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Babies born to healthy mums worldwide are strikingly similar in size

Poor nutrition and health, not race or ethnicity, cause most of the current wide disparities in fetal growth and newborn size

Babies' growth in the womb and their size at birth, especially their length, are strikingly similar the world over – when babies are born to healthy, well-educated and well-nourished mothers.

That's the finding of a landmark international study, INTERGROWTH-21st, led by Oxford University researchers, which involved almost 60,000 pregnancies in eight defined urban areas in Brazil, China, India, Italy, Kenya, Oman, the UK and USA.

Worldwide there are wide disparities in the average size of babies at birth. This has significant consequences for future health, as small for gestational age babies who are already undernourished at birth often face severe short- and long-term health consequences.

It has previously been suggested that 'race' and 'ethnicity' are largely responsible for differences in the size of babies born in different populations and countries.

These new results show that race and ethnicity are not the primary factors.

What matters more is the educational, health and nutritional status of the mothers, and care provided during pregnancy.

The researchers carried out ultrasound scans from early pregnancy to delivery to measure babies' bone growth in the womb, using identical methods in all countries and the same ultrasound machines provided by Philips Healthcare.

They also measured the length and head circumference of all babies at birth.

They have demonstrated that if mothers' educational, health and nutritional status and care during pregnancy are equally good, babies will have equal chances of healthy growth in the womb and future good health.

The researchers report their findings in The Lancet, Diabetes & Endocrinology.

They were funded by the Bill & Melinda Gates Foundation.

'Currently we are not all equal at birth. But we can be,' said the lead author Professor Jose Villar of the Nuffield Department of Obstetrics & Gynaecology, University of Oxford.

'We can create a similar start for all by making sure mothers are well educated and nourished, by treating infection and by providing adequate antenatal care.

'Don't tell us nothing can be done. Don't say that women in some parts of the world have small children because they are predestined to do so. It's simply not true.'

Key points

The study involved almost 60,000 pregnancies in eight defined urban areas in Brazil, China, India, Italy, Kenya, Oman, the UK and USA.

Babies' bone growth in the womb and their length and head circumference at birth are strikingly similar the world over – when babies are born to educated, healthy and well-nourished mothers.

Overall, no more than 4% of the total difference in fetal growth and birth size could be attributed to differences between the eight populations in the study.

Improving the education, health and nutrition of mothers everywhere will boost the health of their babies throughout life within the next generation.

Results are in complete agreement with the previous WHO study using the same methodology from birth to 5 years of age.

In 2010, an estimated 32.4 million babies were born already undernourished in low- and middle-income countries, which represents 27% of all live births globally.

This is closely associated with illness and death in infancy and childhood. Small size at birth has an impact on adult health too, with increased risks of diabetes, high blood pressure and cardiovascular disease.

Smaller babies also result in substantial costs for health services and a significant economic burden on societies as a whole.

Part of the problem in starting to improve pregnancy outcomes is that fetal growth and newborn size are currently evaluated in clinics around the world using at least 100 different growth charts.

In other words, there are no international standards at present for the fetus and newborn, while such standards do exist for infants and children.

'This is very confusing for doctors and mothers and makes no biological sense. How can a fetus or a newborn be judged small in one clinic or hospital and treated accordingly, only for the mother to go to another city or country, and be told that her baby is growing normally,' said Professor Stephen Kennedy, University of Oxford, one of the senior authors of the paper.

The final aim of the INTERGROWTH-21st study is to construct international standards describing optimal growth of a baby in the womb and as a newborn – standards to reflect how a baby should grow when mothers have adequate health, nutrition and socioeconomic status.

The researchers adopted the same approach taken by the WHO's Multicentre Growth Reference Study of healthy infants and children, which established international growth standards from birth to 5 years of age that are now used in more than 140 countries worldwide.

The INTERGROWTH-21st results fit perfectly with the existing WHO standards for infants.

The mean length at birth of the newborns in the INTERGROWTH-21st study was 49.4 ± 1.9 cm, compared with 49.5 ±1.9 cm in the WHO infant study.

From now on international standards can be used worldwide to make judgements on growth and size from conception to 5 years.

'Just think, if your cholesterol or your blood pressure are high, they are high regardless of where you live. Why should the same not apply to growth?' said Professor Villar.

Professor Ruyan Pang, from Peking University, China, one of the study's lead investigators, said: 'The INTERGROWTH-21st results fit perfectly with the existing WHO Infant and Child Growth Standards. Having international standards of optimal growth from conception to 5 years of age that everyone in the world can use means it will now be possible to evaluate improvements in health and nutrition using the same yardstick.'

Professor Zulfiqar Bhutta, from The Aga Khan University, Karachi, Pakistan and the Hospital for Sick Children, Toronto, Canada, who is the Chair of the Steering Committee of this global research team, says: 'The fact that when mothers are in good health, babies grow in the womb in very similar ways the world over is a tremendously positive message of hope for all women and their families. But there is a challenge as well. There are implications in terms of the way we think about public health: This is about the health and life chances of future citizens everywhere on the planet. All those who are responsible for health care will have to think about providing the best possible maternal and child health.'

The paper 'The likeness of fetal growth and newborn size across non-isolated populations in the INTERGROWTH-21st Project' is to be published in The Lancet Diabetes & Endocrinology with an embargo of 00:01 UK time on Monday 7 July 2014 / 19:01 US Eastern time on Sunday 6 July 2014.

The study was funded by the Bill & Melinda Gates Foundation.

A number of factors can lead to small babies, such as mothers' poor nutrition and health over a long period, infections, complications during pregnancy, smoking, alcohol, physically demanding work during pregnancy and the baby's premature birth.

Overnutrition is also becoming a problem because of rising rates of obesity that result in more large babies being born.

The scale of the project is unprecedented in this area. It involved the recruitment of almost 60,000 women, the standardisation of clinical practice of 300 health professionals across eight study sites, the careful monitoring of equipment and data to ensure accuracy, and a team of over 200 researchers and clinicians.

As well as the lead authors from Oxford University, the international research team included members from Peking University in China, the Universidade Católica de Pelotas in Brazil, the Aga Khan University in Kenya, the Ministry of Health in Oman, the Università degli Studi di Torino in Italy, the University of Washington School of Medicine and the Swedish Medical Centre, Seattle in the USA, and the Ketkar Hospital in Nagpur, India.

http://bit.ly/1mnDv4A

The Largest Extinction in Earth's History May Have Been Caused by Microbes

A new theory proposes methane-spurting single-celled organisms were behind the Permian extinctions

Jun 17, 2014 |By Carrie Arnold|

The number of methane-producing single-celled organisms may have exploded because of prehistoric volcanoes.

At the end of the Permian period, about 252 million years ago, animals started dying at ferocious rates. In just 20,000 years 90 percent of all species on the planet had gone extinct. What triggered this die-off? Researchers have been trying to figure that out for decades.

Because the scale of the extinctions was so large, paleobiologists and geochemists started looking for an equally massive disaster as the root cause. Some proposed that an asteroid struck Earth, similar to what ended the reign of the dinosaurs. More recently, they have focused on volcanoes in what is now modern-day Siberia that were highly active at the time. They spewed out large amounts of carbon dioxide and methane, an event documented in the chemical signatures of rocks from Xiakou, China. Scientists think that the surge in these gases warmed the planet and made its oceans more acidic, which, together, ultimately snuffed out most life.

In those same rocks, though, Dan Rothman, a geochemist at the Massachusetts Institute of Technology, saw a discrepancy with the volcano story. The chemical signatures indicated that the concentrations of carbon dioxide and methane kept rising over time. If the gases were the result of volcanic eruptions, one would expect that their levels would rise and then fall back down again. To Rothman and his colleagues, the pattern looked more like a biological factor - not unlike the exponential growth of microbes.

In a study published in April in the Proceedings of the National Academy of Sciences USA, the group names a methane-producing single-celled organism, Methanosarcina, as one of the main culprits behind the Permian extinctions.

The new hypothesis does not disregard the influence of the volcanoes. Instead the M.I.T. researchers think that the vast quantities of nickel deposited by the eruptions allowed Methanosarcina to flourish. The microbe, which had acquired the ability to produce methane right around the time of the extinctions, is dependent on nickel to metabolize organic material into the gas. As ocean currents carried the nickel around the globe, the sudden influx allowed Methanosarcina numbers to skyrocket. That release of large amounts of methane caused temperatures and ocean acidification to increase, and oxygen levels plummeted as O2 was used in the

natural conversion of methane to carbon dioxide. Species began to die off. Then Methanosarcina dined on the decomposition and released more methane, triggering a positive feedback loop.

The findings suggest that microbial evolution has important consequences for the evolution of the environment as a whole, Rothman says: “Microbes run this world. We just live in it.”

Some scientists are skeptical that a single microbe played such a big role in the Permian extinctions. Pennsylvania State University geochemist Lee Kump says that Rothman and his colleagues have not proved for certain that this is what happened because they studied only one group of rocks from southern China. “If this phenomenon led to these extinctions, then you would expect to see this in rocks around the world,” he says. “It's something the researchers still need to look for.”

http://www.eurekalert.org/pub_releases/2014-07/wuis-don070214.php

Discovery of Neandertal trait in ancient skull raises new questions about human evolution

Modern humans emerged from a complex 'labyrinth of biology and peoples,' findings suggest

Re-examination of a circa 100,000-year-old archaic early human skull found 35 years ago in Northern China has revealed the surprising presence of an inner-ear formation long thought to occur only in Neandertals.

"The discovery places into question a whole suite of scenarios of later Pleistocene human population dispersals and interconnections based on tracing isolated anatomical or genetic features in fragmentary fossils," said study co-author Erik Trinkaus, PhD, a physical anthropology professor at Washington University in St. Louis. "It suggests, instead, that the later phases of human evolution were more of a labyrinth of biology and peoples than simple lines on maps would suggest."

The study, forthcoming in the Proceedings of the National Academy of Sciences, is based on recent micro-CT scans revealing the interior configuration of a temporal bone in a fossilized human skull found during 1970s excavations at the Xujiayao site in China's Nihewan Basin.

Trinkaus, the Mary Tileston Hemenway Professor in Arts & Sciences, is a leading authority on early human evolution and among the first to offer compelling evidence for interbreeding and gene transfer between Neandertals and modern human ancestors. His co-authors on this study are Xiu-Jie Wu, Wu Liu and Song Xing of the Institute of Vertebrate Paleontology and Paleoanthropology, Beijing, and Isabelle Crevecoeur of PACEA, Université de Bordeaux.

"We were completely surprised," Trinkaus said. "We fully expected the scan to reveal a temporal labyrinth that looked much like a modern human one, but what we saw was clearly typical of a Neandertal. This discovery places into question whether this arrangement of the semicircular canals is truly unique to the Neandertals."

Often well-preserved in mammal skull fossils, the semicircular canals are remnants of a fluid-filled sensing system that helps humans maintain balance when they change their spatial orientations, such as when running, bending over or turning the head from side-to-side.

Since the mid-1990s, when early CT-scan research confirmed its existence, the presence of a particular arrangement of the semicircular canals in the temporal labyrinth has been considered enough to securely identify fossilized skull fragments as being from a Neandertal. This pattern is present in almost all of the known Neandertal labyrinths. It has been widely used as a marker to set them apart from both earlier and modern humans.

The skull at the center of this study, known as Xujiayao 15, was found along with an assortment of other human teeth and bone fragments, all of which seemed to have characteristics typical of an early non-Neandertal form of late archaic humans.

Trinkaus, who has studied Neandertal and early human fossils from around the globe, said this discovery only adds to the rich confusion of theories that attempt to explain human origins, migrations patterns and possible interbreedings.

While it's tempting to use the finding of a Neandertal-shaped labyrinth in an otherwise distinctly "non-Neandertal" sample as evidence of population contact (gene flow) between central and western Eurasian Neandertals and eastern archaic humans in China, Trinkaus and colleagues argue that broader implications of the Xujiayao discovery remain unclear.

"The study of human evolution has always been messy, and these findings just make it all the messier," Trinkaus said. "It shows that human populations in the real world don't act in nice simple patterns.

"Eastern Asia and Western Europe are a long way apart, and these migration patterns took thousands of years to play out," he said. "This study shows that you can't rely on one anatomical feature or one piece of DNA as the basis for sweeping assumptions about the migrations of hominid species from one place to another."

http://www.eurekalert.org/pub_releases/2014-07/nesc-siw070214.php

Scientist identifies world's biggest-ever flying bird

Long slender wings and soaring ability enabled the creature to stay aloft for long distances without flapping its wings

DURHAM, N.C. - Scientists have identified the fossilized remains of an extinct giant bird that could be the biggest flying bird ever found. With an estimated 20-24-foot wingspan, the creature surpassed size estimates based on wing bones from the previous record holder - a long-extinct bird named Argentavis magnificens - and

was twice as big as the Royal Albatross, the largest flying bird today. Scheduled to appear online the week of July 7, 2014, in the journal Proceedings of the National Academy of Sciences, the findings show that the creature was an extremely efficient glider, with long slender wings that helped it stay aloft despite its enormous size.

The new fossil was first unearthed in 1983 near Charleston, South Carolina, when construction workers began excavations for a new terminal at the Charleston International Airport. The specimen was so big they had to dig it out with a backhoe. "The upper wing bone alone was longer than my arm," said author Dan Ksepka of the National Evolutionary Synthesis Center in Durham, North Carolina.

This is an artist's drawing of the new fossil species Pelagornis sandersi, with the bone fragments the workers found shown in white. The strikingly well-preserved specimen consisted of multiple wing and leg bones and a complete skull. **Art by Liz Bradford**

Now in the collections at the Charleston Museum, the strikingly well-preserved specimen consisted of multiple wing and leg bones and a complete skull. Its sheer size and telltale beak allowed Ksepka to identify the find as a previously unknown species of pelagornithid, an extinct group of giant seabirds known for bony tooth-like spikes that lined their upper and lower jaws. Named 'Pelagornis sandersi' in honor of retired Charleston Museum curator Albert Sanders, who led the fossil's excavation, the bird lived 25 to 28 million years ago - after the dinosaurs died out but long before the first humans arrived in the area.

Researchers have no doubt that P. sandersi flew. It's paper-thin hollow bones, stumpy legs and giant wings would have made it at home in the air but awkward on land. But because it exceeded what some mathematical models say is the maximum body size possible for flying birds, what was less clear was how it managed to take off and stay aloft despite its massive size.

To find out, Ksepka fed the fossil data into a computer program designed to predict flight performance given various estimates of mass, wingspan and wing shape. P. sandersi was probably too big to take off simply by flapping its wings and launching itself into the air from a standstill, analyses show. Like Argentavis, whose flight was described by a computer simulation study in 2007, P. sandersi may have gotten off the ground by running downhill into a headwind or taking advantage of air gusts to get aloft, much like a hang glider.

Once it was airborne, Ksepka's simulations suggest that the bird's long, slender wings made it an incredibly efficient glider. By riding on air currents that rise up from the ocean's surface, P. sandersi was able to soar for miles over the open ocean without flapping its wings, occasionally swooping down to the water to feed on soft-bodied prey like squid and eels.

"That's important in the ocean, where food is patchy," said Ksepka, who is now Curator of Science at the Bruce Museum in Greenwich Connecticut.

Researchers hope the find will help shed light on why the family of birds that P. sandersi belonged to eventually died out, and add to our understanding of how the giants of the skies managed to fly.

This work was supported by the National Science Foundation (DEB: 0949899) and by the National Evolutionary Synthesis Center (NSF EF-0905606).

CITATION: Ksepka, D. (2014). "Flight performance of the largest volant bird." PNAS.

http://phys.org/news/2014-07-life-global.html

When life went global

Is a planetary biosphere necessary for the long-term survival of life?

"An origin of life is not the same as an origin of a biosphere - that's an important distinction," says David Grinspoon, a planetary scientist and curator of astrobiology for the Denver Museum of Nature & Science.

To illustrate the concept Grinspoon offers a simple analogy. Say you're starting a camp fire. It's easy to get it to spark up, but you have to tend it first or it may just die out. But then the fire reaches a critical moment when it catches on and becomes self-sustaining. Now you can leave it alone, and go back to drinking beers.

Grinspoon wonders: Did life start out like little sparks that are vulnerable to extinction? And did it, once it transitioned to a global phenomenon, become like a self-sustaining flame?

False Start on Earth's Sisters?

Grinspoon's work focuses on the evolution of climate and atmosphere on Earth-like planets. At a recent conference themed Habitable Worlds Across Time and Space, held at the Space Telescope Science Institute in Baltimore, MD, he discussed the implications of this viewpoint for Earth's nearest neighbors: Venus and Mars.

The three rocky planets formed around the same time, some 4.5 billion years ago. Just like Earth, Venus and Mars may once have been watery worlds. Today they seem dry and barren, but several lines of evidence suggest they both had oceans in their early days.

"Everything we know about them points to an early environment that was hospitable for life," Grinspoon says in an interview with Astrobiology Magazine.

Somehow only Earth held onto its water, and eventually burst out with the self-sustaining fire of life. "Maybe what's rare is not the formation of watery planets, but the persistence of habitable environments over cosmological timescales," he says.

By the end of his talk, titled "Venus and Mars as Failed Biospheres," Grinspoon raises an intriguing question. Is a biosphere necessary for the long-term survival of life?

The Turning Point on Earth

The oldest signs of life on Earth date to about 3.5 billion years ago. But when did our planet transition from having organisms to having a biosphere?

When life went global

Just like Earth, Venus and Mars may once have been watery worlds. Credit: ESA

"It's hard to tell - it's something that hasn't been studied enough," Grinspoon says. "But my guess is that once life has some kind of global influence, then you're transitioning to a biosphere."

To him the shift had likely occurred by 2.3 billion years ago, or around the time photosynthetic microbes began churning out oxygen into Earth's oceans and atmosphere, affecting life's survival everywhere on the planet.

However, life's influence went way beyond its power to shape the Earth's atmosphere. According to recent studies, life has shaped everything from Earth's interior to the diversity of minerals on its surface. As Grinspoon puts it, "Life has got Earth in its clutches in this deep, and not always obvious way."

Just like Earth, Venus and Mars may once have been watery worlds. **ESA**

Birth of a Living World

"Can a planet, in a sense, become alive?" Grinspoon asks. It's not the first time he puts the concept forward. In his 2003 book Lonely Planets, Grinspoon introduced the "Living World" hypothesis, a slight variant the well-known Gaia hypothesis.

In the 1970s, the chemist James Lovelock and the biologist Lynn Margulis developed the idea that our Earth may be like a living organism, a self-regulating entity that employs feedback loops to keep conditions just right for life.

They christened the potentially living planet "Gaia," from the Greek for Mother Earth.

The idea has since been hotly debated, mostly pegged as more philosophical than scientific.

Still, many researchers agree that the concept has helped Earth system science move forward, allowing us to realize that many of Earth's cycles - the water, nitrogen, and carbon cycles; plate tectonics; and the climate - are deeply interconnected, and is modulating and being modulated by life on Earth.

"Gaia may just be a nice metaphor," Grinpsoon says, "but I wonder if it may be fruitful to think of life as something that happens not just on a planet, but as something that happens to a planet."

"You cannot easily separate the living and the non-living parts of Earth," he adds. "Life has made Earth the way it is to a large extent. That's the general meaning of the Gaia hypothesis, and the Living Worlds hypothesis is simply extending the idea to other planets."

Finding Life's Elsewhere

"The idea of an origin of life separated from the birth of a living world has interesting implications for life elsewhere," Grinspoon writes in Lonely Planets. "If self-regulating Gaia is responsible for Earth's life longevity, then we need to find other places where this kind of global organism has evolved, not merely places where the origin of life might once have occurred."

In other words, our search for life should then target places with active geological and meteorological cycles, the potential tell-tales of a vibrant biosphere.

We've now found nearly 2,000 planets orbiting distant stars, and counting. While these worlds may be too far for us to find any direct evidence for life in the near future, researchers are becoming increasingly proficient at making out the composition of their atmosphere.

That ability could perhaps one day allow us to distinguish between "failed biospheres" and potentially living worlds.

In the meantime, a Living World perspective may yield useful insights as we target our search for life closer to home, in our own solar system. Jupiter's icy moon, Europa, seems to have a young and active surface, while Saturn's moon, Titan, is meteorologically well-alive with methane raining down and filling rivers and lakes.

Even our closest neighbor, Venus, long viewed as a hellish world with its extreme heat, crushing pressure, and clouds of sulfuric acid, could potentially host some kind of life, if vigorous cycles are any indicators of a healthy biosphere, as Grinspoon argued in his 1997 book, Venus Revealed.

For Mars it would be a different story, with its stale atmosphere of carbon dioxide and its rusty, quiet surface.

"From a living worlds perspective, the new wave of interest in life on Mars is highly questionable," Grinspoon wrote in Lonely Planets.

But even if Mars seems dead now, it may not be the end of it for the Red Planet. By 2030, the mission "Mars One" will aim to establish the first human settlement.

In the end, the "fire" which started on Earth 3.5 billion years ago could soon leap and catch on elsewhere.

http://www.eurekalert.org/pub_releases/2014-07/uos-tod070314.php

Time of day crucial to accurately test for diseases, new research finds

A new study published today in the journal PNAS (Proceedings of the National Academy of Sciences), has found that time of day and sleep deprivation have a significant effect on our metabolism.

The finding could be crucial when looking at the best time of day to test for diseases such as cancer and heart disease, and for administering medicines effectively. Researchers from the University of Surrey and The Institute of Cancer Research, London, investigated the links between sleep deprivation, body clock disruption and metabolism, and discovered a clear variation in metabolism according to the time of day.

Healthy male volunteers were put in an environment where light, sleep, meals and posture were controlled. Researchers collected blood samples every two hours to show how metabolic biomarkers change during the day. For the first 24 hours, the participants experienced a normal wake/sleep cycle. This was followed by 24 hours of wakefulness, to investigate the effect of sleep deprivation on metabolic rhythms. The results showed that metabolic processes are significantly increased during sleep deprivation. 27 metabolites, including serotonin, were found at higher levels in periods of sleep deprivation compared to levels during sleep.

Lead author Professor Debra Skene from the University of Surrey, said: "Our results show that if we want to develop a diagnostic test for a disease, it is imperative to take the time of day when taking blood samples into account, since this has a significant effect on metabolism. This is also key for administering medicines and determining when they will be at their most effective. Of course, this will have to be considered on a case-by-case basis, since many people such as shift workers will have a different sleep/wake cycle and timings will need to be adapted to their body clocks."

Co-Senior author, Dr Florence Raynaud, a group leader at The Institute of Cancer Research, London, said: "The study made accurate measurements of a large number of metabolites as they varied by time of day and under different sleep patterns. Our findings are likely to be important in interpreting the results of blood tests, and in understanding why some individuals respond differently to medication. They also set reference points for future studies looking at the connection between metabolic processes and diseases such as cancer."

The research was funded by a grant from the BBSRC awarded to a large team of researchers, and was conducted at the University of Surrey's Faculty of Health and Medical Sciences and at The Institute of Cancer Research, London.

http://www.eurekalert.org/pub_releases/2014-07/kcl-sst070714.php

Significant step towards blood test for Alzheimer's

Scientists have identified a set of 10 proteins in the blood which can predict the onset of Alzheimer's, marking a significant step towards developing a blood test for the disease

Scientists have identified a set of 10 proteins in the blood which can predict the onset of Alzheimer's, marking a significant step towards developing a blood test for the disease. The study, led by King's College London and UK proteomics company, Proteome Sciences plc, analysed over 1,000 individuals and is the largest of its kind to date.

There are currently no effective long-lasting drug treatments for Alzheimer's, and it is believed that many new clinical trials fail because drugs are given too late in the disease process. A blood test could be used to identify patients in the early stages of memory loss for clinical trials to find drugs to halt the progression of the disease.

The study, published today in Alzheimer's & Dementia: The Journal of the Alzheimer's Association, is the result of an international collaboration led by King's College London and Proteome Sciences plc, funded by Alzheimer's Research UK, the UK Medical Research Council, the National Institute for Health Research (NIHR) Maudsley Biomedical Research Centre and Proteome Sciences.

The researchers used data from three international studies. Blood samples from a total of 1,148 individuals (476 with Alzheimer's disease; 220 with 'Mild Cognitive Impairment' (MCI) and 452 elderly controls without dementia) were analysed for 26 proteins previously shown to be associated with Alzheimer's disease. A sub-group of 476 individuals across all three groups also had an MRI brain scan. Researchers identified 16 of these 26 proteins to be strongly associated with brain shrinkage in either MCI or Alzheimer's. They then ran a second series of tests to establish which of these proteins could predict the progression from MCI to Alzheimer's. They identified a combination of 10 proteins capable of predicting whether individuals with MCI would develop Alzheimer's disease within a year, with an accuracy of 87 percent.

Dr Abdul Hye, lead author of the study from the Institute of Psychiatry at King's College London, said: "Memory problems are very common, but the challenge is identifying who is likely to develop dementia. There are thousands of proteins in the blood, and this study is the culmination of many years' work identifying which ones are clinically relevant. We now have a set of 10 proteins that can predict whether someone with early symptoms of memory loss, or mild cognitive impairment, will develop Alzheimer's disease within a year, with a high level of accuracy."

Professor Simon Lovestone, senior author of the study from the University of Oxford, who led the work whilst at King's, said: "Alzheimer's begins to affect the brain many years before patients are diagnosed with the disease. Many of our drug trials fail because by the time patients are given the drugs, the brain has already been too severely affected. A simple blood test could help us identify patients at a much earlier stage to take part in new trials and hopefully develop treatments which could prevent the progression of the disease. The next step will be to validate our findings in further sample sets, to see if we can improve accuracy and reduce the risk of misdiagnosis, and to develop a reliable test suitable to be used by doctors."

Dr Eric Karran, Director of Research at Alzheimer's Research UK, the UK's leading dementia research charity, said: "As the onset of Alzheimer's is often slow and subtle, a blood test to identify those at high risk of the disease at an early stage would be of real value. Detecting the first signs of Alzheimer's could improve clinical trials for new treatments and help those already concerned about their memory, but we're not currently in a position to use such a test to screen the general population.

"With an ageing population, and age the biggest risk factor for Alzheimer's, we are expecting rising numbers of people to be affected over the coming years. It's important to develop new ways to intervene early in the disease to help people maintain their quality of life for as long as possible."

Dr Ian Pike, co-author of the paper from Proteome Sciences, said: "By linking the best British academic and commercial research, this landmark study in Alzheimer's disease is a major advance in the development of a simple blood test to identify the disease before clinical symptoms appear. This is the window that will offer the best chance of successful treatment. Equally important, a blood test will be considerably easier and less expensive than using brain imaging or cerebrospinal spinal fluid.

"We are in the process of selecting commercial partners to combine the protein biomarkers in a blood test for the global market, a key step forward to deliver effective and early treatment for this crippling disease."

Alzheimer's disease is the most common form of dementia. Globally, it is estimated that 135 million people will have dementia by 2050. In 2010, the annual global cost of dementia was estimated at $604 billion. MCI includes problems with day-to-day memory, language and attention, and can be an early sign of dementia, or a symptom of stress or anxiety. Approximately 10% of people diagnosed with MCI develop dementia within a year but apart from regular assessments to measure memory decline, there is currently no accurate way of predicting who will, or won't, develop dementia.

Previous studies have also shown that PET brain scans and plasma in lumbar fluid can be used to predict the onset of dementia from MCI. However, PET imaging is highly expensive and lumbar punctures invasive.

Paper reference: Hye, A. et al. 'Plasma proteins predict conversion to dementia from prodromal disease' published in Alzheimer's and Dementia

Figures from: http://www.alz.co.uk/research/G8-policy-brief

http://www.eurekalert.org/pub_releases/2014-07/asu-pma070814.php

Planet Mercury a result of early hit-and-run collisions

Planet Mercury's unusual metal-rich composition has been a longstanding puzzle in planetary science.

TEMPE, Ariz. - According to a study published online in Nature Geoscience July 6, Mercury and other unusually metal-rich objects in the solar system may be relics left behind by collisions in the early solar system that built the other planets.

The origin of planet Mercury has been a difficult question in planetary science because its composition is very different from that of the other terrestrial planets and the moon. This small, innermost planet has more than twice the fraction of metallic iron of any other terrestrial planet. Its iron core makes up about 65 percent of Mercury's total mass; Earth's core, by comparison, is just 32 percent of its mass.

How do we get Venus, Earth and Mars to be mostly "chondritic" (having a more-or-less Earth-like bulk composition) while Mercury is such an anomaly? For Arizona State University professor Erik Asphaug, understanding how such a planet accumulated from the dust, ice and gas in the early solar nebula is a key science question.

There have been a number of failed hypotheses for Mercury's formation. None of them until now has been able to explain how Mercury lost its mantle while retaining significant levels of volatiles (easily vaporized elements or compounds, such as water, lead and sulfur). Mercury has substantially more volatiles than the moon does, leading scientists to think its formation could have had nothing to do with a giant impact ripping off the mantle, which has been a common popular explanation.

To explain the mystery of Mercury's metal-rich composition, ASU's Asphaug and Andreas Reufer of the University of Bern have developed a new hypothesis involving hit-and-run collisions, where proto-Mercury loses half its mantle in a grazing blow into a larger planet (proto-Venus or proto-Earth). One or more hit-and-run collisions could have potentially stripped away proto-Mercury's mantle without an intense shock, leaving behind a mostly-iron body and satisfying a number of the major puzzles of planetary formation – including the retention of volatiles – in a process that can also explain the absence of shock features in many of the mantle-stripped meteorites.

Asphaug and Reufer have developed a statistical scenario for how planets merge and grow based on the common notion that Mars and Mercury are the last two relics of an original population of maybe 20 bodies that mostly accreted to form Venus and Earth. These last two planets lucked out.

"How did they luck out? Mars, by missing out on most of the action – not colliding into any larger body since its formation – and Mercury, by hitting the larger planets in a glancing blow each time, failing to accrete," explains Asphaug, who is a professor in ASU's School of Earth and Space Exploration. "It's like landing heads two or three times in a row - lucky, but not crazy lucky. In fact, about one in 10 lucky."

By and large, dynamical modelers have rejected the notion that hit-and-run survivors can be important because they will eventually be accreted by the same larger body they originally ran into. Their argument is that it is very unlikely for a hit-and-run relic to survive this final accretion onto the target body.

"The surprising result we have shown is that hit-and-run relics not only can exist in rare cases, but that survivors of repeated hit-and-run incidents can dominate the surviving population. That is, the average unaccreted body will have been subject to more than one hit-and-run collision," explains Asphaug. "We propose one or two of these hit-and-run collisions can explain Mercury's massive metallic core and very thin rocky mantle."

According to Reufer, who performed the computer modeling for the study, "Giant collisions put the final touches on our planets. Only recently have we started to understand how profound and deep those final touches can be.

"The implication of the dynamical scenario explains, at long last, where the 'missing mantle' of Mercury is – it's on Venus or the Earth, the hit-and-run targets that won the sweep-up," says Asphaug.

Disrupted formation

The duo's modelling has revealed a fundamental problem with an idea implicit to modern theories of planet formation: that protoplanets grow efficiently into ever larger bodies, merging whenever they collide.

Instead, disruption occurs even while the protoplanets are growing.

"Protoplanets do merge and grow, overall, because otherwise there would not be planets," says Asphaug. "But planet formation is actually a very messy, very lossy process, and when you take that into account, it's not at all surprising that the 'scraps,' like Mercury and Mars, and the asteroids are so diverse."

These simulations are of great relevance to meteoritics, which, just like Mercury's missing mantle, faces questions like: Where's all the stripped mantle rock that got removed from these early core-forming planetesimals? Where are the olivine meteorites that correspond to the dozens or hundreds of iron meteorite parent bodies?

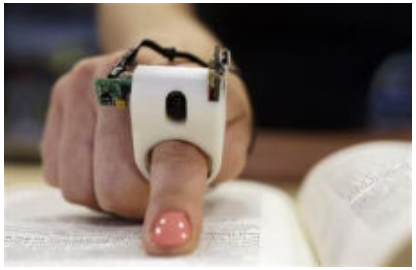
"It's not missing – it's inside the mantles of the planets, ultimately," explains Asphaug. "It got gobbled up by the larger growing planetary bodies in every hit-and-run series of encounters."

http://phys.org/news/2014-07-mit-finger-device-real.html

MIT finger device reads to the blind in real time

Scientists at the Massachusetts Institute of Technology are developing an audio reading device to be worn on the index finger of people whose vision is impaired, giving them affordable and immediate access to printed words.

The so-called FingerReader, a prototype produced by a 3-D printer, fits like a ring on the user's finger, equipped with a small camera that scans text. A synthesized voice reads words aloud, quickly translating books, restaurant menus and other needed materials for daily living, especially away from home or office.



In this Thursday, June 26, 2014 photo, a model wears a FingerReader ring at the Massachusetts Institute of Technology's Media Lab in Cambridge, Mass. Researchers designed and developed the instrument, which enables people with visual disabilities to read text printed on paper or electronic devices. **Stephan Savoia**

Reading is as easy as pointing the finger at text. Special software tracks the finger movement, identifies words and processes the information.

The device has vibration motors that alert readers when they stray from the script, said Roy Shilkrot, who is developing the device at the MIT Media Lab.

For Jerry Berrier, 62, who was born blind, the promise of the FingerReader is its portability and offer of real-time functionality at school, a doctor's office and restaurants.

"When I go to the doctor's office, there may be forms that I wanna read before I sign them," Berrier said.

He said there are other optical character recognition devices on the market for those with vision impairments, but none that he knows of that will read in real time.

Berrier manages training and evaluation for a federal program that distributes technology to low-income people in Massachusetts and Rhode Island who have lost their sight and hearing.

He works from the Perkins School for the Blind in Watertown, Massachusetts.

"Everywhere we go, for folks who are sighted, there are things that inform us about the products that we are about to interact with. I wanna be able to interact with those same products, regardless of how I have to do it," Berrier said.

Pattie Maes, an MIT professor who founded and leads the Fluid Interfaces research group developing the prototype, says the FingerReader is like "reading with the tip of your finger and it's a lot more flexible, a lot more immediate than any solution that they have right now."

Developing the gadget has taken three years of software coding, experimenting with various designs and working on feedback from a test group of visually impaired people. Much work remains before it is ready for the market, Shilkrot said, including making it work on cellphones.

Shilkrot said developers believe they will be able to affordably market the FingerReader but he could not yet estimate a price. The potential market includes some of the 11.2 million people in the United States with vision impairment, according to U.S. Census Bureau estimates.

Current technology used in homes and offices offers cumbersome scanners that must process the desired script before it can be read aloud by character-recognition software installed on a computer or smartphone, Shilkrot said.

The FingerReader would not replace Braille - the system of raised dots that form words, interpreted by touch. Instead, Shilkrot said, the new device would enable users to access a vast number of books and other materials that are not currently available in Braille.

Developers had to overcome unusual challenges to help people with visual impairments move their reading fingers along a straight line of printed text that they could not see. Users also had to be alerted at the beginning and end of the reading material.

Their solutions? Audio cues in the software that processes information from the FingerReader and vibration motors in the ring. The FingerReader can read papers, books, magazines, newspapers, computer screens and other devices, but it has problems with text on a touch screen, said Shilkrot.

That's because touching the screen with the tip of the finger would move text around, producing unintended results. Disabling the touch-screen function eliminates the problem, he said.

Berrier said affordable pricing could make the FingerReader a key tool to help people with vision impairment integrate into the modern information economy. "Any tool that we can get that gives us better access to printed material helps us to live fuller, richer, more productive lives, Berrier said.

http://www.eurekalert.org/pub_releases/2014-07/cums-ssl070814.php

Study shows link between inflammation in maternal blood and schizophrenia in offspring

Maternal inflammation appears to be associated with greater risk for schizophrenia in offspring

Maternal inflammation as indicated by the presence in maternal blood of early gestational C-reactive protein - an established inflammatory biomarker - appears to be associated with greater risk for schizophrenia in offspring, according to researchers at Columbia University's Mailman School of Public Health, Columbia University Medical Center, and the New York State Psychiatric Institute. The study, "Elevated Maternal C-Reactive Protein and Increased Risk of Schizophrenia in a National Birth Cohort," is published online in the American Journal of Psychiatry.

The Columbia researchers with colleagues in Finland conducted an analysis of data from the Finnish Prenatal Study of Schizophrenia, a large, national birth cohort with an extensive bio-bank. They tested for the presence of C-reactive protein in the maternal blood of 777 offspring with schizophrenia and compared the findings with those from 777 control subjects. Maternal C-reactive protein levels were assessed from archived maternal serum specimens.

They found that increasing maternal C-reactive protein levels were significantly associated with development of schizophrenia in offspring and remained significant after adjusting for potential confounders such as parental history of psychiatric disorders, twin/singleton birth, location of birth, and maternal socioeconomic status. For every 1 mg/L increase in maternal C-reactive protein, the risk of schizophrenia increased by 28%.

"This is the first time that this association has been demonstrated, indicating that an infection or increased inflammation during pregnancy could increase the risk of schizophrenia in the offspring," said Alan Brown, MD, MPH, professor of Epidemiology and Psychiatry and senior author. "Inflammation has been shown to alter brain development in previous studies, and schizophrenia is a neurodevelopmental disorder. Thus, this study provides an important link between inflammation and schizophrenia and may help us to better understand the biological mechanisms that lead to this disorder. To the extent that the increased inflammation is due to infection, this work may suggest that approaches aimed at preventing infection may have the potential to reduce risk of schizophrenia." There are many other known causes of inflammation, including tissue injury and autoimmune disease, although the researchers did not examine these specific conditions in this study.

The study was supported by grants R01 MH-082052-05 and K02 MH-065422-09 from NIMH and the State Research Institute and grant T32 MH-16434-31 from NIMH and the Sackler Institute Fellowship.

http://www.eurekalert.org/pub_releases/2014-07/ci-car070814.php

Cosmic accounting reveals missing light crisis

Something is amiss in the Universe. There appears to be an enormous deficit of ultraviolet light in the cosmic budget.

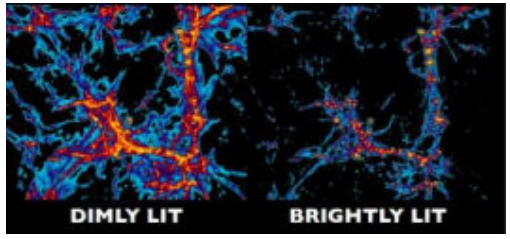
Pasadena, CA- The vast reaches of empty space between galaxies are bridged by tendrils of hydrogen and helium, which can be used as a precise "light meter." In a recent study published in The Astrophysical Journal Letters, a team of scientists finds that the light from known populations of galaxies and quasars is not nearly enough to explain observations of intergalactic hydrogen. The difference is a stunning 400 percent.

"It's as if you're in a big, brightly-lit room, but you look around and see only a few 40-watt lightbulbs," noted Carnegie's Juna Kollmeier, lead author of the study. "Where is all that light coming from? It's missing from our census."

Strangely, this mismatch only appears in the nearby, relatively well-studied cosmos. When telescopes focus on galaxies billions of light years away (and therefore are viewing the universe billions of years in its past), everything seems to add up. The fact that this accounting works in the early universe but falls apart locally has scientists puzzled.

The light in question consists of highly energetic ultraviolet photons that are able to convert electrically neutral hydrogen atoms into electrically charged ions. The two known sources for such ionizing photons are quasars - powered by hot gas falling onto supermassive black holes over a million times the mass of the sun - and the hottest young stars.

Observations indicate that the ionizing photons from young stars are almost always absorbed by gas in their host galaxy, so they never escape to affect intergalactic hydrogen. But the number of known quasars is far lower than needed to produce the required light.



Computer simulations of intergalactic hydrogen in a "dimly lit" universe (left) and a "brightly lit" universe (right) that has five times more of the energetic photons that destroy neutral hydrogen atoms. Hubble Space Telescope observations of hydrogen absorption match the picture on the right, but using only the known astronomical sources of ultraviolet light produces the much thicker structures on the left, and a severe mismatch with the observations. **Ben Oppenheimer and Juna Kollmeier**

"Either our accounting of the light from galaxies and quasars is very far off, or there's some other major source of ionizing photons that we've never recognized," Kollmeier said. "We are calling this missing light the photon underproduction crisis. But it's the astronomers who are in crisis - somehow or other, the universe is getting along just fine."

The mismatch emerged from comparing supercomputer simulations of intergalactic gas to the most recent analysis of observations from Hubble Space Telescope's Cosmic Origins Spectrograph. "The simulations fit the data beautifully in the early universe, and they fit the local data beautifully if we're allowed to assume that this extra light is really there," explained Ben Oppenheimer a co-author from the University of Colorado. "It's possible the simulations do not reflect reality, which by itself would be a surprise, because intergalactic hydrogen is the component of the Universe that we think we understand the best."

"The most exciting possibility is that the missing photons are coming from some exotic new source, not galaxies or quasars at all," said Neal Katz a co-author from the University of Massachusetts at Amherst.

For example, the mysterious dark matter, which holds galaxies together but has never been seen directly, could itself decay and ultimately be responsible for this extra light. "You know it's a crisis when you start seriously talking about decaying dark matter!" Katz remarked.

"The great thing about a 400% discrepancy is that you know something is really wrong," commented co-author David Weinberg of The Ohio State University. "We still don't know for sure what it is, but at least one thing we thought we knew about the present day universe isn't true." Whether the explanation is exotic or not, astronomers will be working hard to shed light on the mystery.

Other co-authors on the study are Francesco Haardt of the Università dell'Insubria, Romeel Davé of the University of the Western Cape, Mark Fardal of University of Massachusetts Amherst, Piero Madau of University of California Santa Cruz, Charles Danforth of the University of Colorado, Amanda Ford of University of Arizona, Molly Peeples of the Space Telescope Science Institute, and Joseph McEwen of The Ohio State University.

This work was supported by the NSF, NASA, and the Ahmanson Foundation.

http://www.eurekalert.org/pub_releases/2014-07/rb-ssf070814.php

Sandalwood scent facilitates wound healing and skin regeneration

Olfactory receptors in the skin detected

Skin cells possess an olfactory receptor for sandalwood scent, as researchers at the Ruhr-Universität Bochum have discovered. Their data indicate that the cell proliferation increases and wound healing improves if those receptors are activated. This mechanism constitutes a possible starting point for new drugs and cosmetics. The team headed by Dr Daniela Busse and Prof Dr Dr Dr med habil Hanns Hatt

from the Department for Cellphysiology published their report in the "Journal of Investigative Dermatology".

The nose is not the only place where olfactory receptors occur

Humans have approximately 350 different types of olfactory receptors in the nose. The function of those receptors has also been shown to exist in, for example spermatozoa, the prostate, the intestine and the kidneys. The team from Bochum has now discovered them in keratinocytes – cells that form the outermost layer of the skin.

Experiments with cultures of human skin cells

The RUB researchers studied the olfactory receptor that occurs in the skin, namely OR2AT4, and discovered that it is activated by a synthetic sandalwood scent, so-called Sandalore. Sandalwood aroma is frequently used in incense sticks and is a popular component in perfumes. The activated OR2AT4 receptor triggers a calcium-dependent signal pathway. That pathway ensures an increased proliferation and a quicker migration of skin cells – processes which typically facilitate wound healing. In collaboration with the Dermatology Department at the University of Münster, the cell physiologists from Bochum demonstrated that effect in skin cell cultures and skin explants.

Additional olfactory receptors in skin detected

In addition to OR2AT4, the RUB scientists have also found a variety of other olfactory receptors in the skin, the function of which they are planning to characterise more precisely. "The results so far show that they possess therapeutic and cosmetic potential," says Prof Hanns Hatt. "Still, we mustn't forget that concentrated fragrances should be handled with care, until we have ascertained which functions the different types of olfactory receptors in skin cells have."

Daniela Busse et al. (2014): A synthetic sandalwood odorant induces wound healing processes in human keratinocytes via the olfactory receptor OR2AT4, Journal of Investigative Dermatology, DOI: 10.1038/JID.2014.273

http://bit.ly/1oONjUR

Human Skin Can 'Sniff' Odors

Human skin contains olfactory receptors capable of detecting odor.

Jul 7, 2014 12:00 PM ET // by Jennifer Viegas

Human skin can smell itself as well as other odors, according to a new study that also determined a common and pleasant-smelling odor promotes skin healing.

The paper, published in the latest issue of the Journal of Investigative Dermatology, strengthens prior research that found olfactory receptors - proteins specialized to detect odors - don't just exist in the nose.

"Only a tiny little amount of odorants are used by our receptors in the nose," chemist Peter Schieberle of the Technical University of Munich told Discovery Schieberle and his team discovered that the human heart, blood and lungs all possess olfactory receptors. Yet another research group, led by Ester Feldmesser of the Weizmann Institute of Science, theorized that these odor-detecting sensors could be all over, and in, the body.

Now, with the new study, Daniela Busse and her team provide the first direct evidence that such cells exist within the epidermis, which is the skin's outermost layer.

Busse, a researcher in the Department of Cellphysiology at Germany's Ruhr-University Bochum, and her team not only identified five different types of olfactory receptors in human skin keratinocytes (the predominant type of cell in the epidermis), but they also cloned one of them, called OR2AT4.

The scientists next exposed the target smeller cells to the compound Sandalore, which is a synthetic sandalwood odorant. Busse and her team focused on sandalwood because, for at least 4,000 years, oil from the East Asian sandalwood tree has been prized both as a perfume and as a medicinal agent for the skin.

Busse and colleagues explained that they used a synthetic sandalwood odorant because, "In the past years, the development of synthetic sandalwood molecules has led to a series of substitutes that are often used in cosmetics, deodorants and perfumes because the essential sandalwood oil obtained from the East Asian sandalwood tree is quite rare and is therefore an expensive substance."

The researchers found that Sandalore activated the cloned smeller cells in skin, thereby inducing a calcium-signaling cascade that dramatically increased the proliferation and migration of cells. This process is characteristic of wound healing.

Busse and her team are not exactly sure why the synthetic sandalwood appears to be so beneficially potent, but they suspect that it somehow facilitates interaction between the predominant human skin cells and neurons (nerve cells), also found within skin.

Yet another study released this week, published in the Archives of Biochemistry and Biophysics, found that in lab experiments East Indian sandalwood oil causes pre-cancerous cells in skin to die, leaving behind healthy skin.

Lead author Sally Dickinson of the Arizona Cancer Center at the University of Arizona and her colleagues explained that "sandalwood oils have many well-known health benefits due to their anti-inflammatory and antiseptic properties, among others."

Yet another fan of the woodsy scent is Chandradhar Dwivedi, head of the Department of Pharmaceutical Sciences at South Dakota State University. He has been conducting research on the fragrant oil for years. "This product has been very effective in preventing skin cancer caused by chemicals and by UV radiation,"

Dwivedi said. "It smells nice, and at the same time, it prevents chemically-caused or UV-induced skin cancer."

Tests are ongoing, so no one is yet urging anyone to run out and buy sandalwood-scented products. Nonetheless, the new research demonstrates how sensitive the body and even its skin are to odors, and it opens the door to possible new skin problem treatments with few side effects, so long as the individual does not, in this case, mind smelling like a tree.

Daniela Busse et al. (2014): A synthetic sandalwood odorant induces wound healing processes in human keratinocytes via the olfactory receptor OR2AT4, Journal of Investigative Dermatology, DOI: 10.1038/JID.2014.273

http://bit.ly/1r5rQdI

Mysterious Earthen Rings Predate Amazon Rainforest

A series of square, straight and ringlike ditches scattered throughout the Bolivian and Brazilian Amazon were there before the rainforest existed, a new study finds.

Jul 7, 2014 05:00 PM ET // by Stephanie Pappas, LiveScience

These human-made structures remain a mystery: They may have been used for defense, drainage, or perhaps ceremonial or religious reasons. But the new research addresses another burning question: whether and how much prehistoric people altered the landscape in the Amazon before the arrival of Europeans.

"People have been affecting the global climate system through land use for not just the past 200 to 300 years, but for thousands of years," said study author John Francis Carson, a postdoctoral researcher at the University of Reading in the United Kingdom. (See Images of the Ancient Amazonian Earthworks)

For many years, archaeologists thought that the indigenous people who lived in the Amazon before Christopher Columbus arrived in the Americas in 1492 moved across the area while making barely a dent in the landscape. Since the 1980s, however, deforestation has revealed massive earthworks in the form of ditches up to 16 feet (5 meters) deep, and often just as wide.

These discoveries have caused a controversy between those who believe Amazonians were still mostly gentle on the landscape, altering very little of the rainforest, and those who believe these pre-Columbian people conducted major slash-and-burn operations, which were later swallowed by the forest after the European invasion caused the population to collapse.

Carson and his colleagues wanted to explore the question of whether early Amazonians had a major impact on the forest. They focused on the Amazon of northeastern Bolivia, where they had sediment cores from two lakes nearby major earthworks sites. These sediment cores hold ancient pollen grains and charcoal from long-ago fires, and can hint at the climate and ecosystem that existed when the sediment was laid down as far back as 6,000 years ago.

An examination of the two cores - one from the large lake, Laguna Oricore, and one from the smaller lake, Laguna Granja - revealed a surprise: The very oldest sediments didn't come from a rainforest ecosystem at all. In fact, the Bolivian Amazon before about 2,000 to 3,000 years ago looked more like the savannas of Africa than today's jungle environment.

The question had been whether the early Amazon was highly deforested or barely touched, Carson said. "The surprising thing we found was that it was neither," he told Live Science. "It was this third scenario where, when people first arrived on the landscape, the climate was drier."

The pollen in this time period came mostly from grasses and a few drought-resistant species of trees. After about 2,000 years ago, more and more tree pollen appears in the samples, including fewer drought-resistant species and more evergreens, the researchers report today (July 7) in the journal Proceedings of the National Academy of Sciences. Charcoal levels also went down, indicating a less-fire-prone landscape. These changes were largely driven by an increase in precipitation, Carson said.

The earthworks predate this shift, which reveals that the diggers of these ditches created them before the forest moved in around them. They continued to live in the area as it became forested, probably keeping clear regions around their structures, Carson said. "It kind of makes sense," he said. "It's easier to stomp on a sapling than it is to cut down a big Amazonian tree with a stone ax."

The discovery that the human activity came before the forest answers some questions, like how Amazonian people could have built in the rainforest with no more than stone tools (they didn't have to), how many people would have been necessary to construct the structures (fewer than if clear-cutting had been required), and how the population survived (by growing maize).

The study also has wider implications for the modern day, Carson said. The question of how to preserve the Amazonian rainforest is difficult to answer; some people say humans need to get out, and others believe people and the forest can coexist. Ancient history could provide a guide, as well as a greater understanding of how the forest has recovered from earlier perturbations. (The Amazon also drives climate as well as responds to it, thanks to its ability to take up carbon from the atmosphere.)

The new study suggests that the modern forest is a coproduction between humans and nature, Carson said. Natural cycles drove the rainforest to sprout, but humans stayed on-site for 1,500 years afterward, he said. "It's very likely, in fact, that people had some kind of effect on the composition of the forest," Carson said. "People might favor edible species, growing in orchards and things like that, altered

the soils, changing the soil chemistry and composition, which can have a longer-lasting legacy effect."

Those long-range changes are next for Carson and his colleagues to investigate. "This kind of study has only just started in Amazonia," Carson said.

http://bit.ly/1sK3pA5

Master plan hatched as African Ebola deaths pass 500

The death toll this year from the world's deadliest Ebola outbreak has reached 518, according to figures released today by the World Health Organization, but a plan has finally been devised to halt its spread.

17:54 08 July 2014 by Andy Coghlan

The WHO brought together health ministers from 11 West African countries on 2-3 July in Ghana to thrash out a strategy. A top priority is to counter misinformation. This includes rumours that health workers give patients lethal injections in ambulances, that medics spread the virus deliberately, that witchcraft is to blame and denial that Ebola even exists.

"We need to make sure people know the facts, have the right information to protect themselves and know how to avoid infecting others," says Sophie-Jane Madden of international health charity Médecins sans Frontières.

Spread through contact with infected bodily fluids, the disease has hit Guinea, Liberia and Sierra Leone this year.

Technological approach

The other major focus of the plan is to strengthen health teams and boost resources needed to diagnose cases, treat patients and trace other people they may have infected, a plea echoed this week by leading doctors from Sierra Leone writing in medical journal The Lancet.

They also said mobile phones, ubiquitous in West Africa, should be better used to help track the outbreak and send mass text messages to counter misinformation. Digital maps could be created with satellite images to improve the accuracy of case mapping.

There has even been talk of using IBM's Watson supercomputer to help.

A key focus of the master plan is that, for the first time, there will be cross-border cooperation and coordination between all affected countries.

A regional control centre has also been set up, in Guinea, to coordinate efforts.

"We're pleased the countries have recognised the scale of the problem, and this gives them the opportunity to assess what action to take regionally and how to work together," says Madden.

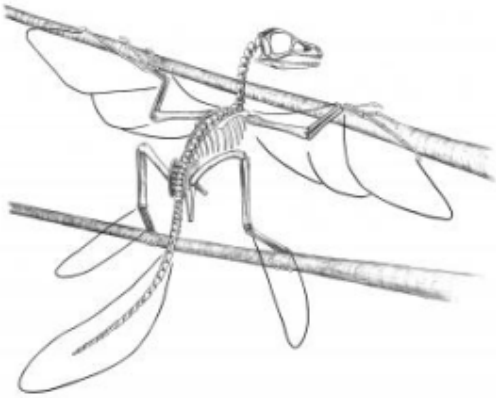
"There hasn't been that level of regional cooperation before, but we now need to see these plans translate into concrete action on the ground."

http://www.eurekalert.org/pub_releases/2014-07/s-rdd070914.php

Researchers declassify dinosaurs as being the great-great-grandparents of birds

Re-examination of birdlike fossil challenges common belief that birds evolved from ground-dwelling dinosaurs

The re-examination of a sparrow-sized fossil from China challenges the commonly held belief that birds evolved from ground-dwelling theropod dinosaurs that gained the ability to fly. The birdlike fossil is actually not a dinosaur, as previously thought, but much rather the remains of a tiny tree-climbing animal that could glide, say American researchers Stephen Czerkas of the Dinosaur Museum in Blanding, Utah, and Alan Feduccia of the University of North Carolina. The study appears in Springer's Journal of Ornithology.



This is a skeletal reconstruction of Scansoriopteryx with outlines to indicate the extent of the feathers. **Stephen A. Czerkas**

The fossil of the Scansoriopteryx (which means "climbing wing") was found in Inner Mongolia, and is part of an ongoing cooperative study with the Chinese Academy of Geological Sciences. It was previously classified as a coelurosaurian theropod dinosaur, from which many experts believe flying dinosaurs and later birds evolved. The research duo used advanced 3D microscopy, high resolution photography and low angle lighting to reveal structures not clearly visible before. These techniques made it possible to interpret the natural contours of the bones. Many ambiguous aspects of the fossil's pelvis, forelimbs, hind limbs, and tail were confirmed, while it was discovered that it had elongated tendons along its tail vertebrae similar to Velociraptor.

Czerkas and Feduccia say that Scansoriopteryx unequivocally lacks the fundamental structural skeletal features to classify it as a dinosaur. They also believe that dinosaurs are not the primitive ancestors of birds. The Scansoriopteryx should rather be seen as an early bird whose ancestors are to be found among tree-climbing archosaurs that lived in a time well before dinosaurs.

Through their investigations, the researchers found a combination of plesiomorphic or ancestral non-dinosaurian traits along with highly derived features. It has numerous unambiguous birdlike features such as elongated forelimbs, wing and hind limb feathers, wing membranes in front of its elbow, half-moon shaped wrist-

like bones, bird-like perching feet, a tail with short anterior vertebrae, and claws that make tree climbing possible. The researchers specifically note the primitive elongated feathers on the forelimbs and hind limbs. This suggests that Scansoriopteryx is a basal or ancestral form of early birds that had mastered the basic aerodynamic maneuvers of parachuting or gliding from trees.

Their findings validate predictions first made in the early 1900's that the ancestors of birds were small, tree-dwelling archosaurs which enhanced their incipient ability to fly with feathers that enabled them to at least glide. This "trees down" view is in contrast with the "ground up" view embraced by many palaeontologists in recent decades that birds derived from terrestrial theropod dinosaurs.

"The identification of Scansoriopteryx as a non-dinosaurian bird enables a reevaluation in the understanding of the relationship between dinosaurs and birds. Scientists finally have the key to unlock the doors that separate dinosaurs from birds," explained Czerkas.

Feduccia added, "Instead of regarding birds as deriving from dinosaurs, Scansoriopteryx reinstates the validity of regarding them as a separate class uniquely avian and non-dinosaurian."

Reference: Czerkas, S.A. & Feduccia, A. (2014). Jurassic archosaur is a non-dinosaurian bird, Journal of Ornithology. DOI 10.1007/s10336-014-1098-9

http://www.eurekalert.org/pub_releases/2014-07/uoc--bls070914.php

Biologists link sexual selection and placenta formation

UC Riverside research shows fish with placentas are smaller and less brightly colored than non-placental fish

RIVERSIDE, Calif. - Sexual selection refers to species' selection for traits that are attractive to the opposite sex. This special type of natural selection enhances opportunities to mate, the tail of male peacocks being an iconic example.

Biologists at the University of California, Riverside have now found that sexual selection and "placentation" - the formation of a placenta - are linked. Describing the life histories of more than 150 species of fish in the family Poeciliidae, the researchers found that species with placentas tend to have males that do not have bright coloration, ornamentation or courtship displays. They tend to be much smaller than the males of species without placentas. They also tend to be very well endowed, enabling males to sneak up on females to mate with them without the formality of courtship.

"It impresses me as being a bit like science fiction to say that male morphology and mating behavior and female preferences will be in any way governed by the female's mode of reproduction," said David Reznick, a distinguished professor of biology, whose lab led the research. "I would have thought that what was going on in the inside of the animal would be largely independent of what is going on on the outside." Study results appear online July 9 in Nature.

All of 150 species Reznick's team described give birth to live young, but some of these species have the equivalent of a mammalian placenta. The researchers discovered that the placenta has evolved multiple times and that species vary considerably in how well their placentas have developed.

This is non-placental species Xiphophorus hellerii. Note the beautiful ventral extension of the tail fin. **Juan Carlos Merino.**

"This diversity is enabling us to address questions about how and why the placenta evolved and to learn something about the consequences of having one," said Bart J. A. Pollux, a former postdoctoral scholar in Reznick's lab, a member of the research team and the lead author on the research paper.

Complex organ

A mammalian organ that forms inside the mother's uterus, the placenta plays a crucial role during pregnancy. It provides oxygen and nutrients to the unborn baby and removes waste products from the baby's blood.

"Evolutionary biologists have been trying to answer how and why complex organs evolve," Reznick said. "They have also been trying to answer how mating strategies and sexual selection evolve. These may seem like unrelated questions, but our research builds a bridge between them."

Like the eye, the placenta is a complex organ. It is the product of a very large number of genes that must all be well integrated before the placenta can function properly, Reznick explained. "The seeming impossibility of this event is the basis of virtually all of the creation science/intelligent design arguments against evolution," he said.

This is placental species *Heterandria formosa*. Note the lack of sexual dichromatism. **Chiara Sciarone**

Conflict management

The new work adds to the growing abundance of evidence about how important parent-offspring conflict - the disagreement between parent and offspring over the nature of the parental investment in the offspring - is in shaping evolution. This conflict generally increases during parental care, with offspring employing all kinds

of strategies to get more from their parents than is in the best interest of the parents to give to them.

"First conceived in 1974, conflict was the product of musings about the coefficient of relatedness between mothers, fathers and offspring," Reznick said. "In the context of our paper, the evolution of the placenta is shaped by conflict, but then its presence creates an ongoing conflict between mother and offspring that has a continuing role in shaping evolution."

An evolutionary theory put to the test

The new work presents for the first time the diversity of modes of reproduction in the Poeciliidae family. Further, it uses this diversity to perform a formal statistical test of an evolutionary theory called the "viviparity driven conflict hypothesis." Reznick explained that a research paper in 2000 originally proposed this hypothesis, arguing that there must be a relationship between how animals reproduce and how important sexual selection is in choosing mates. Specifically, when animals evolve placentas, the paper's authors predicted a shift away from choosing who to mate with towards mating with multiple mates, then choosing which fertilized egg to nourish through to the end of development.

"The question is why this change?" Reznick said. "Females of non-placental species fully provision eggs before they are fertilized. If they are to choose a mate, then the choice must be made on the basis of the mate's appearance or behavior. Females of placental species make most of their investment in offspring after the egg is fertilized. This is also a time when the father's genome is active and contributing to the development of the baby. They thus have the ability to choose fathers on the basis of the performance of the developing baby."

All that glitters (in fish tanks) is non-placental

The Poeciliidae family includes guppies, platys, swordtails, and mollies that are frequently on sale in pet stores. "The reason they are in pet stores is that all of these species are non-placental," Reznick said. "They have males with gaudy colors or elaborate display structures, like the tail of a swordtail or the enlarged fins of sailfin mollies. Gaudy males, it turns out, are more profitable."

Reznick noted that the work his lab is engaged in could not be done on mammals. "All placental mammals inherited their placenta from a single common ancestor that lived more than 100 million years ago," he explained. "Whatever was happening then has long since been lost to history. These fish have evolved placentas around eight different times and some origins were quite recent. This diversity gives us the power to ask questions about how and why it happened and about what the consequences of the evolution of the placenta have been."

Reznick and Pollux were joined in the study by Robert W. Meredith and Mark S. Springer at UC Riverside. Pollux is now at Wageningen University, the Netherlands. Meredith, a former postdoctoral researcher in Springer's lab, is now at Montclair State University, NJ.

The research was supported by a grant to Reznick and Springer from the National Science Foundation.

http://www.eurekalert.org/pub_releases/2014-07/ehs-nco070814.php

New class of anti-arthritis drugs effectively treats multiple inflammatory diseases

Commonly prescribed anti-arthritics can exacerbate other inflammatory diseases like periodontitis, according to new research published in The American Journal of Pathology

Philadelphia, PA - Inflammatory diseases can occur simultaneously in distinct sites in the same patient, complicating treatment because a medication effective for one disorder may exacerbate the other. One such example is the anti-arthritic medication dexamethasone, which alleviates joint disease but can worsen periodontal bone disease. A study in the August issue of The American Journal of Pathology highlights the effects of a new class of anti-arthritic drugs, specifically DTrp8-ɣMSH (DTrp), that acts via the melanocortin (MC) system to reduce both arthritic joint inflammation and periodontitis.

"This research, a joint program with the Universidade Federal de Minas Gerais in Brazil, indicates that MC receptor agonists, possibly better if selective for MC3, represent a novel class of anti-arthritic therapeutics able to target joint disease without aggravating unwanted effects on distant organs and tissues," says Mauro Perretti, PhD, of Queen Mary University of London, Barts, and The London School of Medicine and Dentistry (UK).

More than 60 years ago, adrenocorticotropic hormone (ACTH) was shown to be effective for treating rheumatoid and gouty arthritis, yet its current clinical use is very sporadic. It is now appreciated that some of the anti-inflammatory actions of ACTH are mediated via the peripheral MC system on MC receptors expressed in bone cells, fibroblasts, and immune cells. Research has shown that activation of MC receptors by ACTH or other MC peptides can lead to a variety of protective actions against bone loss, including increased matrix deposition, reduced osteoclast activation, and enhanced proliferation of bone-forming cells.

In this study, researchers first determined whether mice that were induced with experimental arthritis also manifested bone loss in the alveolar (tooth socket) bone. They found that bone loss in the jaw correlated with the severity of localized inflammation in the joints of the mice.

They next compared the effects of a peptide that selectively activates MC3 receptors in mice on both arthritis and alveolar bone loss, and compared the effects

to other known medications. The glucocorticoid dexamethasone exerted potent anti-arthritic effect, which were, however, inversely correlated with protection against bone loss. This was markedly distinct from the effect seen with DTrp, which showed a highly positive correlation between clinical score and bone loss (ie reduced bone loss associated with better anti-arthritic effect). Calcitonin had little effect on arthritis but did protect against alveolar bone loss. "This finding is of relevance as prolonged steroid therapy is associated with bone density loss, osteoporosis, and fractures; melanocortin-based therapeutics could spare these unwanted actions," says Dr. Perretti.

"DTrp could be viewed as a starting point for a new class of bone-sparing anti-arthritic agents," says John L. Wallace, PhD, MBA, of the Department of Physiology and Pharmacology, University of Calgary, Calgary, Alberta, Canada and University of Toronto, in a commentary on these findings. "This study highlights the continued value of simpler and cheaper (for both the maker and the end-user) approaches to drug development, harnessing the potential of endogenous anti-inflammatory mechanisms."

According to Dr. Wallace, drugs that harness endogenous anti-inflammatory mechanisms like the MC system offer a number of advantages: they produce a wide range of anti-inflammatory effects, promote the healing of injured tissue, and are potentially associated with very few adverse effects. He comments that these medications "hold out significant promise for safely treating a wide range of inflammatory disorders including, like MC3 agonists, co-existing inflammatory diseases in the same patient."

http://bit.ly/1q56uxf

Earth's Magnetic Field Flip Could Happen Sooner Than Expected

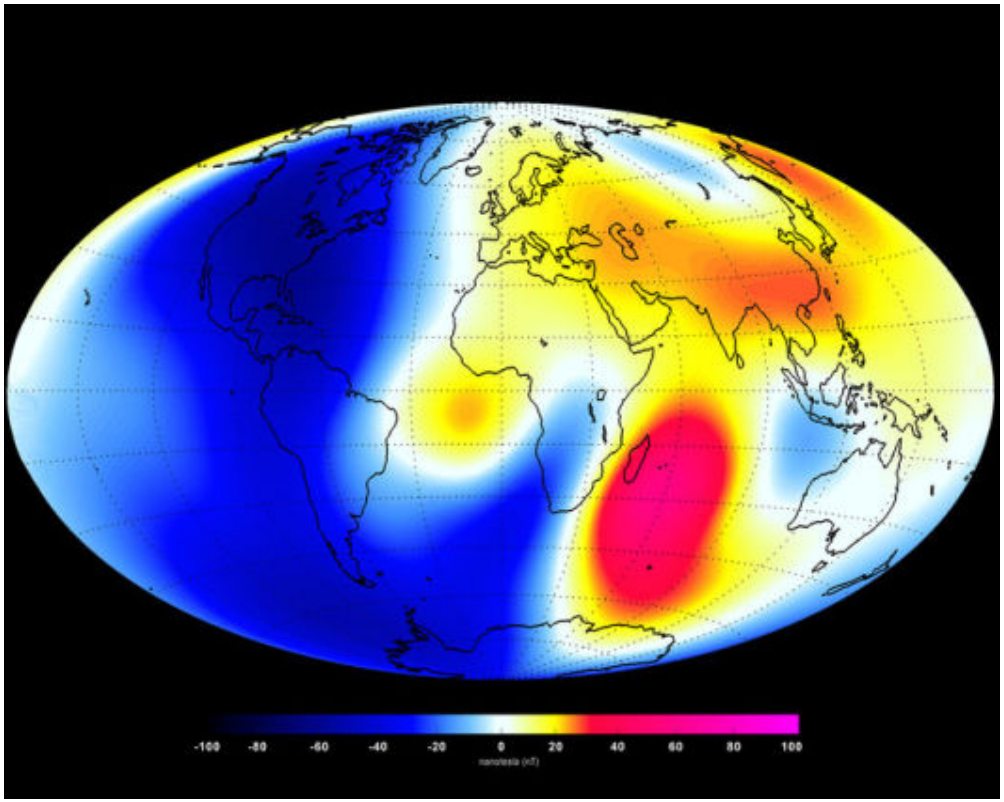
Changes measured by the Swarm satellite show that our magnetic field is weakening 10 times faster than originally predicted, especially over the Western Hemisphere

Jul 9, 2014 |By Kelly Dickerson and LiveScience

Earth's magnetic field, which protects the planet from huge blasts of deadly solar radiation, has been weakening over the past six months, according to data collected by a European Space Agency (ESA) satellite array called Swarm.

The biggest weak spots in the magnetic field - which extends 370,000 miles (600,000 kilometers) above the planet's surface - have sprung up over the Western Hemisphere, while the field has strengthened over areas like the southern Indian Ocean, according to the magnetometers onboard the Swarm satellites - three separate satellites floating in tandem.

The scientists who conducted the study are still unsure why the magnetic field is weakening, but one likely reason is that Earth's magnetic poles are getting ready to flip, said Rune Floberghagen, the ESA's Swarm mission manager. In fact, the data suggest magnetic north is moving toward Siberia. "Such a flip is not instantaneous, but would take many hundreds, if not a few thousand years," Floberghagen told Live Science. "They have happened many times in the past."



Changes in Earth's magnetic field from January to June 2014 as measured by the Swarm constellation of satellites. These changes are based on the magnetic signals that stem from Earth's core. Shades of red represent areas of strengthening, while blues show areas of weakening over the 6-month period.. **ESA/DTU**

Scientists already know that magnetic north shifts. Once every few hundred thousand years the magnetic poles flip so that a compass would point south instead of north. While changes in magnetic field strength are part of this normal flipping cycle, data from Swarm have shown the field is starting to weaken faster than in the past. Previously, researchers estimated the field was weakening about 5 percent per century, but the new data revealed the field is actually weakening at 5 percent per

decade, or 10 times faster than thought. As such, rather than the full flip occurring in about 2,000 years, as was predicted, the new data suggest it could happen sooner. Floberghagen hopes that more data from Swarm will shed light on why the field is weakening faster now.

Still, there is no evidence that a weakened magnetic field would result in a doomsday for Earth. During past polarity flips there were no mass extinctions or evidence of radiation damage. Researchers think power grids and communication systems would be most at risk.

Earth's magnetic field acts like a giant invisible bubble that shields the planet from the dangerous cosmic radiation spewing from the sun in the form of solar winds. The field exists because Earth has a giant ball of iron at its core surrounded by an outer layer of molten metal. Changes in the core's temperature and Earth's rotation boil and swirl the liquid metal around in the outer core, creating magnetic field lines.

The movement of the molten metal is why some areas of the magnetic field strengthen while others weaken, Florberghagen said. When the boiling in one area of the outer core slows down, fewer currents of charged particles are released, and the magnetic field over the surface weakens.

"The flow of the liquid outer core almost pulls the magnetic field around with it," Floberghagen said. "So, a field weakening over the American continent would mean that the flow in the outer core below America is slowing down."

The Swarm satellites not only pick up signals coming from the Earth's magnetic field, but also from its core, mantle, crust and oceans. Scientists at the ESA hope to use the data to make navigation systems that rely on the magnetic field, such as aircraft instruments, more accurate, improve earthquake predictions and pinpoint areas below the planet's surface that are rich in natural resources. Scientists think fluctuations in the magnetic field could help identify where continental plates are shifting and help predict earthquakes. These first results from Swarm were presented at the Third Swarm Science Meeting in Denmark on June 19.

http://www.eurekalert.org/pub_releases/2014-07/uom-sdc071014.php

Scientists discover clues why weight-loss surgery cures diabetes

Scientists at The University of Manchester are a step closer to understanding why diabetes is cured in the majority of patients that undergo gastric bypass surgery.

The research, published in the journal Endocrinology, shows the cure is likely to be explained by the actions of specialised cells in the intestine that secrete a cocktail of powerful hormones when we eat.

During the research, the team showed that gut hormone cells previously thought to contain just one hormone, had up to six hormones including the hunger hormone ghrelin.

Study team leader, Dr Craig Smith, a Senior Lecturer in Molecular Cell Physiology, said: "Our research centred on enteroendocrine cells that 'taste' what we eat and in response release a cocktail of hormones that communicate with the pancreas, to control insulin release to the brain, to convey the sense of being full and to optimize and maximize digestion and absorption of nutrients."

"Under normal circumstances these are all important factors in keeping us healthy and nourished. But these cells may malfunction and result in under or over eating."

75% of people suffering from obesity who also have diabetes are cured of diabetes after receiving a gastric bypass and Dr Smith says that understanding how bypass surgery cures diabetes is the crux of his team's research.

Dr Smith: "This is where things start to get really interesting because the most common type of gastric bypass actually also bypasses a proportion of the gut hormone cells. It is thought that this causes the gut hormone cells to change and be reprogrammed. For us, understanding how these cells change in response to surgery is likely to hold the key to a cure for diabetes."

In the UK, approximately 2.9 million people are affected by diabetes and the most common form of the disease is Type 2 diabetes which is linked to genes, ethnicity, obesity and diet.

"Understanding the messages the gut sends out when we eat food and when things go wrong, as is the case in diabetes, is our next challenge and hopefully one that will result in the development of drugs which could be used instead of surgery to cure obesity and prevent diabetes," said Dr Smith.

The research team also comprised John Mclaughlin who is Professor of Gastroenterology and Nutrition at The University of Manchester as well as Professor Robert Fenton's team based at the University of Aarhaus in Denmark.

http://www.eurekalert.org/pub_releases/2014-07/tl-tlw070914.php

World's most advanced dengue vaccine candidate shows promise in phase 3 trial

The first dengue vaccine candidate (CYD-TDV) to reach phase 3 clinical testing has shown moderate protection (56%) against the disease in Asian children, according to new research published in The Lancet.

Dengue is a mosquito-borne disease that infects around 390 million people each year, of whom about 96 million suffer from symptomatic infection. WHO estimates that the global burden of dengue has risen 30-fold over the past 50 years, with over half of the world's population at risk of the disease.

There is no licensed vaccine available to treat or prevent dengue fever, and efforts to develop one have been complicated by the fact that dengue is caused by four distinct dengue viruses, and a vaccine must target all four serotypes (DENV 1–4).

This phase 3 trial took place in dengue-endemic areas across five countries in Asia, a region that accounts for over 70% of the global dengue burden. The study involved 10 275 healthy children aged 2 to 14 years who were randomly assigned to receive three injections of the CYD-TDV vaccine (6851) or a placebo (3424) at 0, 6, and 12 months, and followed for up to 2 years.

The researchers recorded 250 dengue cases more than 28 days after the third injection - 117 in the vaccine group and 133 in the placebo group, demonstrating an overall protective efficacy of 56.5%. The vaccine also showed 88.5% efficacy after 3 doses against severe disease (dengue haemorrhagic fever) which leads to hospitalisation for over half a million people (mostly children) every year, and 67% against dengue-associated hospitalisation.

The researchers found that the vaccine gave low protection (35%) against DENV 2, but more than 75% protection against DENV 3 and 4, and 50% against DENV 1.

The vaccine was generally well tolerated. A total of 647 serious adverse events were reported, 402 (62%) in the vaccine group and 245 (38%) in the placebo group.

According to lead author Dr Maria Rosario Capeding from the Research Institute for Tropical Medicine in the Philippines, "Our results suggest that vaccination with CYD-TDV can reduce the incidence of symptomatic dengue infection by more than half and importantly reduced severe disease and hospitalisations. This candidate vaccine has the potential to have a significant impact on public health in view of the high disease burden in endemic countries."*

Writing in a linked Comment, Professor Annelies Wilder-Smith from Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore says, "Perhaps the most interesting finding of this trial was that efficacy after at least one dose was almost as high as that after three doses…Because three doses 6 months apart is an inconvenient and costly immunisation schedule for scale up in national programmes, the question of whether sufficient efficacy can be achieved with a lower number of doses deserves further assessment."

She adds, "With an estimated 96 million clinically apparent dengue infections annually, a reduction by half would present a significant public health benefit that would support dengue vaccine introduction….Whether the armamentarium of alternative vaccine candidates presently in the pipeline (including inactivated, live attenuated, chimeric, recombinant, subunit and DNA vaccines) will improve efficacy beyond 56% remains to be established. For the moment, the CYD-TDV vaccine is the best we have; however, with 56% efficacy it will never be a single solution. Continued support for the development of other novel strategies including drugs, improved case management, insecticides, and new approaches to vector control, is needed before effective dengue control becomes a credible prospect."

The study was funded by Sanofi Pasteur.

http://phys.org/news/2014-07-nasa-spacecraft-evidence-ice-gullies.html

NASA spacecraft observes further evidence of dry ice gullies on Mars

Repeated high-resolution observations made by NASA's Mars Reconnaissance Orbiter (MRO) indicate the gullies on Mars' surface are primarily formed by the seasonal freezing of carbon dioxide, not liquid water.

The first reports of formative gullies on Mars in 2000 generated excitement and headlines because they suggested the presence of liquid water on the Red Planet, the eroding action of which forms gullies here on Earth. Mars has water vapor and plenty of frozen water, but the presence of liquid water on the neighboring planet, a necessity for all known life, has not been confirmed. This latest report about gullies has been posted online by the journal Icarus.

"As recently as five years ago, I thought the gullies on Mars indicated activity of liquid water," said lead author Colin Dundas of the U.S. Geological Survey's Astrogeology Science Center in Flagstaff, Arizona. "We were able to get many more observations, and as we started to see more activity and pin down the timing of gully formation and change, we saw that the activity occurs in winter."

Dundas and collaborators used the High Resolution Imaging Science Experiment (HiRISE) camera on MRO to examine gullies at 356 sites on Mars, beginning in 2006. Thirty-eight of the sites showed active gully formation, such as new channel segments and increased deposits at the downhill end of some gullies.

Using dated before-and-after images, researchers determined the timing of this activity coincided with seasonal carbon-dioxide frost and temperatures that would not have allowed for liquid water.

Frozen carbon dioxide, commonly called dry ice, does not exist naturally on Earth, but is plentiful on Mars. It has been linked to active processes on Mars such as carbon dioxide gas geysers and lines on sand dunes plowed by blocks of dry ice.

One mechanism by which carbon-dioxide frost might drive gully flows is by gas that is sublimating from the frost providing lubrication for dry material to flow. Another may be slides due to the accumulating weight of seasonal frost buildup on steep slopes.

The findings in this latest report suggest all of the fresh-appearing gullies seen on Mars can be attributed to processes currently underway, whereas earlier hypotheses suggested they formed thousands to millions of years ago when climate conditions were possibly conducive to liquid water on Mars.

Dundas's co-authors on the new report are Serina Diniega of NASA's Jet Propulsion Laboratory in Pasadena, California, and Alfred McEwen of the University of Arizona, Tucson.

"Much of the information we have about gully formation, and other active processes, comes from the longevity of MRO and other orbiters," said Diniega. "This allows us to make repeated observations of sites to examine surface changes over time."

Although the findings about gullies point to processes that do not involve liquid water, possible action by liquid water on Mars has been reported in the past year in other findings from the HiRISE team. Those observations were of a smaller type of surface-flow feature.

An upcoming special issue of Icarus will include multiple reports about active processes on Mars, including smaller flows that are strong indications of the presence of liquid water on Mars today.

"I like that Mars can still surprise us," Dundas said. "Martian gullies are fascinating features that allow us to investigate a process we just don't see on Earth."

http://bit.ly/1qtwHBJ

New study shows drinking alcohol provides no heart health benefit

Results call into question previous studies suggesting one drink per day may promote cardiovascular health

PHILADELPHIA – Reducing the amount of alcoholic beverages consumed, even for light-to-moderate drinkers, may improve cardiovascular health, including a reduced risk of coronary heart disease, lower body mass index (BMI) and blood pressure, according to a new multi-center study published in The BMJ and co-led by the Perelman School of Medicine at the University of Pennsylvania. The latest findings call into question previous studies which suggest that consuming light-to-moderate amounts of alcohol (0.6-0.8 fluid ounces/day) may have a protective effect on cardiovascular health.

The new research reviewed evidence from more than 50 studies that linked drinking habits and cardiovascular health for over 260,000 people. Researchers found that individuals who carry a specific gene which typically leads to lower alcohol consumption over time have, on average, superior cardiovascular health records. Specifically, the results show that individuals who consume 17 percent less alcohol per week have on average a 10 percent reduced risk of coronary heart disease, lower blood pressure and a lower body mass index.

"These new results are critically important to our understanding of how alcohol affects heart disease. Contrary to what earlier reports have shown, it now appears that any exposure to alcohol has a negative impact upon heart health," says co-lead author Michael Holmes, MD, PhD, research assistant professor in the department of Transplant Surgery at the Perelman School of Medicine at the University of Pennsylvania. "For some time, observational studies have suggested that only heavy drinking was detrimental to cardiovascular health, and that light consumption may actually be beneficial. This has led some people to drink moderately based on the belief that it would lower their risk of heart disease. However, what we're seeing with this new study, which uses an investigative approach similar to a randomized clinical trial, is that reduced consumption of alcohol, even for light-to-moderate drinkers, may lead to improved cardiovascular health."

In the new study, researchers examined the cardiovascular health of individuals who carry a genetic variant of the 'alcohol dehydrogenase 1B' gene, which is known to breakdown alcohol at a quicker pace. This rapid breakdown causes unpleasant symptoms including nausea and facial flushing, and has been found to lead to lower levels of alcohol consumption over time. By using this genetic marker as an indicator of lower alcohol consumption, the research team was able to identify links between these individuals and improved cardiovascular health.

The study was funded by the British Heart Foundation and the Medical Research Council, and was an international collaboration that included 155 investigators from the UK, continental Europe, North America, and Australia.

http://www.eurekalert.org/pub_releases/2014-07/nioa-bn071014.php

'Mississippi Baby' now has detectable HIV, researchers find

Infant seemingly cured of HIV reported as a case study of a prolonged remission now has detectable levels of HIV after two years of no antiretroviral therapy

The child known as the "Mississippi baby" - an infant seemingly cured of HIV that was reported as a case study of a prolonged remission of HIV infection in The New England Journal of Medicine last fall - now has detectable levels of HIV after more than two years of not taking antiretroviral therapy without evidence of virus, according to the pediatric HIV specialist and researchers involved in the case.

"Certainly, this is a disappointing turn of events for this young child, the medical staff involved in the child's care, and the HIV/AIDS research community," said NIAID Director Anthony S. Fauci, M.D. "Scientifically, this development reminds us that we still have much more to learn about the intricacies of HIV infection and where the virus hides in the body. The NIH remains committed to moving forward with research on a cure for HIV infection."

NIAID and the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), both part of the National Institutes of Health, provided funding to the researchers involved in the analysis of the case and will conduct a clinical trial to build upon the findings. The researchers planning the clinical trial will now need to take this new development into account.

The child was born prematurely in a Mississippi clinic in 2010 to an HIV-infected mother who did not receive antiretroviral medication during pregnancy and was not diagnosed with HIV infection until the time of delivery. Because of the high risk of HIV exposure, the infant was started at 30 hours of age on liquid, triple-drug

antiretroviral treatment. Testing confirmed within several days that the baby had been infected with HIV. At two weeks of age, the baby was discharged from the hospital and continued on liquid antiretroviral therapy.

The baby continued on antiretroviral treatment until 18 months of age, when the child was lost to follow up and no longer received treatment. Yet, when the child was again seen by medical staff five months later, blood samples revealed undetectable HIV levels (less than 20 copies of HIV per milliliter of blood (copies/mL)) and no HIV-specific antibodies. The child continued to do well in the absence of antiretroviral medicines and was free of detectable HIV for more than two years.

However, during a routine clinical care visit earlier this month, the child, now nearly 4 years of age, was found to have detectable HIV levels in the blood (16,750 copies/mL). Repeat viral load blood testing performed 72 hours later confirmed this finding (10,564 copies/mL of virus). Additionally, the child had decreased levels of CD4+ T-cells, a key component of a normal immune system, and the presence of HIV antibodies - signals of an actively replicating pool of virus in the body. Based on these results, the child was again started on antiretroviral therapy. To date, the child is tolerating the medication with no side effects and treatment is decreasing virus levels. Genetic sequencing of the virus indicated that the child's HIV infection was the same strain acquired from the mother. The child continues to receive medical care, treatment and monitoring from Hannah Gay, M.D., a pediatric HIV specialist at the University of Mississippi Medical Center in Jackson, who has been involved in the child's care since birth.

In light of the new findings, researchers must now work to better understand what enabled the child to remain off treatment for more than two years without detectable virus or measurable immunologic response and what might be done to extend the period of sustained HIV remission in the absence of antiretroviral therapy.

"The fact that this child was able to remain off antiretroviral treatment for two years and maintain quiescent virus for that length of time is unprecedented," said Deborah Persaud, M.D., professor of infectious diseases at the John Hopkins Children's Center in Baltimore and one of the two pediatric HIV experts involved in the ongoing analysis of the case. "Typically, when treatment is stopped, HIV levels rebound within weeks, not years."

"The prolonged lack of viral rebound, in the absence of HIV-specific immune responses, suggests that the very early therapy not only kept this child clinically well, but also restricted the number of cells harboring HIV infection," said Katherine Luzuriaga, M.D., professor of molecular medicine, pediatrics and medicine at the University of Massachusetts Medical School.

"The case of the Mississippi child indicates that early antiretroviral treatment in this HIV-infected infant did not completely eliminate the reservoir of HIV-infected cells that was established upon infection but may have considerably limited its development and averted the need for antiretroviral medication over a considerable period," said Dr. Fauci. "Now we must direct our attention to understanding why that is and determining whether the period of sustained remission in the absence of therapy can be prolonged even further."

NIAID and the NICHD provided funding that supported the collaborating investigators involved in the ongoing analysis of the Mississippi child through the International Maternal Pediatric Adolescent AIDS Clinical Trials Network's (IMPAACT) cooperative agreement grants AI106716 and AI068632.

http://www.eurekalert.org/pub_releases/2014-07/nu-uc071014.php

Understanding consciousness

Researchers advocate for more scientific research on consciousness

EVANSTON, Ill. - Why does a relentless stream of subjective experiences normally fill your mind? Maybe that's just one of those mysteries that will always elude us. Yet, research from Northwestern University suggests that consciousness lies well within the realm of scientific inquiry -- as impossible as that may currently seem. Although scientists have yet to agree on an objective measure to index consciousness, progress has been made with this agenda in several labs around the world.

"The debate about the neural basis of consciousness rages because there is no widely accepted theory about what happens in the brain to make consciousness possible," said Ken Paller, professor of psychology in the Weinberg College of Arts and Sciences and director of the Cognitive Neuroscience Program at Northwestern. "Scientists and others acknowledge that damage to the brain can lead to systematic changes in consciousness. Yet, we don't know exactly what differentiates brain activity associated with conscious experience from brain activity that is instead associated with mental activity that remains unconscious," he said.

In a new article, Paller and Satoru Suzuki, also professor of psychology at Northwestern, point out flawed assumptions about consciousness to suggest that a wide range of scientific perspectives can offer useful clues about consciousness.

"It's normal to think that if you attentively inspect something you must be aware of it and that analyzing it to a high level would necessitate consciousness," Suzuki noted. "Results from experiments on perception belie these assumptions.

"Likewise, it feels like we can freely decide at a precise moment, when actually the process of deciding begins earlier, via neurocognitive processing that does not enter awareness," he said.

The authors write that unconscious processing can influence our conscious decisions in ways we never suspect. If these and other similar assumptions are incorrect, the researchers state in their article, then mistaken reasoning might be behind arguments for taking the science of consciousness off the table.

"Neuroscientists sometimes argue that we must focus on understanding other aspects of brain function, because consciousness is never going to be understood," Paller said. "On the other hand, many neuroscientists are actively engaged in probing the neural basis of consciousness, and, in many ways, this is less of a taboo area of research than it used to be."

Experimental evidence has supported some theories about consciousness that appeal to specific types of neural communication, which can be described in neural terms or more abstractly in computational terms. Further theoretical advances can be expected if specific measures of neural activity can be brought to bear on these ideas.

Paller and Suzuki both conduct research that touches on consciousness. Suzuki studies perception, and Paller studies memory. They said it was important for them to write the article to counter the view that it is hopeless to ever make progress through scientific research on this topic. They outlined recent advances that provide reason to be optimistic about future scientific inquiries into consciousness and about the benefits that this knowledge could bring for society.

"For example, continuing research on the brain basis of consciousness could inform our concerns about human rights, help us explain and treat diseases that impinge on consciousness, and help us perpetuate environments and technologies that optimally contribute to the well being of individuals and of our society," the authors wrote. They conclude that research on human consciousness belongs within the purview of science, despite philosophical or religious arguments to the contrary.

http://www.eurekalert.org/pub_releases/2014-07/uoc--nct070814.php

New compound treats both blindness and diabetes in animal studies

Study offers fresh insights into the role of cellular stress in degenerative illnesses

In a new study led by UC San Francisco (UCSF) scientists, a chemical compound designed to precisely target part of a crucial cellular quality-control network provided significant protection, in rats and mice, against degenerative forms of blindness and diabetes.

In addition to opening a promising drug-development path for the wide range of diseases caused by cell loss, the new research offers a new view of the workings of the unfolded protein response (UPR), a cellular "life-or-death" signaling network: When cells are under stress, the UPR works to ensure that they produce properly configured proteins, but those cells not up to this task are quickly prompted by the UPR to self-destruct.

A component of the UPR known as the IRE1 pathway has generally been thought to handle the protective aspects of this response, promoting cell survival by providing cells with the biological resources they need to cope with stress, while a complementary pathway, called PERK, has been associated with cell death.

But in the new research, published in the July 10, 2014 edition of Cell, when researchers used KIRA6, a small-molecule kinase inhibitor they designed to inhibit the actions of IRE1 alpha - the molecular sensor that triggers the IRE1 pathway - they blocked cell death and preserved function in experimental models of two human diseases.

In two rat models of retinitis pigmentosa, a disease in which light-sensing cells in the eye progressively die off, causing blindness, KIRA6 preserved both the number of these cells and visual function. And in mice from a strain known as Akita, which carry a genetic mutation that causes diabetes in early life as stressed insulin-producing beta cells of the pancreas degenerate, KIRA6 protected beta cells from cell death, leading to a two-fold increase in insulin production and improving blood glucose control.

"This is a huge advance in our field," said co-senior author Scott A. Oakes, MD, associate professor of pathology at UCSF. "On the surface these would seem to be two very different diseases, but IRE1-induced cell death is at the root of both of them."

The results are the culmination of "a gigantic project," first to establish that the IRE1 pathway could drive degenerative disease, and then to design and test compounds to head off the damage, said UCSF's Feroz Papa, MD, PhD, associate professor of medicine and co-senior author, and a member of the California Institute for Quantitative Biosciences. "It took four years, over a hundred separate experiments in various contexts - not counting replications - and involved 24 researchers working in seven labs labs across four cities."

KIRA6 is the latest in a series of compounds (the acronym stands for "Kinase-Inhibiting RNase Attenuators) that were originally designed and synthesized in the labs of study co-authors Dustin J. Maly, PhD, associate professor of chemistry at The University of Washington, Seattle, and Bradley J. Backes, PhD, associate professor of medicine at UCSF.

"While KIRA6 showed efficacy in animals," said Papa, "it is important to stress that more optimization through medicinal chemistry efforts is needed to develop this class of compounds to the stage where they could be tested for efficacy in humans through clinical trials."

Oakes and Papa said that support from the Cleveland, Ohio-based Harrington Discovery Institute was crucial to sustaining this complex collaboration. Both scientists were 2013 winners of Scholar-Innovator Awards from the Institute, which is part of The Harrington Project for Development and Discovery a $250 million national model to accelerate the development of medical breakthroughs by physician-scientists into medicines that benefit patients. Other critical support for the work came from the National Institutes of Health, the Juvenile Diabetes Research Foundation, the Burroughs Wellcome Fund, the American Cancer Society, and the Howard Hughes Medical Institute.

Other UCSF researchers on the project included Douglas B. Gould, PhD, associate professor of ophthalmology; Michael German, MD, professor of medicine; postdoctoral fellows Rajarshi Ghosh, PhD and Likun Wang, PhD, and graduate student Eric S. Wang, all co-first authors; postdoctoral fellows Aeid Igbaria, PhD, Shuhei Morita, MD, PhD, Kris Prado, MD, Maike Thamsen, PhD, Hector Macias, PhD, and Marcel V. Alavi, PhD; former research associate Deborah Caswell; graduate student Kurt F. Weiberth; and research associate Micah J. Gliedt. The team was also joined by other colleagues from The University of Washington, Seattle; The Miller School of Medicine at The University of Miami, Florida; and the Albert Einstein College of Medicine, in Bronx, New York.

http://www.eurekalert.org/pub_releases/2014-07/sfpa-dwp070714.php

Do women perceive other women in red as more sexually receptive?

Would that result in a woman guarding her mate against a woman in red?

Previous research has shown that men perceive the color red on a woman to be a signal of sexual receptivity. Women are more likely to wear a red shirt when they are expecting to meet an attractive man, relative to an unattractive man or a woman. But do women view other women in red as being more sexually receptive? And would that result in a woman guarding her mate against a woman in red? A study published in Personality and Social Psychology Bulletin sought to answer these questions.

Perceptions of Sexual Receptivity

Nonverbal communication via body language, facial expressions and clothing conveys information to others, occasionally with unintended social consequences. Researchers from the University of Rochester, Trnava University, and the Slovak Academy of Sciences collaborated to study what information the color red conveys to women.

Three experiments were involved in the study. The first experiment asked individuals to compare a digital image of a woman wearing red versus a woman wearing white. Participants were asked questions about the woman's sexual receptivity, such as "This person is interested in sex," which required moving a bar along a sliding scale from "No, not at all" to "Yes, definitely." Participants rated the woman in red as more sexually receptive than the woman in white. Sixty-nine percent of participants reported they were in a committed relationship, and the results of the experiment showed that participant's relationship status did not have a significant effect on their perceptions of women in white versus red.

Derogation and Mate-Guarding

The researchers tested whether participants would derogate a woman in red and the likelihood of guarding their mate from a woman in red in subsequent experiments. "Derogation [involves] speaking poorly of another person to make them seem inferior, undesirable, or unlikeable, while making oneself seem superior and more likable by
contrast," lead researcher Adam Pazda explains. "Mate-guarding is the act of protecting one's own romantic partner from romantic or sexual encounters with others." The researchers specifically tested whether women would derogate on the topics of fidelity ("I would guess that this women cheats on men"), and financial resources ("I would guess that this woman has no money").

The third and final experiment altered the conditions slightly. Instead of comparing white and red, the researchers chose to compare green and red in an effort to eliminate the possible bias of associating white and purity.

"Using green allowed us to equate both hues on lightness and chroma, which allowed for a more rigorous, controlled test of the red effect," Pazda said. The participants were located in an Eastern European country, rather than the U.S. as in the two prior experiments.

To determine intent to mate-guard, participants were asked: "How likely would you be to introduce this person to your boyfriend?" and "How likely would you be to let your boyfriend spend time alone with this person?"

Results from the last two experiments confirmed that women found another woman in red to be more sexually receptive, versus white or green.

In terms of derogation, participants who viewed a woman in red were more likely to derogate the woman's sexual fidelity, but not financial resources. Participants did not show any difference between sexual fidelity derogation and financial resource derogation in relation to a woman in white.

Women were more likely to guard their partner from a woman dressed in red if they are in a committed relationship, relative to a woman in green.

Please email press@spsp.org if you would like a copy of the original study in Personality and Social Psychology Bulletin.

Pazda, A.D., Prokop, P., and Elliot, A.J. (2014). Red and Romantic Rivalry: Viewing Another Woman in Red Increases Perceptions of Sexual Receptivity, Derogation and Intentions to Mate-Guard. Personality and Social Psychology Bulletin, 40(10).

http://www.eurekalert.org/pub_releases/2014-07/jhm-pst070814.php

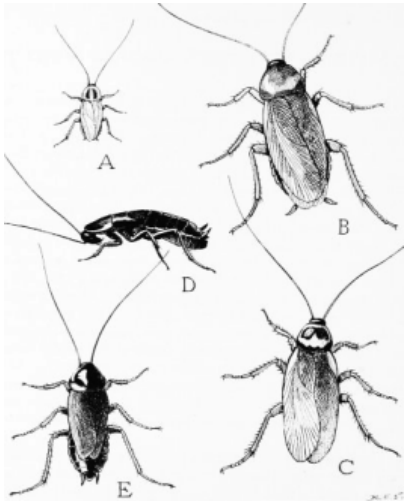
Potent spider toxin 'electrocutes' German, not American, cockroaches

Development raises possibility of more species-specific insecticides

Using spider toxins to study the proteins that let nerve cells send out electrical signals, Johns Hopkins researchers say they have stumbled upon a biological tactic that may offer a new way to protect crops from insect plagues in a safe and environmentally responsible way.

Their finding - that naturally occurring insect toxins can be lethal for one species and harmless for a closely related one - suggests that insecticides can be designed to target specific pests without harming beneficial species like bees. A summary of the research, led by Frank Bosmans, Ph.D., an assistant professor of physiology at the Johns Hopkins University School of Medicine, will be published July 11 in the journal Nature Communications.

"Most insecticides used today take a carpet-bombing approach, killing indiscriminately and sometimes even hurting humans and other animals," says Bosmans. "The more specific a toxin's target, the less dangerous it is for everything else."



A is the German roach, or Croton bug, Blattella germanica. B is the American cockroach, Periplaneta americana. C is the Australian cockroach, Periplaneta australasiae. D is the wingless female of the oriental roach, Blatta orientalis. E is the winged male of the oriental roach. **US Department of Agriculture**

Their finding began with the mistaken inclusion of a protein, called Dc1a, in a shipment sent by the team's Australian collaborators. The protein was extracted from the venom of the desert bush spider Diguetia canities, which lives in the deserts of the southwestern United States and Mexico and is harmless to humans.

When Bosmans' Australian collaborators tested the impact of Dc1a on proteins from American cockroaches, the proteins reacted very weakly, so they hadn't planned on sending Dc1a to Bosmans for further study. But it was accidentally included with other spider venom proteins for Bosmans' group to test, says Bosmans, so his laboratory did so.

The Bosmans lab studies proteins called sodium channels, which are found in the outer envelope of nerve cells throughout the body. Stimuli, like the acute pressure of hitting your finger with a hammer, are communicated to the proteins, causing them to open their pores so that sodium flows in. The positive charge of sodium causes an electrical signal to be sent down the nerve, eventually reaching the spinal cord and brain so the body can react.

"Sodium channels are the fastest ion channels in the human body and are needed to experience nearly every sensation, so mutations in them can lead to severe disorders of the nerves, muscles and heart," Bosmans says. That makes them a critical target for scientific study.

To understand the channels better, Bosmans and his team insert the protein's gene into frog eggs, which are large and easy to study. They can then use electrodes to monitor the flow of sodium into the cells. Adding spider toxins that interfere with the function of the channels sheds light on the channels' activity, since different toxins inhibit different parts of the protein, causing different effects. In addition to testing human sodium channels, the team sometimes works with sodium channels from insects.

Because his laboratory recently acquired the gene for the German cockroach sodium channel, Bosmans' team tested Dc1a on the protein and saw a startling increase in the channels' activity. "Sodium poured into the cells. In a bug, that would cause massive seizures, much like being electrocuted," says Bosmans. "Luckily, the toxin doesn't act on human sodium channels."

Curious about the difference between the two cockroach species' channels, they first identified the region of the channel that the toxin targets, but it turned out to be exactly the same in the two bugs. Digging deeper, they found a region nearby that differed by just two amino acids, the basic building blocks of the proteins. When mutations were made in the German version so that its amino acids were the same as the American version's, the German cockroach sodium channel reacted like the American one.

The team's next step is to test the toxin on other insect species to determine its full range. Now that they know how important this region of sodium channels is, Bosmans says, researchers will know to look for mutations there as they try to find the mechanism for various human disorders. It may also be possible to create drugs that block access to the site in overactive sodium channels.

Other authors of the report include John Gilchrist and Jordan Wagner of the Johns Hopkins University School of Medicine; Niraj Bende, Volker Herzig and Glenn King of the University of Queensland; and Slawomir Dziemborowicz and Graham Nicholson of the University of Technology, Sydney.

This work was supported by grants from the Australian Research Council (DP130103813) and the National Institute of Neurological Disorders and Stroke (R00NS073797).

Link to article in Nature Communications http://dx.doi.org/10.1038/ncomms5350

http://nyti.ms/W6BXSD

Science Journal Pulls 60 Papers in Peer-Review Fraud

A scientific journal has retracted 60 papers linked to a researcher in Taiwan, accusing him of "perverting the peer-review process" by creating fraudulent online accounts to judge the papers favorably and help get them published.

By HENRY FOUNTAIN JULY 10, 2014

Sage Publications, publisher of The Journal of Vibration and Control, in which the papers appeared over the last four years, said the researcher, Chen-Yuan Chen, had established a "peer-review and citation ring" consisting of fake scientists as well as real ones whose identities he had assumed. It said that in at least one case, Mr. Chen, who also uses the first name Peter, reviewed his own paper using one of the aliases.

In all, Mr. Chen, an associate professor of computer science who resigned in February from the National Pingtung University of Education amid an investigation, appears to have created 130 email accounts that were used in reviewing the papers. A spokeswoman for the publisher said it had contacted all the accounts but received no replies.

Sage said that the retracted papers all had at least one author or reviewer implicated in the ring, and that it was possible that other scientists were involved in the activity.

Chen Chien-huang, the university's chief secretary, said by email on Friday morning that the university is still looking into the case. "We are continuing to investigate according to the materials just publicized by JVC," he wrote. "Whether there are other professors involved is still under investigation." He said the university did not know Chen-Yuan Chen's whereabouts.

The retractions were first reported on the blog Retraction Watch.

The journal - whose former editor, Ali F. Nayfeh, an emeritus professor of engineering at Virginia Tech, resigned in May as the investigation was drawing to a close - publishes studies on subjects like signal analysis and noise control. Among the retracted papers was one titled "Ant-Inspired Collective Problem-Solving Systems."

The publisher said it and Mr. Nayfeh first suspected misconduct last year and eventually contacted the university. The spokeswoman for Sage said it was never able to talk with Mr. Chen directly.

Mr. Nayfeh could not be reached for comment. Mehdi Ahmadian, another Virginia Tech professor and one of three senior editors appointed to replace Mr. Nayfeh, referred a request for comment to the publisher.

Most scientific and other academic journals use peer review, in which papers are accepted based partly on the judgment of independent researchers. Many publishers, including Sage, have set up systems in which the process is conducted online. The spokeswoman said Sage did not have any concerns about its system.

Most retractions related to fraud involve cases where data was fabricated or altered. But there have been a few other cases in which researchers have tried to manipulate the peer-review process. In 2012, Retraction Watch reported on a South Korean plant researcher who created fake email accounts so that he could review his own papers. When the fraud was uncovered, over 30 papers were retracted.

Michael B. Eisen, a biologist at the University of California, Berkeley, and a critic of peer review, said that in many countries, including Taiwan, academic institutions have an "almost explicit" formula for promotions based on the quantity, rather than quality, of published papers.

"That creates room for various forms of shenanigans," he said. "It doesn't surprise me that much that something like this happens."

Austin Ramzy contributed reporting from Taipei, Taiwan.

http://bit.ly/1rgcVei

Were Ancient Child Skulls Gifts to the Lake Gods?

Children's skulls found at the edges of Bronze Age settlements may have been a gruesome gift for the local lake gods.

Jul 11, 2014 09:10 AM ET // by Jennifer Viegas

The children's skulls were discovered encircling the perimeter of ancient villages around lakes in Switzerland and Germany. Some had suffered ax blows and other head traumas.

Though the children probably weren't human sacrifices killed to appease the gods, they may have been offered after death as gifts to ward off flooding, said study co-author Benjamin Jennings, an archaeologist at Basel University in Switzerland.

Lake dwellers

Since the 1920s, archaeologists have known that ancient villages dotted Alpine lakes in Switzerland and Germany. However, it wasn't until the 1970s and 1980s that many of the sites were excavated, yielding hunting tools, animal bones, ceramics, jewelry, watchtowers, gates and more than 160 dwellings. Tree rings on wooden artifacts from the sites suggest people lived there at different periods between 3,800 and 2,600 years ago.

The Bronze Age lake dwellers regularly faced flooding. Whenever lake levels rose, they would pick up and move to dry land, only to return once the waters receded.

To adapt to this watery threat, the people built houses on stilts or on sturdy wooden foundations, and created palisades, or fences, made from bog pine, the researchers wrote in the June issue of the journal Antiquity.

But in addition to finding evidence for such architectural adaptations, archaeologists also unearthed more macabre details of life (and death): children's

skulls and skeletal remains encircling the villages at the palisade edges. Many of these ancient skulls were placed there long after their initial burial, at a time when the settlements experienced the worst inundation from rising lake levels, the researchers wrote.

Gift to the gods

In the current study, Jennings and his colleagues took a closer look at the fossil skeletons. Most were from children under age 10, and though the skeletal remains revealed tooth decay and signs of respiratory ailments, those health troubles would not have been severe enough to warrant a mercy killing, the researchers wrote in the journal article.

The skulls showed evidence of head trauma from battle-axes or clubs, though the injuries don't have the uniformity associated with a ritual killing. As a result, it's more likely the youngsters were felled in warfare, rather than killed as a sacrifice for the gods, the researchers wrote.

Either way, it's clear these weren't ordinary burials, he said.

"Across Europe as a whole there is quite a body of evidence to indicate that throughout prehistory human remains, and particularly the skull, were highly symbolic and socially charged," Jennings told Live Science in an email.

At these sites, "the remains are found at the perimeter of the settlement - not inside and not outside, but at a liminal position on the border between in and out," Jennings added. And at one of the sites, the remains were placed at the high-water mark of the floodwaters. Taken together, the details of the burial suggest the remains were placed as an offering to protect against flooding, Jennings said.

Still, there are many unanswered questions about these mysterious Alpine people. "There are very few instance or examples of burials in the vicinity of the lake settlements, and so we really do not know where the majority of the lake dwellers are buried, or how they treated their dead," Jennings said.

http://www.eurekalert.org/pub_releases/2014-07/wkh-ils071114.php

In lab studies, hydroxyethyl starch has direct harmful effects on kidney cells

'Pure mass of HES molecules' explains toxicity to renal tubule cells

The increased risk of kidney injury related to the use of hydroxyethyl starch (HES) in resuscitation fluids reflects the mass of HES molecules, according to a report in Anesthesia & Analgesia, official journal of the International Anesthesia Research Society (IARS).

The "total mass of HES molecules" explains the harmful effect of HES on cultured human renal proximal tubule cells (PTCs), concludes the laboratory study by Dr Christian Wunder and colleagues of University Hospital Würzburg, Austria. Other factors - such as differences in the origin or molecular weight of HES solutions - appear to play little or no role in cellular-level toxicity of HES.

What Factors Affect Toxic Effects of HES on Kidney Cells?

Hydroxyethyl starch is a starch derivative that has been widely used for fluid resuscitation with volume expansion for critically ill or injured patients in shock. A growing body of evidence suggests that HES solutions may have harmful effects, including an increased risk of kidney injury and death.

In previous studies, Dr Wunder and colleagues found that HES caused impaired kidney function in animals with sepsis (severe infection). Those studies showed that HES was localized mainly in the kidney PTCs. The researchers performed a series of in-depth follow-up experiments to look at factors influencing the toxic effects of HES on cultured human PTCs.

Most of the factors assessed had no major influence on reductions in cell viability caused by HES. Cellular toxicity was unrelated to the type of "carrier" solution used in the cell cultures, the use of HES made from different origins (potato versus corn starch), or the time cells spent in culture with HES.

The toxic effects were also similar for HES solutions of different molecular weights. That's an important finding, as newer low-molecular weight HES solutions were thought to be safer than previous products. There was also no evidence that the toxic effects of HES were related to the presence of inflammation.

Instead, the only significant factor was the total mass of HES molecules. The effect was dose-dependent: the greater the molecular mass, the greater the evidence of cell toxicity. The toxic effects started very soon after PTCs were exposed to HEC, and further increased at higher doses.

There is a long history of debate and confusion over potential harmful effects of HES solutions used for resuscitation. Recent studies have linked HES to reduced kidney function in patients with sepsis. Last year, both the US Food and Drug Administration and the European Medicines Agency issued statements that HES solutions should not be used in critically ill patients.

The new study suggests that the molecular mass of HES is the major factor responsible for damage to kidney cells. Other factors have no significant influence - even with new low-molecular weight HES solutions, cellular-level toxic effects appear just as likely, once the total mass of HES molecules is taken into account.

Although the study was performed in the laboratory on cultured kidney cells, the PTC toxicity caused by HES appears consistent with the risks of kidney damage and death observed in critically ill patients. Dr Wunder and coauthors conclude, "Our data show that HES itself has a negative impact on renal PTC, which should be considered when used clinically."

Read the article in Anesthesia & Analgesia.

http://www.wired.com/2014/07/cdc-pox-2/

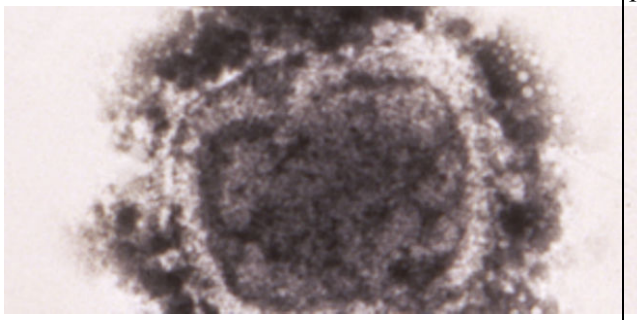
Virus in Found Tubes of Smallpox Is Viable

Update on the vials found on the National Institutes of Health campus last week that were labeled smallpox

By Maryn McKenna

Here's an update on the vials found on the National Institutes of Health campus last week that were labeled smallpox, and transported earlier this week to the Centers for Disease Control and Prevention: The CDC and NIH have both confirmed that the virus in two of the tubes is viable.

That is, if the vials had broken, and someone had come in contact with the dried contents, the result could have been a smallpox infection - something that has not been seen in the world since 1978.



Variola, CDC

NIH director Dr. Francis Collins made the announcement in an email sent to staff today, which was shared with me. Simultaneously, CDC director Dr. Thomas Frieden announced in a press briefing that the CDC lab studying the vials, which earlier had identified the contents as smallpox virus based on PCR of the contents' DNA, had induced growth of the contents in a tissue culture, and confirmed that the growing material is smallpox virus.

(NB: The smallpox incident turns out to be coincident with a larger set of lab-related problems engulfing the CDC, which Frieden also disclosed today. They are complicated, and also not connected to the smallpox incident except by accident of timing, so I'm not going to deal with them in this post. I'll take them up later if I can, but meanwhile, the *Washington Post* has details.)

To recap from earlier: The CDC disclosed on Tuesday that, last week, workers clearing out a little-used cold-storage room belonging to the Food and Drug Administration found a cardboard box containing six tubes, made of and sealed with glass, and labeled with the scientific name for smallpox, variola. Those vials should not have been there: The only stockpiles of smallpox virus anywhere on the planet are supposed to be at the CDC and at a parallel facility in Siberia. In fact, after smallpox was eradicated in 1980, the World Health Organization asked every country in the world to certify that it had either destroyed any stored stocks of virus or tendered them to the WHO to be sent to the stockpiles - and the United States, as one of the guardians of the virus, obviously certified that it had.

The CDC said in its Tuesday announcement that the room where the box was found, which is on the NIH campus, had originally belonged to the NIH and then was tendered to the FDA in the 1970s. I've since learned that in the 1950s, the room belonged to NIH's Division of Biological Standards, which was charged with assessing the potency of vaccines. That responsibility passed to FDA in 1972.

(Vaccine reliability was a significant concern in the 1950s. In 1954, the date on the smallpox vials, the country was in the midst of the third trial of desperately desired polio vaccine - which was approved for use a year later, and then almost yanked from the market when one batch was found to be contaminated and causing paralysis. At the same time, researchers were testing different formulas for smallpox vaccines, as related in this account from the New York State Department of Health. The international smallpox-eradication program did not begin until 1966.)

Frieden said today:

On Monday night, (CDC scientists) worked through the night to confirm that the DNA was present by PCR testing, they then injected the material into special materials to see if it was alive. And yesterday we learned that two of the six vials showed evidence of growth. Our scientists again repeated the PCR testing and determined that the growth is indeed smallpox virus. This is growing in our approved smallpox containment laboratory, a BSL-4 facility.

We've already begun the process of analyzing the entire genetic sequence of the smallpox virus, and we'll see whether any of the remaining four vials grow, something that may take up to two weeks. After we've monitored growth and sequenced the genome, we will destroy the vials and all of the culture material from these materials. That's what should have been done a couple of decades ago, and that's what will be done now, and we've invited representatives from the World Health Organization will witness that destruction.

Whoever created these vials didn't do so out of malice… The problem was not in the creation of the materials but in the inventory control which allowed them to remain unsecured for decades. They should have been destroyed decades ago, and once we complete the work here, we will destroy them.

The question that has been asked since Tuesday, of course, is how much bad "inventory control" has there been, and is there more lost smallpox, or other dangerous organisms, out there somewhere? Collins, the NIH director, promised today that NIH will be scoured to make sure nothing else remains. He said:

This incident underscores the need to keep close track of all potentially pathogenic materials and conduct our research with the utmost care and attention to proper protocols for the handling of hazardous materials of all kinds… I take seriously this recent incident and our need to assure that it will not happen again. It is imperative that we conduct a comprehensive search of our facilities to be certain that no other select

agents, toxins, or hazardous biological materials are improperly stored in any of our facilities, owned, leased, or through contract arrangements.
We have developed a plan of action for the conduct of this search. It requires investigators to examine all freezers, refrigerators, cold rooms, storage shelves, and cabinets, as well as all other areas of storage such as offices associated with laboratories. Many of you will be involved in helping to do a "clean sweep" of NIH intramural labs… I am sure you will cooperate fully.

It's worth asking: If someone had been exposed to the vials' contents, what would have happened? Under natural circumstances - which haven't existed for 37 years - people became infected either from close face-to-face contact with another infected person, or through contact with household items or pox scabs bearing the virus. (There's a surprising amount of discrepancy in the old literature - most of which is not digitized - about how likely an exposure would be to cause an infection.) Assume though that someone did become infected: Smallpox takes a while to develop, and has a unique set of symptoms even before the characteristic rash develops, making it easily detectable if a physician thinks to look for it. If this hypothetical person was vulnerable (possible, because there has been no vaccination in the US general population since the 1970s) and did develop smallpox, it would be exceedingly bad for them: Smallpox killed at least one in four who contracted it. But that person might be the only victim: there is a significant vaccine stockpile, about 220 million doses, that could be deployed to create a cordon sanitaire around the case and choke off any further spread.
That is not to say that a case of smallpox would be a minor matter. It would be a dreadful thing to bring an extinguished disease back into the world again. And the panic, if news got out, would no doubt be an uproar. When a traveler brought smallpox to New York City in 1947, causing an outbreak that killed two and infected 12 others, 6 *million* people demanded to be vaccinated, standing in line for days. As Frieden said today, "These events should not have happened." With good fortune, they won't happen again.

http://bit.ly/1q5nIuy

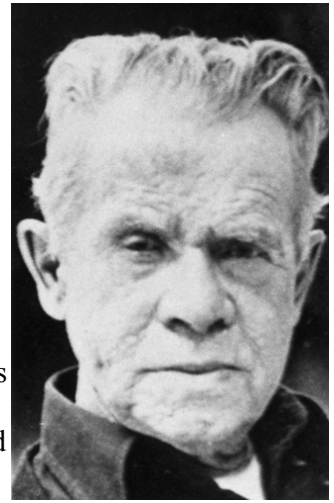
The Tragic Tale of Atomic Man: Life as a Radioactive Human

Lived a decade after showered with radiation 500 times the occupational limit and skull embedded with radioactive americium

Sarah Zhang

For the first time since the accident in 1976, workers at Hanford Nuclear Reservation in Washington are planning to clean out the room where chemicals exploded in Harold McCluskey's face, showering him with radiation 500 times the occupational limit and embedding radioactive americium in his skull, turning him into the Atomic Man.

McCluskey, improbably, survived the incident. (He later said, "Of nine doctors, four thought I had a 50-50 chance and the rest just shook their heads.") The massive dose of radiation left him with health problems, and decades later, his body still set off Geiger counters.



Left: McCluskey after the incident in 1980.

But the most painful legacy of the explosion was probably the isolation, both physical and social, as other humans shied away from his radioactive body.
When the accident happened on August 30, 1976, McCluskey had just returned to his job as a technician after a five-month strike had shut down the Plutonium Finishing Plant at Hanford. The material he was working with had become unstable after the long hiatus and so right after he added nitric acid as instructed, it exploded, blowing out the glove box that was supposed to contain it. He was exposed to the highest level of radioactive americium ever recorded.
His body - now covered in blood and shards of metal and glass - was taken to the decontamination center where he stayed in an isolation of concrete and steel. Nobody was allowed near him out of fear for the radiation he still emitted. "Blinded, his hearing damaged by the explosion, McCluskey spent the next three weeks at the unit cut off from personal contact," described a later profile in *People*. "Monitored, like an alien, by nurses wearing respirators and protective clothing, he could neither see nor clearly understand the attendants who approached."
The nurses scrubbed and shaved him every day - the bath towels and bathwater now part of Hanford's radioactive waste. He endured 600 shots of zinc DTPA, a drug that binds to radioactive metals.
For the first month, his family was only allowed with 30 feet of him. He continued to exhale radioactive americium with every breath. When the radioactivity in his body had finally dropped 80 percent after five months in the isolation facility, McCluskey was allowed to go home.
But home came with its own problems. He recalls friends calling and saying, "Harold, I like you, but I can never come to your house." *People* also recounts how he rotated where he got his hair cut. "I didn't want anyone's business to be hurt," he explained. Being the Atomic Man meant being a pariah, like a patient with a deadly, contagious disease.
McCluskey had his share of health problems - a kidney infection, four heart attacks, a cornea transplant - but he remarkably did not seem bitter. He ultimately died more

than a decade later of causes seemingly unrelated to radiation, which actually perplexed doctors.

But radiation's legacy doesn't go away so tidily. For all these years, the McCluskey Room, as it's now known, has sat mostly undisturbed, save for the occasional clean-up effort. This time, it's the real deal. The entire Plutonium Finishing Plant that once produced plutonium for nuclear weapons is to be cleaned up and demolished. If all goes according to plan, the plant and the McCluskey Room will be gone by 2016.

Today, Hanford is the most contaminated nuclear site in the U.S. and the focus of the nation's biggest cleanup effort. Questions about safety have bedeviled the facility, especially after a leak of radioactive waste in 2013. Even with the McCluskey Room gone, the radioactivity legacy at Hanford will remain for a long, long time. And so should the shadow of Harold McCluskey, unwitting Atomic Man

. ***http://www.eurekalert.org/pub_releases/2014-07/uoc-pc071014.php***

Prehistoric 'bookkeeping' continued long after invention of writing

An archaeological dig in southeast Turkey has uncovered a large number of clay tokens that were used as records of trade until the advent of writing, or so it had been believed.

But the new find of tokens dates from a time when writing was commonplace - thousands of years after it was previously assumed this technology had become obsolete. Researchers compare it to the continued use of pens in the age of the word processor. The tokens – small clay pieces in a range of simple shapes – are thought to have been used as a rudimentary bookkeeping system in prehistoric times. One theory is that different types of tokens represented units of various commodities such as livestock and grain. These would be exchanged and later sealed in more clay as a permanent record of the trade – essentially, the world's first contract.

Examples of tokens discovered at Ziyaret Tepe are displayed. **Ziyaret Tepe Archaeological Project**

The system was used in the period leading up to around 3000 BC, at which point clay tablets filled with pictorial symbols drawn using triangular-tipped reeds begin to emerge: the birth of writing, and consequently history. From this point on in the archaeological record, the tokens dwindle and then disappear, leading to the assumption that writing quickly supplanted the token system.

However, recent excavations at Ziyaret Tepe – the site of the ancient city Tušhan, a provincial capital of the Neo-Assyrian Empire – have unearthed a large quantity of tokens dating to the first millennium BC: two thousand years after 'cuneiform' – the earliest form of writing – emerged on clay tablets.

"Complex writing didn't stop the use of the abacus, just as the digital age hasn't wiped out pencils and pens," said Dr John MacGinnis from Cambridge's MacDonald Institute for Archaeological Research, who led the research.

"In fact, in a literate society there are multiple channels of recording information that can be complementary to each other. In this case both prehistoric clay tokens and cuneiform writing used together."

The tokens were discovered in the main administrative building in Tušhan's lower town, along with many cuneiform clay tablets as well as weights and clay sealings. Over 300 tokens were found in two rooms near the back of the building that MacGinnis describes as having the character of a 'delivery area', perhaps an ancient loading bay.

"We think one of two things happened here. You either have information about livestock coming through here, or flocks of animals themselves. Each farmer or herder would have a bag with tokens to represent their flock," said MacGinnis. "The information is travelling through these rooms in token form, and ending up inscribed onto cuneiform tablets further down the line."

Archaeologists say that, while cuneiform writing was a more advanced accounting technology, by combining it with the flexibility of the tokens the ancient Assyrians created a record-keeping system of greater sophistication.

"The tokens provided a system of moveable numbers that allowed for stock to be moved and accounts to be modified and updated without committing to writing; a system that doesn't require everyone involved to be literate."

MacGinnis believes that the new evidence points to prehistoric tokens used in conjunction with cuneiform as an empire-wide 'admin' system stretching right across what is now Turkey, Syria and Iraq. In its day, roughly 900 to 600 BC, the Assyrian empire was the largest the world had ever seen.

Types of tokens ranged from basic spheres, discs and triangles to tokens that resemble oxhide and bull heads.

While the majority of the cuneiform tablets found with the tokens deal with grain trades, it's not yet known what the various tokens represent. The team say that some tokens likely stand for grain, as well as different types of livestock (such as goats and cattle), but – as they were in use at the height of the empire – tokens could have been used to represent commodities such as oil, wool and wine.

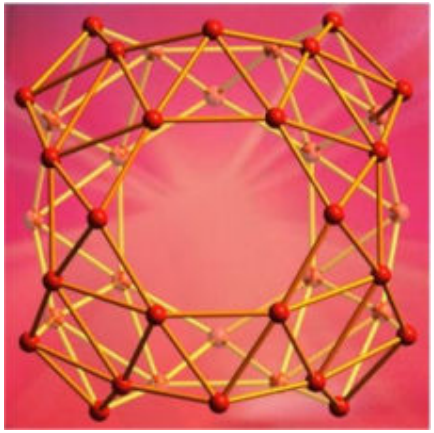
"One of my dreams is that one day we'll dig up the tablet of an accountant who was making a meticulous inventory of goods and systems, and we will be able to crack the token system's codes," said MacGinnis.

"The inventions of recording systems are milestones in the human journey, and any finds which contribute to the understanding of how they came about makes a basic contribution to mapping the progress of mankind," he said.

http://www.eurekalert.org/pub_releases/2014-07/bu-rdb071014.php

Researchers discover boron 'buckyball'

A cluster of 40 boron atoms forms a hollow molecular cage similar to a carbon buckyball



PROVIDENCE, R.I. (Brown University) -- The discovery 30 years ago of soccer-ball-shaped carbon molecules called buckyballs helped to spur an explosion of nanotechnology research. Now, there appears to be a new ball on the pitch.

Researchers from Brown University, Shanxi University and Tsinghua University in China have shown that a cluster of 40 boron atoms forms a hollow molecular cage similar to a carbon buckyball. It's the first experimental evidence that a boron cage structure - previously only a matter of speculation - does indeed exist.

Researchers have shown that clusters of 40 boron atoms form a molecular cage similar to the carbon buckyball. This is the first experimental evidence that such a boron cage structure exists. **Wang lab / Brown University**

"This is the first time that a boron cage has been observed experimentally," said Lai-Sheng Wang, a professor of chemistry at Brown who led the team that made the discovery. "As a chemist, finding new molecules and structures is always exciting. The fact that boron has the capacity to form this kind of structure is very interesting."

Wang and his colleagues describe the molecule, which they've dubbed borospherene, in the journal Nature Chemistry.

Carbon buckyballs are made of 60 carbon atoms arranged in pentagons and hexagons to form a sphere - like a soccer ball. Their discovery in 1985 was soon followed by discoveries of other hollow carbon structures including carbon nanotubes. Another famous carbon nanomaterial - a one-atom-thick sheet called graphene - followed shortly after.

After buckyballs, scientists wondered if other elements might form these odd hollow structures. One candidate was boron, carbon's neighbor on the periodic table. But because boron has one less electron than carbon, it can't form the same 60-atom structure found in the buckyball. The missing electrons would cause the cluster to collapse on itself. If a boron cage existed, it would have to have a different number of atoms.

Wang and his research group have been studying boron chemistry for years. In a paper published earlier this year, Wang and his colleagues showed that clusters of 36 boron atoms form one-atom-thick disks, which might be stitched together to form an analog to graphene, dubbed borophene. Wang's preliminary work suggested that there was also something special about boron clusters with 40 atoms. They seemed to be abnormally stable compared to other boron clusters. Figuring out what that 40-atom cluster actually looks like required a combination of experimental work and modeling using high-powered supercomputers.

On the computer, Wang's colleagues modeled over 10,000 possible arrangements of 40 boron atoms bonded to each other. The computer simulations estimate not only the shapes of the structures, but also estimate the electron binding energy for each structure - a measure of how tightly a molecule holds its electrons. The spectrum of binding energies serves as a unique fingerprint of each potential structure.

The next step is to test the actual binding energies of boron clusters in the lab to see if they match any of the theoretical structures generated by the computer. To do that, Wang and his colleagues used a technique called photoelectron spectroscopy. Chunks of bulk boron are zapped with a laser to create vapor of boron atoms. A jet of helium then freezes the vapor into tiny clusters of atoms. The clusters of 40 atoms were isolated by weight then zapped with a second laser, which knocks an electron out of the cluster. The ejected electron flies down a long tube Wang calls his "electron racetrack." The speed at which the electrons fly down the racetrack is used to determine the cluster's electron binding energy spectrum - its structural fingerprint.

The experiments showed that 40-atom-clusters form two structures with distinct binding spectra. Those spectra turned out to be a dead-on match with the spectra for two structures generated by the computer models. One was a semi-flat molecule and the other was the buckyball-like spherical cage.

"The experimental sighting of a binding spectrum that matched our models was of paramount importance," Wang said. "The experiment gives us these very specific signatures, and those signatures fit our models."

The borospherene molecule isn't quite as spherical as its carbon cousin. Rather than a series of five- and six-membered rings formed by carbon, borospherene consists of 48 triangles, four seven-sided rings and two six-membered rings. Several atoms

stick out a bit from the others, making the surface of borospherene somewhat less smooth than a buckyball.

As for possible uses for borospherene, it's a little too early to tell, Wang says. One possibility, he points out, could be hydrogen storage. Because of the electron deficiency of boron, borospherene would likely bond well with hydrogen. So tiny boron cages could serve as safe houses for hydrogen molecules.

But for now, Wang is enjoying the discovery.

"For us, just to be the first to have observed this, that's a pretty big deal," Wang said. "Of course if it turns out to be useful that would be great, but we don't know yet. Hopefully this initial finding will stimulate further interest in boron clusters and new ideas to synthesize them in bulk quantities."

The theoretical modeling was done with a group led by Prof. Si-Dian Li from Shanxi University and a group led by Prof. Jun Li from Tsinghua University. The work was supported by the U.S. National Science Foundation (CHE-1263745) and the National Natural Science Foundation of China.

http://www.bbc.com/news/health-28262878

One in three Alzheimer's cases preventable, says research

One in three cases of Alzheimer's disease worldwide is preventable, according to research from the University of Cambridge.

The main risk factors for the disease are a lack of exercise, smoking, depression and poor education, it says. Previous research from 2011 put the estimate at one in two cases, but this new study takes into account overlapping risk factors.

Alzheimer's Research UK said age was still the biggest risk factor.

Writing in The Lancet Neurology, the Cambridge team analysed population-based data to work out the main seven risk factors for Alzheimer's disease.

These are:

- ***Diabetes***
- ***Mid-life hypertension***
- ***Mid-life obesity***
- ***Physical inactivity***
- ***Depression***
- ***Smoking***
- ***Low educational attainment***

They worked out that a third of Alzheimer's cases could be linked to lifestyle factors that could be modified, such as lack of exercise and smoking.

The researchers then looked at how reducing these factors could affect the number of future Alzheimer's cases. They found that by reducing each risk factor by 10%, nearly nine million cases of the disease could be prevented by 2050.

In the UK, a 10% reduction in risk factors would reduce cases by 8.8%, or 200,000, by 2050, they calculated. Current estimates suggest that more than 106 million people worldwide will be living with Alzheimer's by 2050 - more than three times the number affected in 2010.

Healthier old age

Prof Carol Brayne, from the Institute of Public Health at the University of Cambridge, said: "Although there is no single way to treat dementia, we may be able to take steps to reduce our risk of developing dementia at older ages.

"We know what many of these factors are, and that they are often linked.

"Simply tackling physical inactivity, for example, will reduce levels of obesity, hypertension and diabetes, and prevent some people from developing dementia.

"As well as being healthier in old age in general, it's a win-win situation."

Dr Simon Ridley, head of research at charity Alzheimer's Research UK, said there was still much to discover about the disease. "While age is the biggest risk factor for most cases of Alzheimer's, there are a number of lifestyle and general health factors that could increase or decrease a person's chances of developing the disease.

"However, we still do not fully understand the mechanisms behind how these factors are related to the onset of Alzheimer's."

Investment

Dr Ridley said there were more than 820,000 people in the UK living with dementia, and an ageing population would lead to spiralling numbers being affected.

"As there is still no certain way to prevent Alzheimer's, research must continue to build the strongest evidence around health and environmental factors to help individuals reduce their risk." He added: "This new study also highlights that many cases are not due to modifiable risk factors which underlines the need to drive investment into new treatment research."

Of the seven risk factors, the largest proportion of cases of Alzheimer's in the US, UK and the rest of Europe can be attributed to physical inactivity.

The study says about a third of the adult population in these countries are physically inactive. Physical inactivity is also linked to increased risks of other health problems, such as cancers and cardiovascular diseases.

http://bit.ly/1sSFrTo

US bioterror fears are driving Ebola drug development

Research provoked by the 9/11 attacks has given us the best hope yet of averting future Ebola epidemics in West Africa

14 July 2014 by Curtis Abraham

IF ONE good thing comes out of the unfolding crisis in West Africa, where hundreds have fallen victim to the Ebola virus, it's the hope that it will redouble efforts around the world to develop new treatments.

The outbreak is the deadliest to date. In Guinea nearly 300 people have died. Confirmed cases and deaths have also hit neighbouring Liberia and Sierra Leone.

The World Health Organization listed a total of 759 cases and 467 deaths by the end of June. Health workers fear the disease is out of control.

Concerned by the march of the virus, aided by funeral rituals which involve physical contact with the dead and fearful family members hiding sick relatives, the WHO gathered health ministers from 11 countries in the region for talks on a coordinated response.

The unprecedented scale of the epidemic calls for unprecedented action and innovation to stop the death and suffering. Dying in isolation wards is neither attractive to patients nor their families. No wonder the relatives of some people infected in Sierra Leone snatched their kin and took them home to care for them.

So what hope of a medical advance soon? Ironically, the key driver for drug development is US interest in infectious diseases because of their potential use as bioweapons. After anthrax was mailed to news organisations and politicians in the US in the wake of the 9/11 attacks in 2001, hundreds of millions of dollars have been poured into research of this type.

So far no vaccine has been approved for Ebola; candidate drugs are years away from human use. But post-infection treatments intended to save lives are more advanced. They include TKM-Ebola, a drug being developed by Canadian firm Tekmira under a $140 million contract with the US Department of Defense. It targets genes vital to the virus to reduce its impact. The survival rate in monkeys given the drug was 100 per cent. In January, clinical trials began to evaluate safe dosage and side effects. In March, the US Food and Drug Administration fast-tracked development of TKM-Ebola.

Other hopeful approaches include the identification of antibodies against the Zaire strain of the virus, which is responsible for the current outbreak. Monkeys given cocktails of such antibodies survived infection.

To make the leap from lab to treatment, though, requires a lot of money. With the world watching events in Africa, more resources might follow. Public funding is the key. Since 1976, Ebola has infected less than 3000 people, so the commercial drive for drug development is low.

While the fact that drugs are on the horizon is no consolation for those hit by the current outbreak, its scale and an enduring fear of bioterrorism in the US might just mean next time is different.