuries to fight malaria and other fevers, and even though Dr. Tu said she figured out the extraction techniques by reading classical works. Instead, it said it was rewarding Dr. Tu for the specific scientific procedures she used to extract the active ingredient and create a chemical drug.

But the most sophisticated part of Chinese medicine, Dr. Liu said, involves formulas of 10 to 20 herbs or minerals that a practitioner adjusts weekly after a consultation with a patient. And yet almost no research has been done on how these formulas actually interact with the body, he said. Instead, the government has poured money into finding another Artemisinin — with no luck.

"Are we truly respecting this cultural heritage?" Dr. Liu said. "When we think Chinese medicine needs to be modernized and the path it shall go down must be like Tu Youyou's path, I think it is a disrespect."

But many Chinese think it should not be respected at all. Scientists like He Zuoxiu, a member of the prestigious Chinese Academy of Sciences, say that the ancient pharmacopoeia should be mined, but the underlying theories that identified these herbs should have been discarded long ago.

"I think for the future development of Chinese medicine, people should abandon its medical theory and focus more on researching the value of herbs with a modern scientific approach," Dr. He said in an interview.

In an interview with China's state news media, the Nobel laureate said the award was a recognition of her country and its traditional medicine.

These radically different views on Chinese medicine go back at least a century, and get to the heart of how modern China sees itself.

After a series of lost wars and national humiliations, Chinese reformers and revolutionaries began jettisoning almost everything from the country's long past: its political and religious systems; its architecture and urban planning; its national dress and its lunar calendar.

Traditional medicine came in for especially harsh criticism. Some of the country's most famous writers, like Lu Xun, Lao She, and Ba Jin, pilloried it as exemplifying everything wrong with the country. Its theories were obscure, its outcomes unproven, and most of all it was "unscientific" in a country that was beginning to worship science as the cure to all ills.

"Everyone at that time agreed that Chinese medicine had no future," said Paul Unschuld, a historian of Chinese medicine at the Charité Hospital in Berlin. "Ideas like yin-yang, the Five Elements — all of that was considered backwards."

When the Communists took over China in 1949, however, the country had few Western hospitals. A few years later, Mao Zedong declared that "Chinese medicine and pharmacology are a great treasure house." The praise, though, came with a caveat: It must modernize. That meant setting up traditional Chinese hospitals, schools and research facilities like the academy in Beijing.

But money has flowed overwhelmingly toward Western medicine. In the Mao era, rural health care workers — "barefoot doctors" — were often traditional practitioners, which raised the profile of Chinese medicine. After Mao's death and with growing prosperity, the government doubled down on Western medicine.

Today, China has 1.1 million certified doctors of Western medicine, versus 186,947 traditional practitioners. It has 23,095 hospitals, 2,889 of which specialize in Chinese medicine.

"It's part of the nation, but the nation of China defines itself as a modern nation, which is tied very much to science," said Volker Scheid, an anthropologist at the University of Westminster in London. "So this causes a conflict."

The conundrum was on display Friday at a hastily called news conference hosted by the academy's Institute of Chinese Materia Medica, where Dr. Tu worked.

Chinese reporters had been badgering the institute for days for information on Dr. Tu. Finally, late Thursday night, officials announced the briefing.

For an hour, Chinese journalists asked two officials from the institute for any sort of information on Dr. Tu: what was she like (blunt and hard-working), how many were on her team (50), why was she asked to head the project (no one could say). Mostly, they asked what she had done in the 40 years since her discovery. After a bit of shuffling and grimacing, the answer: She had tried to find other herbs but had not succeeded.

In a nearby clinic attached to the academy, doctors say they know why. Chinese medicine almost never uses individual plants or minerals. Instead, it relies on diagnoses based solely on the doctor's questions, observations and the skillful taking of the pulse.

One senior practitioner is Hu Xin, 61, who began learning herbal medicine 50 years ago from his father. He later went to university, earning advanced degrees, but said that any good herbalist has to study the classics, some of which date back 2,000 years. Sitting in his small consultation room at the end of a long morning, Dr. Hu had just treated 14 patients with serious ailments like intestinal inflammation, ovarian cysts, menstrual cramps and chronic bronchitis.

But despite the successes that he and his patients report, he worried about the attacks on Chinese medicine. Now, he said excitedly, the Nobel Prize would help keep critics at bay.

"In the future, how can people say that Chinese medicine isn't scientific?" Dr. Hu said. "You can't deny that it's based on Chinese medical texts and clinical experience."