http://www.bbc.co.uk/news/health-23880152

'Molecular basis' for jet lag found

Scientists believe they have figured out why it takes us so long to adapt when we travel to new time zones.

By James Gallagher Health and science reporter, BBC News

Researchers at Oxford University say they have found the "molecular brakes" that prevent light resetting the body clock when we fly - causing jet lag. Experiments, reported in the journal Cell, showed "uncoupling" these brakes in mice allowed them to rapidly adapt. Researchers hope the discovery will help find new drugs for jet lag and mental health treatments.

The body clock keeps us in tune with the pattern of day and night. It means we sleep at night, but also affects hunger, mood and blood pressure. Light acts like a reset button to keep the clock to time, but when we fly around the world it takes time for our body clocks to adjust. The resulting fatigue, which can last for days, is known as jet lag.

Master clock

The research team, funded by The Wellcome Trust, was trying to figure out why people do not instantly adapt. They looked in mice as all mammals have the same core body clock mechanisms. They focused on the "master clock" in a part of the brain, which keeps the rest of the body in sync, called the suprachiasmatic nuclei

They were looking for sections of DNA that changed their activity levels in response to light.

They found a huge numbers of genes were activated, but then a protein called SIK1 went round turning them all off again. It was acting as a brake by limiting the effect of light. Experiments to reduce the function of SIK1 meant the mice could rapidly adjust their body clock when it was shifted six hours - the equivalent of a flight from the UK to India.

Reset

Prof Russell Foster told the BBC: "We reduced levels by 50-60%, which is big enough to get a very, very big effect. What we saw was the mice would actually advance their clock six hours within a day [rather than taking six days for untreated mice]. "We've know there's been a brake on the clock for some time, but we had absolutely no idea what it is, this provides a molecular basis for jet lag and as a result new targets for potentially developing new drugs."

He said some mental health disorders including schizophrenia were linked to an out-of-tune body clock, so these findings may open up new areas for research. The brakes are likely to be in place to prevent the body clock from becoming erratic and being reset by artificial or moon light.

Dr Akhilesh Reddy, a specialist in the body clock, at the University of Cambridge, was very confident that treatments would follow as "it is a very drugable target and I would suspect there are lots of potential drugs already developed".

He told the BBC: "We have known a lot about the basis of jet lag and why it occurs. "This shows how you can get into the brain and manipulated the clock, which is why this study is important. "We have drugs which can make the clock shorter or longer, what we need is to shift it to a new time zone and that is what they have done."

http://www.sciencedaily.com/releases/2013/09/130901154111.htm

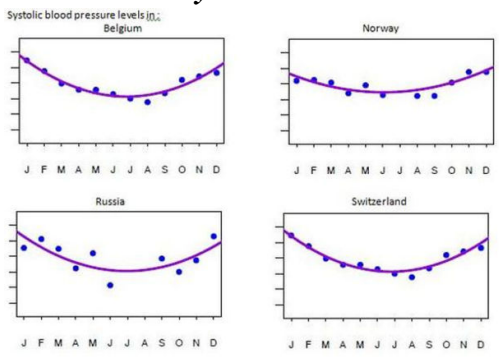
Cardiovascular Risk Factors Highest in Winter and Lowest in Summer

Cardiovascular risk factors are highest in winter and lowest in summer, according to research presented at the ESC Congress today by Dr Pedro Marques-Vidal from Switzerland. The analysis included more than 100,000 subjects in 7 countries.

Dr Marques-Vidal said: "Deaths from cardiovascular disease are higher in winter and lower in summer. We decided to conduct a large scale study to see whether cardiovascular risk factors have a seasonal pattern which could explain the seasonality in deaths."

The study used cross-sectional data from 10 population based studies in 7 countries. Information was obtained on cardiovascular risk factors in 107,090 subjects aged 35 to 80 years.

The country breakdown was as follows: 21,128 subjects in Belgium, 15,664 in Denmark, 1,626 in France, 18,370 in Italy, 25,532 in Norway, 9,359 in Russia and 15,411 in Switzerland.



Systolic blood pressure levels by month. The y axis represents the adjusted difference between annual and monthly systolic blood pressure averages. (Credit: Image courtesy of European Society of Cardiology)

Levels of blood pressure, lipids, glucose, body mass index (BMI, kg/m2) and waist circumference were compared according to season. All data were adjusted for age, gender and smoking. Data on blood pressure, lipids and glucose were adjusted for BMI and whether or not the patient was taking medication.
The researchers found that levels of several cardiovascular risk factors (such as blood pressure, waist circumference and total cholesterol) were higher in winter (January to February) and lower in summer (June to August) compared to the annual average.
Systolic blood pressure levels were on average 3.5 mmHg lower in summer than in winter (see figure).
Dr Marques-Vidal said: "Although this difference is almost irrelevant for an individual, it is considerable for a whole population because the whole blood pressure distribution is shifted to higher values, increasing cardiovascular risk. Indeed, the impact of season on blood pressure levels might have as great an impact on cardiovascular risk as genetic markers for blood pressure. This is because the joint effect of genetic markers on blood pressure is modest, between 2 and 3 mmHg."
He added: "We are currently conducting a study involving 50 million deaths in 18 countries to discover whether seasonality of risk factors affects the risk of dying from myocardial infarction or stroke." Waist circumference was on average 1 cm smaller in summer than in winter, while total cholesterol was on average 0.24 mmol/L lower in summer than in winter. Dr Marques-Vidal said: "We observed a seasonal variation in waist circumference but BMI did not change throughout the year. We have no clear explanation for this finding. Total cholesterol may increase during the winter because of changes in eating habits. There was no seasonal variation in glucose, probably because several cohorts did not collect blood samples in the fasting state. We have begun a study on seasonality of food intake which may help explain these findings."
He added: "Our large scale study shows that some cardiovascular risk factors take holidays over the summer. This may explain why deaths from cardiovascular disease are higher in winter than summer. People need to make an extra effort to exercise and eat healthily in the winter to protect their health."
He concluded: "Our team is currently conducting another study to find out if the seasonal pattern in cardiovascular risk factors reverses in the southern hemisphere, where seasons are inverted relative to the northern hemisphere. Based on preliminary data, it does seem to be the case.
The overall study is expected to collect information on almost 200,000 subjects from over 12 countries."

http://www.eurekalert.org/pub_releases/2013-09/cwru-biy082913.php

Boy interrupted: Y-chromosome mutations reveal precariousness of male development

The idea that men and women are fundamentally different from each other is widely accepted. And throughout the world, this has created distinct ideas about which social and physical characteristics are necessary in each gender to maintain healthy human development.

However, social revolutions throughout the last century have challenged traditional ideas about not only which traits are normal and necessary for survival, but also how humans acquire them. Thanks to a new study from researchers at Case Western Reserve University, science is continuing the charge.
By studying rare families in which a daughter shares the same Y chromosome as her father, Michael Weiss, MD, PhD, and his colleagues at the university's School of Medicine have determined that the pathway for male sexual development is not as consistent and robust as scientists have always assumed.
A team led by Weiss, chairman of the Department of Biochemistry, the Cowan-Blum Professor of Cancer Research, and a professor of biochemistry and medicine, has published a study in the Proceedings of the National Academy of Sciences that examines the function of the SRY gene. This gene is responsible for initiating the process that leads to male development.
"A general principle of developmental biology is that evolution favors reliability," Weiss explained. "Robust switches ensure that our genetic programs give rise to a consistent body plan to ensure that babies have one heart, two arms, ten fingers, and so forth."
Traditional viewpoints emphasize the uniformity of this process. The new research indicates that male sexual development is less stable than other genetic programs.
In fetal development, a gene located on the Y chromosome, called SRY, begins the process that leads to male development. All fetuses initially develop with female tissues, no matter what the sex will be at birth, so the master switch is responsible for initiating the transformation of female tissues into male tissues. From there, the testes develop and produce testosterone, which eventually forms the male's external genitalia.
The university's study employs mutated SRY genes shared by a father and a sterile XY daughter. Females usually develop with an XX pair, but, in these families, the father instead produced a daughter with an XY pair. This occurs during fetal development when the SRY gene's master switch fails to trigger. Internal female tissues, such as the uterus and fallopian tubes, continue to develop but are dysfunctional and infertile.

"Yet the father has the same Y chromosome and the same mutation as the daughter," Weiss pointed out. "And since he is a fertile male, we know that the switch must be poised right at its edge."
The team decided to measure the biochemical threshold of the SRY master switch.
"Our expectation was that we'd find that a factor of 100 or more—a severe insult to the Y-encoded switch—was necessary to alter development," Weiss said. "But what we found was that the SRY threshold, as probed in father-daughter pairs, is only a factor of two."
Therefore, human males actually develop near the edge of sexual ambiguity. This means that, unlike the robust genetic programs which develop other essential processes like heart function, the SRY gene master switch is particularly vulnerable to change. It only takes a slight deviation from the normal process to dramatically alter fetal sexual development.
Given the importance of sexual reproduction to the survival of a species, why do human SRY genes function so close to the boundary of infertility? The idea of an unreliable master switch might appear paradoxical, but a growing body of research suggests that it might be an evolutionary necessity.
Extensive studies of gender-associated styles of childhood play and the acquisition of social competencies by Dr. S. Baron-Cohen and colleagues at Cambridge University (UK) have highlighted the long-term effects of testosterone secretion by the fetal testis. Testosterone influences the patterning of the male brain during a critical window in human development.
And it is the SRY gene that sparks the genetic program leading to the formation of testes and the production of fetal testosterone.
"We have this tenuous switch on the Y chromosome, and we anticipate that its gift to humanity is variability in the pathway of male development from its earliest stages," Weiss said. "The essential idea is that our evolution has favored a broad range of social competencies. In prehistory, this range would have given a survival advantage to communities enriched by a diversity of gender styles."
In fact, certain aspects of modern history seem to parallel this idea.
Susan Case, PhD, a professor of organizational behavior at Case Western Reserve Weatherhead School of Management, who was not involved in the study, agreed with Weiss's argument and noted that "diverse mixes of people offer more varied perspectives, more ideas and solutions, and more challenges to long-accepted views." In the corporate world, for example, these differing styles increase creativity and problem solving, especially within a group.
The implications of Weiss's research suggest that elements of human culture, which had been assumed to be psychological or cultural, may be biological, instead. Therefore, human evolution would not have been dependent on consistency and homogeneity, but on their exact opposite.

http://www.eurekalert.org/pub_releases/2013-09/dc-pcc082813.php

Prehistoric climate change due to cosmic crash in Canada

Dartmouth-led team reveals cause of global climate shift 12,900 years ago

For the first time, a dramatic global climate shift has been linked to the impact in Quebec of an asteroid or comet, Dartmouth researchers and their colleagues report in a new study. The cataclysmic event wiped out many of the planet's large mammals and may have prompted humans to start gathering and growing some of their food rather than solely hunting big game.
The findings appear next week in the online Early Edition of the Proceedings of the National Academy of Sciences. A preprint of the article is available to journalists starting Wednesday, Aug. 28, at http://www.eurekalert.org/account.php.
The impact occurred about 12,900 years ago, at the beginning of the Younger Dryas period, and marks an abrupt global change to a colder, dryer climate with far-reaching effects on both animals and humans. In North America, the big animals all vanished, including mastodons, camels, giant ground sloths and saber-toothed cats. Their human hunters, known to archaeologists as the Clovis people, set aside their heavy-duty spears and turned to a hunter-gatherer subsistence diet of roots, berries and smaller game.
"The Younger Dryas cooling impacted human history in a profound manner," says Dartmouth Professor Mukul Sharma, a co-author of the study. "Environmental stresses may also have caused Natufians in the Near East to settle down for the first time and pursue agriculture."
It is not disputed that these powerful environmental changes occurred, but there has long been controversy over their cause.
The classic view of the Younger Dryas cooling interlude has been that an ice dam in the North American ice sheet ruptured, releasing a massive quantity of freshwater into the Atlantic Ocean. The sudden influx is thought

to have shut down the ocean currents that move tropical water northward, resulting in the cold, dry climate of the Younger Dryas.
But Sharma and his co-authors have discovered conclusive evidence linking an extraterrestrial impact with this environmental transformation. The report focuses on spherules, or droplets of solidified molten rock expelled by the impact of a comet or meteor. The spherules in question were recovered from Younger Dryas boundary layers at sites in Pennsylvania and New Jersey, the layers having been deposited at the beginning of the period. The geochemistry and mineralogy profiles of the spherules are identical to rock found in southern Quebec, where Sharma and his colleagues argue the impact took place.
"We have for the first time narrowed down the region where a Younger Dryas impact did take place," says Sharma, "even though we have not yet found its crater." There is a known impact crater in Quebec — the 4-kilometer wide Corossal crater -- but based on the team's mineralogical and geochemical studies, it is not the impact source for the material found in Pennsylvania and New Jersey.
People have written about many impacts in different parts of the world based on the presence of spherules. "It may well have taken multiple concurrent impacts to bring about the extensive environmental changes of the Younger Dryas," says Sharma. "However, to date no impact craters have been found and our research will help track one of them down.

http://www.eurekalert.org/pub_releases/2013-09/uoca-ssi083013.php

Soot suspect in mid-1800s Alps glacier retreat

Scientists have uncovered strong evidence that soot, or black carbon, sent into the air by a rapidly industrializing Europe, likely caused the abrupt retreat of mountain glaciers in the European Alps.

The research, published Sept. 2 in the Proceedings of the National Academy of Sciences, may help resolve a longstanding scientific debate about why the Alps glaciers retreated beginning in the 1860s, decades before global temperatures started rising again.
Thomas Painter, a snow and ice scientist at NASA's Jet Propulsion Laboratory in Pasadena, Calif., is lead author of the study, and co-authors include Waleed Abdalati, Director of the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder.
Glacier records in the central European Alps dating back to the 1500s show that between 1860 and 1930, loosely defined as the end of the Little Ice Age in Europe, large valley glaciers in the Alps abruptly retreated by an average of nearly 0.6 mile (1 kilometer).
Yet weather in Europe cooled by nearly 1.8 degrees Fahrenheit (1 degree Celsius) during that time.
Glaciologists and climatologists have struggled to understand the mismatch between the climate and glacier records. "Something was missing from the equation," Painter said.
To investigate, he and his colleagues turned to history. In the decades following the 1850s, Europe was undergoing a powerful economic and atmospheric transformation spurred by industrialization. Residents, transportation, and perhaps most importantly, industry in Western Europe began burning coal in earnest, spewing huge quantities of black carbon and other dark particles into the atmosphere.
When black carbon particles settle on snow, they darken the surface. This melts the snow and exposes the underlying glacier ice to sunlight and relatively warm air earlier in the year, allowing more and faster melt.
To determine how much black carbon was in the atmosphere and the snow when the Alps glaciers began to retreat, the researchers studied ice cores drilled from high up on several European mountain glaciers.
By measuring the levels of carbon particles trapped in the ice core layers and taking into consideration modern observations of the distribution of pollutants in the Alps, they could estimate how much black carbon was deposited on glacial surfaces at lower elevations, where levels of black carbon tend to be highest.
The team then ran computer models of glacier behavior, starting with recorded weather conditions and adding the impact of lower-elevation black carbon. By including this impact, the simulated glacier mass loss and timing finally were consistent with the historic record of glacial retreat, despite the cool temperatures of the time.
"This study uncovers some likely human fingerprints on our changing environment," Abdalati said. "It's a reminder that the actions we take have far-reaching impacts on the environment in which we live."
"We must now look closer at other regions on Earth, such as the Himalaya, to study the present-day impacts of black carbon on glaciers," said Georg Kaser, a study co-author from the University of Innsbruck and lead author of the Working Group I Cryosphere chapter of the Intergovernmental Panel on Climate Change's upcoming Fifth Assessment Report.
Other institutions participating in the study include the University of Michigan, Ann Arbor, and the University of California, Davis.

http://phys.org/news/2013-09-phosphate-soluble-mars.html

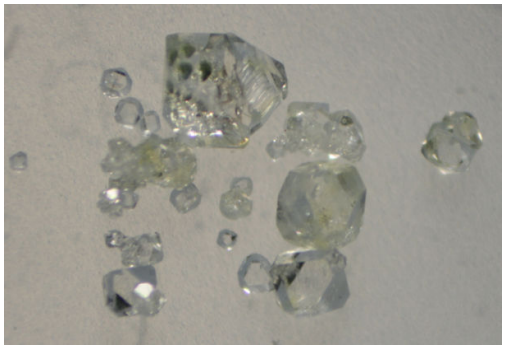
Researchers find phosphate in more soluble form on Mars

A trio of researchers at the University of Nevada has found that phosphate found in minerals on Mars, is far more soluble than it is in natural Earth minerals.

Phys.org - In their paper published in the journal Nature Geoscience, the researchers describe how they synthesized mineral types found on Mars and then tested how well they dissolved in water releasing phosphate as compared to samples from natural Earth minerals.

Most scientists agree that phosphate is a key ingredient for life. Put another way, they believe that life couldn't have evolved without it. For that reason, scientists have been studying ways in which minerals that contain phosphate could have broken down to allow the phosphate to escape.

Such studies have thus far found that minerals that hold phosphate on Earth are not very soluble—they don't break down easily when soaked in sea water. That has led to what Earth scientists call "the phosphate problem." How did life get started on Earth if there wasn't enough phosphate around when life was first beginning? Some have suggested the answer is that it didn't, instead, it started on another planet, such as Mars, and made its way here via meteorites. Prior research has already shown that Mars has much more phosphate than does Earth. In this new effort, the team in Nevada looked at minerals that exist on Mars to see if they might be more soluble in water as well.



Synthetic crystals of the calcium phosphate mineral whitlockite similar to those used to produce the extraterrestrial mineral merrillite. If life ever arose on Mars, merrillite may have been a major source of biologically required phosphate. Largest crystal are ~1mm. **Credit: C. T. Adcock / University of Nevada Las Vegas**

Lacking samples from Mars to test, the researchers synthesized chlorapatite and merrillite in their lab—two common phosphate bearing minerals found on the Red Planet. They then soaked samples in several tubs, each with a different pH level for varying amounts of time. As they did so, they measured how much phosphate made its way into the water and how long it took. In analyzing their results, the researchers found that more phosphate made its way into the water with both types of minerals and they did so at a faster rate than minerals that contain phosphate found naturally on Earth. In some cases, they report that the Mars rocks released phosphate up to 45 percent faster than Earth rocks.

The findings by the team don't prove that life began on Mars and migrated to Earth—after all, scientists have yet to prove life ever existed Mars. But it does add some credence to the argument that perhaps life did start somewhere other than our home planet, which if true, might mean it's still out there waiting for us to discover it.

More information: Readily available phosphate from minerals in early aqueous environments on Mars, Nature Geoscience (2013) DOI: 10.1038/ngeo1923

Abstract

If the chemistry essential to life was present in water-containing environments on Mars, the processes that led to life on Earth may have also occurred on the red planet1. Phosphate is one of the chemical nutrients thought to be essential for life and is also considered critical to reactions that may have led to life on Earth2, 3. However, low prebiotic availability of phosphate may have been a complicating factor in terrestrial abiogenesis2, 4, suggesting that a similar hurdle may have confronted the development of life on Mars. Phosphate available for biological reactions can be introduced into aqueous environments through dissolution of primary phosphate minerals during water–rock interactions, but little is known about the dissolution of the dominant phosphate minerals found in martian meteorites and presumably on Mars5, 6, 7, 8. Here we present dissolution rates, phosphate release rates and solubilities of phosphate minerals found in martian rocks as determined from laboratory measurements. Our experimental findings predict phosphate release rates during water–rock interactions on Mars that are as much as 45 times higher than on Earth and phosphate concentrations of early wet martian environments more than twice those of Earth. We suggest that available phosphate may have mitigated one of the hurdles to abiogenesis on Mars.

http://www.bbc.co.uk/news/science-environment-23932400

Mammals harbour 'at least 320,000 new viruses'

There could be at least 320,000 viruses awaiting discovery that are circulating in animals, a study suggests.

By Rebecca Morelle Science reporter, BBC World Service

Researchers say that identifying these viral diseases, especially those that can spread to humans, could help to prevent future pandemics. The team estimates that this could cost more than £4bn ($6bn), but says this is a fraction of the cost of dealing with a major pandemic. The research is published in the journal mBio.

Prof Ian Lipkin, director of the Center for Infection and Immunity at Columbia University's Mailman School of Public Health in the US, said: "What we're really talking about is defining the full range of diversity of viruses

within mammals, and our intent is that as we get more information we will be able to understand the principles that underlie determinants of risks."

Flying fox

Nearly 70% of viruses that infect humans, such as HIV, Ebola and the new Middle East Respiratory Syndrome (Mers), originate in wildlife. But until now, the scale of the problem has been difficult to assess.

To investigate, researchers in the US and Bangladesh looked at a species of bat called the flying fox.

This animal carries the Nipah virus, which if it spreads to humans can kill.

By studying 1,897 samples collected from the bats, scientists were able to assess how many other pathogens the animal carried. They found nearly 60 different types of viruses, most of which had never been seen before.

The team then extrapolated this figure to all known mammals, and concluded there were at least 320,000 viruses that have not yet been detected. The researchers said that identifying all of these would be crucial to keeping one step ahead of diseases that could become a threat to human health.

Prof Lipkin said: "Obviously we cannot survey every animal on the planet, but we can try and map as best as we can using a concept referred to as hotspots. "We look at areas where we know, based on previous experience, there is a high likelihood that new infectious agents will emerge or will pose considerable threat to human health." He said that this would take 10 years and would cost billions of dollars.

But he added: "Despite what looks like an extraordinary expense to pursue this kind of work, it really pales in comparison with what one might learn that could lead to very rapid recognition and intervention that could come to the fore with a pandemic risk. "The idea is to develop an early warning system.

A related project called PREDICT has so far discovered 240 new viruses in areas of the world where people and animals live in close contact.

Commenting on the research, Prof Jonathan Ball from the University of Nottingham, said: "The authors focussed on bats because they have been the original source of a number of virus outbreaks in people.

"But we should remember, bats adopt a lifestyle that's particularly helpful to viruses - they live in large communities, they are dispersed throughout the world and they fly very large distances."

"Whether or not other mammals carry a similar array of viruses is an important question to ask, and no doubt one that the researchers are looking into," he said.

"Will larger-scale studies like this help us predict or better control future virus outbreaks?" He added: The number of potential virus reservoirs is huge - there are more than a thousand different species of bat alone - and adequately screening these and other animals for viral threats would be challenging to say the least."

http://www.eurekalert.org/pub_releases/2013-09/sfpa-wpc090313.php

Why parenting can never have a rule book

Review of studies involving more than 14,600 pairs of twins shows children's genetics significantly affect how they are parented.

Any parent will tell you that there is no simple recipe for raising a child. Being a parent means getting hefty doses of advice – often unsolicited – from others. But such advice often fails to consider a critical factor: the child. A new review of dozens of studies involving more than 14,600 pairs of twins shows that children's genetics significantly affect how they are parented.

"There is a lot of pressure on parents these days to produce children that excel in everything, socially and academically," says Reut Avinun of the Hebrew University of Jerusalem. "Since children are not born tabula rasa, I felt it was important to explore their side of the story, to show how they can affect their environment, and specifically parental behavior." Most studies of parenting look at only the reverse, how parents affect their children's experiences.

To explore the flip side, Avinun and Ariel Knafo looked to twins. They reasoned that if parents treat identical twins, who share 100 percent of their genes, more similarly than non-identical twins, who share on average 50 percent of their genes, then it suggests that the child's genes shape parenting.

Indeed, across 32 studies of twins, they found that children's genetically-influenced characteristics do affect parental behavior. As published in Personality and Social Psychology Review, they estimated that 23 percent of differences in parenting is due to a child's genetics. The genotype-related differences are ways that the children evoke different responses from their environment. For example, a child that is antisocial is more likely to elicit harsh discipline from parents than a more social child.

In one recent study, Knafo's research group found that boys with less self-control are more likely to experience lower levels of positive maternal behavior. For boys, but not for girls, a particular genotype – a polymorphic region in the gene that codes for the serotonin transporter – predicted mothers' levels of positive parenting and

the boys' level of self-control. "In other words, boys' genetically influenced level of self-control affected the behavior of their mothers toward them," Avinun says.
Avinun and Knafo also found that children's shared environment – socioeconomics, cultural exposure, etc. – accounts for 43 percent of parenting differences. And the non-shared environment – different schools, friends, etc. – accounts for 34 percent of the differences. Importantly, the study's findings support the idea that parenting does not necessarily affect children in the same family similarly.
Several factors affect the extent to which genetics influence parenting. Avinun and Knafo found, for example, that age was important, supporting the argument that the child's genetic influence on parenting increases with age. "As children become increasingly autonomous, their genetic tendencies are more likely to be able to affect their behavior, which in turn influences parental behavior," Avinun says.
The research in total, Avinun says, "means that parenting should not be viewed solely as a characteristic of the parent, but as something that results from both parental and child attributes." Therefore, any interventions or treatments to help parenting should consider both the parents and children, and could vary even within a family.
"The discussion of 'nature vs. nurture' has transformed into 'nature and nurture.' We now understand that most characteristics are determined by the interplay between genetic and environmental influences," Avinun says.
Because children are born differently, there never can be a general rule book for raising children, she explains. "There isn't one style of ideal parenting. Each child requires a different environment to excel. So parents should not invest a lot of effort in trying to treat their children similarly, but instead, be aware of the variation in their children's attributes and nurture them accordingly."
The study, "Parenting as a Reaction Evoked by Children's Genotype: A Meta-Analysis of Children-as-Twins Studies Reut Avinun and Ariel Knafo, was published online on August 12, 2013, and is forthcoming in print in November 2013 in Personality and Social Psychology Review, a journal of the Society for Personality and Social Psychology (SPSP).

http://www.eurekalert.org/pub_releases/2013-09/sp-trc090313.php

Tattoos reduce chances of getting a job, new research says

Having a tattoo can reduce your chance of getting a job, but it depends on where the tattoo is, what it depicts and if the job involves dealing with customers, new research says.

London - Dr Andrew R. Timming told the British Sociological Association conference on work, employment and society in Warwick today [Wednesday 4 September] that employers were prone to view tattoos negatively.
Dr Timming, of the School of Management at the University of St Andrews, said he had spoken to 15 managers involved in hiring staff about their reaction to interview candidates with visible tattoos. The managers worked for organisations including a hotel, bank, city council, prison, university and bookseller.
"Most respondents agreed that visible tattoos are a stigma," Dr Timming told the conference. One woman manager told him that "they make a person look dirty". Another male manager told him "subconsciously that would stop me from employing them." Another male manager said "tattoos are the first thing they [fellow recruiters] talk about when the person has gone out of the door."
The managers were concerned about what their organisations' customers might think, said Dr Timming. "Hiring managers realise that, ultimately, it does not matter what they think of tattoos – what really matters, instead, is how customers might perceive employees with visible tattoos.
"Respondents expressed concern that visibly tattooed workers may be perceived by customers to be 'abhorrent', 'repugnant', 'unsavoury' and 'untidy'. It was surmised that customers might project a negative service experience based on stereotypes that tattooed people are thugs and druggies."
One woman manager told him: "We all judge people on first impressions and what we sum up is quite quick. When they [customers] walk in the door and see that there's a receptionist with guns or knives tattooed, or 'hate' tattooed, I think that is something that would be uncomfortable."
Dr Timming said: "The one qualification to this argument is there are certain industries in which tattoos may be a desirable characteristic in a job interview. For example, an HR manager at a prison noted that tattoos on guards can be 'something to talk about' and 'an in' that you need to make a connection with the prisoners."
The negative attitude to tattoos did not extend to ones that could be easily concealed by clothing. Three of the managers themselves had concealed tattoos – one "was so proud of his body art that he somewhat humorously took off his shirt, exposing his naked torso" during his conversation with Dr Timming.
Dr Timming also found that in some of the organisations it was only certain types of tattoos that diminished the chances of getting a job at interview. One male manager told him: "If it's gang culture-related you may have a different view about the tattoo than if it's just because it's a nice drawing of an animal that they've done on their arm."
Dr Timming told the conference: "Tattoo acceptance was at its highest with innocuous symbols like flowers or butterflies. Military insignia was also seen as a 'badge of honour'.

"Examples of distasteful tattoos given by the managers included 'a spider's web tattooed on the neck'; 'somebody being hung, somebody being shot'; 'things to do with death'; 'face tears, which suggest that you've maimed or killed'; 'something of a sexual content'; anything with 'drug connotations'; and 'images with racist innuendo' such as a swastika."
He also found that "there was a broad consensus among the respondents that although visible tattoos still hold a degree of taboo, in the not-so-distant future they will inevitably gain greater acceptance in the wider society.
"Several respondents pointed out that intolerance to tattoos is currently strongest amongst the older generations. That, coupled with the increasing prevalence of tattoos in younger people, points to a future in which body art will become largely normalised and accepted.
"Tattooed applicants can take comfort in the fact that the stigma associated with body art appears to be on the wane and that, as a corollary, there will likely be an increase in the number of potentially sympathetic tattooed hiring managers.
"In the event that one chooses to get a visible tattoo, one would do well to select a genre that is unlikely to be perceived as distasteful by hiring managers, co-workers and customers alike."
Dr Timming's interviewees worked for 14 organisations with between one and 24,000 staff, and were all based in mid or southern Scotland. The managers were aged in their 30s, 40s, 50s and 60s.

http://www.eurekalert.org/pub_releases/2013-09/esoc-bui083013.php

Being underweight increases death risk of CAD women by 2-fold

The aim of the current study was to examine the effect of weight change over time on survival in women with CAD and different body weight classes

Amsterdam, The Netherlands –Being underweight increases the death risk of women with coronary artery disease (CAD) by 2-fold, according to research presented at the ESC Congress today by Dr Aziza Azimi from Denmark. The study suggests that underweight women with CAD should gain weight to reduce their risk of death.
Dr Azimi said: "The increasing prevalence of obesity is concerning because it is a major risk factor for cardiovascular disease, early death and other diseases like diabetes mellitus type 2, high blood pressure, and high cholesterol. To our knowledge until now the impact of weight change on risk of death in women with CAD has not been studied."
The aim of the current study was to examine the effect of weight change over time on survival in women with CAD and different body weight classes. The study included 1,685 women (average age 64 years) diagnosed with CAD based on coronary angiography during 2005-2011. Body weight was obtained from anaesthesiology and coronary angiography records. Patients were followed for 6 years.
Weight change was stratified into 3 groups: no change (gain or loss of <2 kg/year), weight loss (loss of >2 kg/year) and weight gain (gain of >2 kg/year). The women were also divided into four weight classes by body mass index (BMI, kg/m2): underweight (BMI<20 kg/m2), normal weight (BMI 20-24.9 kg/m2), overweight (BMI 25.0-29.9 kg/m2), and obese (BMI >30.0 kg/m2).
Hazard ratios (HRs) for risk of death were calculated using the normal weight group as reference. The researchers adjusted for age, smoking, diabetes, previous heart surgery, previous percutaneous coronary intervention, use of statins and antihypertensive drugs, and degree of CAD.
The researchers found that maintaining weight lowered the risk of death in obese women with CAD (HR=0.36, p=0.06). Weight gain and weight loss did not appear to affect their risk of CAD death compared to the normal weight group.
Dr Azimi said: "Weight maintenance decreased the risk of death in obese women with CAD. Obese women are more likely to be treated early with statins, antihypertensive or diabetes drugs, and this may reduce their risk. Weight management should be individual due to their medical condition."
In contrast, underweight women who maintained their weight significantly increased their risk of death by 2-fold (HR=2.15, p=0.03). In this group, losing weight appeared to further increase their risk by 2-fold (although the findings were not significant).
Dr Azimi said: "Weight maintenance or weight loss seems to increase the risk of death in underweight women with CAD. Our findings suggest that these women should gain weight in order to reduce their risk of death."
She concluded: "These data appear to be against the common sense that obesity is a risk factor for cardiovascular mortality as underweight has been even more strongly related to worse clinical outcome than overweight. Future investigations will be necessary to prove this new concept."

http://www.eurekalert.org/pub_releases/2013-09/ssoa-ito082913.php

Iranian telegraph operator, first to propose earthquake early warning system

In 1909, an Iranian telegraph operator living in the remote desert town of Kerman noticed an unusual movement of the magnetic needle of his telegraph instrument.

SAN FRANCISCO -- While other telegraph operators during the late 1800s and early 1900s noticed the phenomenon, the Iranian telegraph operator proposed an earthquake early warning system, as detailed in an article published today by the journal Seismological Research Letters (SRL).

Nineteenth century telegraph operators in New Zealand, Switzerland, Chile, the Caribbean and elsewhere noted the usefulness of electric telegraph for recording natural phenomena. But the Iranian telegraph operator and cashier, named Yusef (Joseph), took the next step, suggesting the concept of a local earthquake warning system in a Persian newspaper, The New Iran.

He became aware of anomaly in 1897 and put the knowledge to use in 1909, using the six seconds of warning to urge his fellow dwellers to evacuate the building.

"I am confident if a more sophisticated instrument is built," wrote Yusef, "a few minutes after the needle's anomalous move, the earthquake will be felt. And if the system is connected to a big bell (an alarm system), it can be heard by all the people, and their lives will be saved."

While J.D. Cooper, M.D. is credited with first proposing an early warning system in 1868, which he described in an article printed by The San Francisco Daily Bulletin, the Iranian telegraph operator living on the edge of desert likely had no access to American newspapers. Few newspapers existed at that time in Iran, when the literacy rate did not exceed five percent.

Manuel Berberian, who authored the SRL paper, called Yusef's attempt to transfer knowledge in the service of others "priceless." He noted that by the 100th anniversary of the printing of Yusef's article, earthquakes had claimed the lives of more than 164,000 Iranians, and no plans for an early warning system are in development.

The article, "Early Earthquake Detection and Warning Alarm System in Iran by a Telegraph Operator: A 116-Year-Old Disaster Prevention Attempt," will appear in the September issue of SRL, which is published by the Seismological Society of America.

http://www.eurekalert.org/pub_releases/2013-09/afps-foh083013.php

Fear of holes may stem from evolutionary survival response

What do lotus flowers, soap bubbles, and aerated chocolate have in common?

They may seem innocuous, even pleasant, but each of these items is a trigger for people who report suffering from trypophobia, or the fear of holes. For trypophobes, the sight of clusters of holes in various formations can cause intensely unpleasant visceral reactions.

New research from psychological scientists Geoff Cole and Arnold Wilkins of the University of Essex suggests that trypophobia may occur as a result of a specific visual feature also found among various poisonous animals. The findings are published in Psychological Science, a journal of the Association for Psychological Science.

"These findings suggest that there may be an ancient evolutionary part of the brain telling people that they are looking at a poisonous animal," says Cole.

Trypophobia is widely documented by sufferers on the Internet and, in one study, Cole and Wilkins found that about 16% of participants reported trypophobic reactions. Despite this, there has been little scientific investigation of the phenomenon, leading Cole to refer to trypophobia as "the most common phobia you have never heard of."

Cole and Wilkins, both vision scientists, wondered whether there might be a specific visual feature common to trypophobic objects. They compared 76 images of trypophobic objects (obtained from a trypophobia website) with 76 control images of holes not associated with trypophobia. After standardizing various features of the images, the researchers found that the trypophobic objects had relatively high contrast energy at midrange spatial frequencies in comparison to the control images.

Why might this unique visual feature lead to such aversive reactions? One trypophobia sufferer provided Cole with a clue: He had seen an animal that caused him to experience a trypophobic reaction.

The animal in question, the blue-ringed octopus, is one of the most poisonous animals in the world, which led Cole to a "bit of a Eureka moment."

He and Wilkins analyzed images of various poisonous animals — including the blue-ringed octopus, deathstalker scorpion, king cobra snake, and other poisonous snakes and spiders — and found that they, too, tended to have relatively high contrast at midrange spatial frequencies.

In light of this, the researchers speculate that trypophobia may have an evolutionary basis — clusters of holes may be aversive because they happen to share a visual feature with animals that humans have learned to avoid as a matter of survival.

"We think that everyone has trypophobic tendencies even though they may not be aware of it," says Cole. "We found that people who don't have the phobia still rate trypophobic images as less comfortable to look at than other images."
In studies currently under way, Cole and Wilkins are exploring whether manipulating the spectral characteristics of images of everyday objects, like watches, leads people to prefer one object over another. They believe these experiments will shed light on just how ingrained trypophobic tendencies might be.
The article abstract is available online at: http://pss.sagepub.com/content/early/2013/08/23/0956797613484937

http://www.eurekalert.org/pub_releases/2013-09/jhm-rsc090313.php

Robotic surgery complications underreported, Johns Hopkins Study suggests

'Haphazard' system of reporting yields misleading picture of safety

Despite widespread adoption by hospitals of surgical robot technology over the past decade, a "slapdash" system of reporting complications paints an unclear picture of its safety, according to Johns Hopkins researchers.
In a report published online in the Journal for Healthcare Quality, the Johns Hopkins team says that of the 1 million or so robotic surgeries performed since 2000, only 245 complications -- including 71 deaths -- were reported to the U.S. Food and Drug Administration. When an adverse event or device malfunction occurs, hospitals are required to report these incidents to the manufacturer, which in turn is required to report them to the FDA. But this doesn't always happen, the researchers say.
"The number reported is very low for any complex technology used over a million times," says Martin A. Makary, M.D., M.P.H., an associate professor of surgery at the Johns Hopkins University School of Medicine. "Doctors and patients can't properly evaluate safety when we have a haphazard system of collecting data that is not independent and not transparent. There may be some complications specific to the use of this device, but we can only learn about them if we accurately track outcomes."
As part of their study, the researchers found several incidents reported in the national news media that were not reported to the FDA until after the stories appeared in the press, even though the incidents took place long before the media exposure. Makary says it's likely many other incidents go unreported, never to be captured by research like his or by the FDA.
"We need innovation in medicine and, in this country, we are tremendously good at introducing new technologies," he says. "But we have to evaluate new technology properly so we don't over-adopt -- or under-adopt -- important advances that could benefit patients."
Robot-assisted surgery is a minimally invasive technique employed in a variety of operations from hysterectomy to removal of the gallbladder to repair of the mitral valve of the heart. To perform the surgery, small incisions are made through which remote-controlled instruments are inserted into the body. The surgeon directs the movement of the instruments via console, possibly from another room. Such devices can get into smaller spaces than human hands and fingers can. Some surgeons complain that the robot reduces tactile sensations, making it difficult to be certain they are making appropriate incisions, but recent studies have found that patient outcomes after robot-assisted surgery are the same as with laparoscopic procedures, albeit more expensive.
In his study, Makary explains how the use of robots in surgery has skyrocketed in recent years. Between 2007 and 2011, the number of procedures performed using them increased by more than 400 percent in the United States and more than 300 percent internationally. At the end of 2011, there were 1,400 surgical robots installed in American hospitals, up from 800 just four years before.
For their study, Makary and his colleagues reviewed the FDA adverse events database from Jan. 1, 2000, to Aug. 1, 2012. They also searched legal judgments and adverse events using LexisNexis to scan news media, and PACER to scan court records. The cases were then cross-referenced to see if they matched. They found that eight cases were not appropriately reported to the FDA, five of which were never filed and two of which were filed only after a story about them appeared in the press.
The researchers also reviewed all reported complications. The procedures most commonly associated with death were gynecologic (22 of the 71 deaths), urologic (15 deaths) and cardiothoracic (12 deaths). The cause of death was most often excessive bleeding. In cases where patients survived, hysterectomy by far had the most complications (43 percent of injuries).
A previous study found that nearly 57 percent of surgeons anonymously surveyed reported irrecoverable operative malfunction while using the robotic system and had to convert to laparoscopic or open surgery as a result.
Makary says there needs to be standardized reporting of adverse events related to robotic devices. One rare complication that occurs, he says, is that a surgeon can accidently cut the aorta because the surgeon cannot feel

its firmness. For reporting purposes, however, it's unclear whether such an event is surgeon error or device-related error.
Makary argues that these errors, although preventable with proper technique, should be tracked as device-related because they are more common with robotic surgery compared to conventional surgery. Without better reporting standards, he says, these complications are less likely to be reported to the FDA at all, and thus cannot contribute to understanding or identifying safety problems. The FDA, in this scenario, is only collecting device-related complications. He suggests one solution may be to use a database like the one maintained by the American College of Surgeons in which independent nurses identify and track adverse events and complications of traditional operations.
Good information on robotic surgery is not only needed for research, but also to ensure patients are fully informed about potential risks. Right now, Makary says, it is too easy for a surgeon to say there are no additional risks related to robotic surgery because the evidence is nowhere to be found. "Decisions should not be made based on the information in the FDA database," he says. "We need to be able to give patients answers to their questions about safety and how much risk is associated with the robot. We have all suspected the answer has not been zero. We still don't really know what the true answer is."
Other Johns Hopkins researchers who contributed to the study include Michol A. Cooper, M.D., Ph.D.; Andrew Ibrahim, M.D.; and Heather Lyu, B.A.

http://www.sciencedaily.com/releases/2013/09/130903101550.htm

Two New Versions of the Flu Vaccine Arriving Soon

For the first time, there will be a vaccine which protects against four strains of the flu virus. Until now, flu vaccines have only protected against three forms of the virus.

Each year, scientists choose what they believe will be the three most common forms of the flu to spread during the winter months, and they incorporate them into the annual vaccine. This year's new vaccine containing four varieties has those three flu forms and an additional version of the virus.
"The real need for the vaccine with four flu viruses comes if that additional virus begins to circulate," says Clark Kebodeaux, Pharm.D., BCACP, assistant professor of pharmacy practice at St. Louis College of Pharmacy. "At this early point, it's not certain what types of flu will cause the most illnesses."
Vaccines will be available through two forms of injections and a nasal spray. "If parents want to ensure that their children receive the new style of vaccine, ask for a nasal spray instead of an injection," Kebodeaux says. "The four strain vaccine is available by injection as well, but some injections only include the three strain vaccine. Going forward after this year, we'll know if the additional protection is necessary."
Adults with egg allergies have a new option as well. An egg-free version of the vaccine is available, but it is only for adults ages 18 to 49.
Kebodeaux adds that older adults, and those with chronic conditions like diabetes and asthma, need to receive an injection as soon as the vaccines arrive. The high-dose version of the vaccine for older adults protects against three versions of the flu virus. "I encourage everyone to get any version of the flu vaccine," Kebodeaux says. "There will be plenty for everyone."

http://www.wired.com/wiredscience/2013/09/tools-and-language/

Striking Patterns: Study Suggests Tool Use and Language Evolved Together

When did humans start talking? There are nearly as many answers to this perplexing question as there are researchers studying it.

By Michael Balter, ScienceNOW

A new brain imaging study claims to support the hypothesis that language emerged long before Homo sapiens and coevolved with the invention of the first finely made stone tools nearly 2 million years ago. However, some experts think it’s premature to draw sweeping conclusions.
Unlike ancient bones and stone tools, language does not fossilize. Researchers have to guess about its origins based on proxy indicators. Does painting cave walls indicate the capacity for language? How about the ability to make a fancy tool? Yet, in recent years, scientists have made some progress. A series of brain imaging studies by Dietrich Stout, an archaeologist at Emory University in Atlanta, and Thierry Chaminade, a cognitive neuroscientist at Aix-Marseille University in France, have shown that toolmaking and language use similar parts of the brain, including regions involved in manual manipulations and speech production.
Moreover, the overlap is greater the more sophisticated the toolmaking techniques are. Thus, there was little overlap when modern-day flint knappers were making stone tools using the oldest known techniques, dated to 2.5 million years ago and called the Oldowan technology. But when knappers used a more sophisticated approach, called Acheulean technology and dating to as much as 1.75 million years ago, the parallels between toolmaking and language were more evident. Stout and Chaminade have used functional magnetic resonance

imaging (fMRI) and positron emission tomography (PET) scans, although not on the same subjects at the same time.

Acheulean handaxes found in Haute-Garonne, France. **Image: Didier Descouens/Wikimedia Commons**

In the new work, published online today in PLOS ONE, archaeologist Natalie Uomini and experimental psychologist Georg Meyer, both at the University of Liverpool in the United Kingdom, attempted to advance these earlier studies in several ways. They applied a technique called functional transcranial Doppler ultrasonography (fTCD), which measures blood flow to the brain's cerebral cortex and which—unlike fMRI and PET—is highly portable and can be used on subjects in the field through a device attached to their heads.

The fTCD approach makes it much easier to monitor subjects' brains during vigorous activity, such as the somewhat violent motions that are required to make stone tools. Uomini and Meyer are also the first to study both toolmaking and language tasks in the same subjects.

The researchers recruited 10 expert flint knappers and gave them two different tasks. In the first, the knappers crafted an Acheulean hand ax (see photo), a symmetrical tool that requires considerable planning and skill. The procedure involves shaping a flint core with another stone called a hammerstone. While wearing the fTCD monitor, the knappers worked on the tool for periods of about 30 seconds each, interspersed with control periods of about 20 seconds in which they simply struck the core with the hammerstone without trying to make a tool.

In the second task, the knappers were asked to silently think up words beginning with a given letter. The control periods consisted of simply resting quietly and not thinking of words.

The team found that the pattern of blood flow changes in the brain during the critical first 10 seconds of each experimental period—when the knappers were strategizing about how to shape the core or thinking up their first words—was very similar, again involving areas of the brain implicated in manual manipulations and language. Moreover, although there were some variations in the patterns between the 10 knappers, the toolmaking and language patterns within each individual were very closely aligned—suggesting, the team concludes, that the same brain areas recruited in both tasks.

The results, Uomini and Meyer argue, support earlier hypotheses that language and toolmaking coevolved, perhaps beginning as early as 1.75 million years ago. This doesn't necessarily mean that early humans were talking in the same rapid-fire way that we do today, Uomini points out, but that "the circuits for both activities were there early on."

Stout calls the new study "exciting work" that provides "one more piece of evidence supporting a link between stone-tool making and language evolution." Yet a number of questions remain, he says, such as whether the correlation is between the motor skills involved in making tools and in making the sounds of speech, or whether toolmaking and language share higher cognitive functions such as those used in symbolic behavior.

That question is critical, some researchers say, because the knappers in this study and the ones that Stout conducted probably used a technique known as the Late Acheulean, dating from about 500,000 years ago, which put a much greater emphasis on symmetry and aesthetic considerations than did the earliest Acheulean, dating from 1.75 million years ago.

"There is an enormous difference" between these varieties of Acheulean toolmaking, says Michael Petraglia, an archaeologist at the University of Oxford in the United Kingdom, who adds that "future experimental studies should thus examine the range of techniques and methods used."

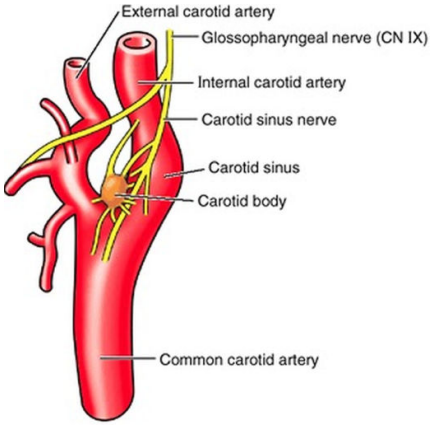
Thus the new work is "consistent with the hypothesis" of coevolution between language and toolmaking, "but not proof of it," says Michael Corballis, a psychologist at the University of Auckland in New Zealand. "It is possible that language itself emerged much later, but was built on circuits established during the Acheulean" period.

Thomas Wynn, an archaeologist at the University of Colorado, Colorado Springs, is even more cautious about the results. He thinks that the fTCD technique, which measures blood flow to large areas of the cerebral cortex but does not have as high a resolution as fMRI or PET, "is a crude measure, even for brain imaging techniques." As a result, Wynn says, he is "far from convinced" that the study has anything new to say about language evolution.

http://www.sciencedaily.com/releases/2013/09/130903113300.htm

New Effective Treatment for High Blood Pressure? Removing Tiny Organ

Removing one of the tiniest organs in the body has shown to provide effective treatment for high blood pressure.



The discovery, made by University of Bristol researchers and published in Nature Communications, could revolutionise treatment of the world's biggest silent killer.

The carotid body -- a small nodule (no larger than a rice grain) found on the side of each carotid artery -- appears to be a major culprit in the development and regulation of high blood pressure.

Researchers, led by Professor Julian Paton, found that by removing the carotid body connection to the brain in rodents with high blood pressure, blood pressure fell and remained low.

Professor Paton, from Bristol's School of Physiology and Pharmacology, said: "We knew that these tiny organs behaved differently in conditions of hypertension but had absolutely no idea that they contributed so massively to the generation of high blood pressure; this is really most exciting."

Normally, the carotid body acts to regulate the amount of oxygen and carbon-dioxide in the blood. They are stimulated when oxygen levels fall in your blood as occurs when you hold your breath. This causes a dramatic increase in breathing and blood pressure until blood oxygen levels are restored. This response comes about through a nervous connection between the carotid body and the brain.

Professor Paton commented: "Despite its small size the carotid body has the highest blood flow of any organ in the body. Its influence on blood pressure likely reflects the priority of protecting the brain with enough blood flow."

The team's work on carotid body research started in the late 1990's and their recent discovery has since led to a human clinical trial at the Bristol Heart Institute of which the results are expected at the end of the year.

Professor Paton added: "This is an extremely proud moment for my research team as it is rare that this type of research can so quickly fuel a human clinical trial. I am delighted that Bristol was chosen as a site for this important trial."

The work was funded by the British Heart Foundation, Cibiem, New York and the National Institutes of Health.

Fiona D. McBryde, Ana P. Abdala, Emma B. Hendy, Wioletta Pijacka, Paul Marvar, Davi J. A. Moraes, Paul A. Sobotka, Julian F. R. Paton. The carotid body as a putative therapeutic target for the treatment of neurogenic hypertension. Nature Communications, 2013; 4 DOI: 10.1038/ncomms3395

http://bit.ly/15B3pEO

Magnetic Levitation Train Hits 310 MPH

Japan's railways are (rightly) famous for their bullet trains that move at up o 200 miles an hour. The Central Japan Railway Co. recently tested one that makes the bullet trains seem positively slow, reaching 310 miles per hour.

Sep 3, 2013 01:35 PM ET // by Jesse Emspak

It's called the L-Zero, and it's a magnetic levitation, or maglev, train. Once it gets up to speed, it doesn't use wheels — magnetic fields levitate it above the tracks. The train essentially flies. Once in service, the train will get from Tokyo to Osaka in 45 minutes, a trip that takes about an hour and a half now.

The railway tested a five-car train on a 27-mile track, making it the longest maglev train anywhere, as well as the fastest. Magnets not only float it above the tracks but keep the train itself centered.

Even though it reached its maximum speed in a few minutes, none of the people invited for the ride — mostly local journalists — reported feeling pressed back into their seats.

Completion is scheduled for 2027; the whole project will cost $90 billion. Even with the big up-front investment, though, maglev trains promise lower operating costs because there is less wear on the tracks.

If the L-Zero were built here, it could cut the travel time between Boston and New York to under an hour; a trip from San Francisco to Los Angeles would take an hour and ten minutes. Even trips cross-country would be more feasible; Amtrak's Lake Shore Limited takes 19 hours to go 960 miles from New York to Chicago. A high-speed maglev could do it in less than half that, with stops.

Sadly, such a project remains a dream, despite the $8 billion the Obama administration promised for rail projects, which are geared to more conventional high-speed technologies.

http://bit.ly/1fxqjT9

Standard Vaccines Can Offer Protection against H5N1 Pandemic Avian Flu

A test vaccine has been found to be protective against a synthetic version of the H5N1 virus, but the result might not predict performance on real pandemic H5N1

By Beth Mole and Nature News Blog | Tuesday, September 3, 2013

Scientists may be able to protect humans from avian influenza viruses – before they have even evolved to spread among people.

An experimental flu vaccine designed for a bird-specific H5N1 influenza virus can protect humans from a lab-made H5N1 strain engineered to pass among mammals. The finding is published today in the Journal of Clinical Investigation.

The vaccine was made the same way as seasonal flu shots. But it was tested on a synthetic H5N1 flu, tweaked to spread among ferrets, a model of human infection. Doing any research of this sort has been dogged by heated debate and self-imposed moratorium.

"The transmissible viruses are very scary because H5N1 has a very high mortality rate," says lead author James Crowe, of Vanderbilt University in Nashville, Tennessee. But he says that the study justifies creating such dangerous pathogens in lab. "Our paper shows that there is a very clear mechanism for conventional vaccines to kill these things."

Crowe and his colleagues took the blood of four patients given the experimental vaccine, and singled out the antibodies that could attack H5N1 viruses. They next wanted to test whether these antibodies could protect against the synthetic H5N1 virus — scientist's best estimation of what a potentially pandemic virus may look like.

But scientists had enacted a voluntary moratorium on working with the highly pathogenic strains out of fear that they could get out of the lab or be used as a weapon.

To get around this, the researchers used DNA sequences from the synthetic virus to create pseudo-versions that would not cause disease. They found that antibodies from the patients' blood could defeat the faux transmissible flu by binding between mutations that allow it to spread among mammals.

Richard Webby, a flu expert at St. Jude Children's Research Hospital in Memphis, Tennessee, says that the finding confirms that vaccines based on the bird virus can still be useful against strains that become more infectious. "Those transmission changes didn't really seem to affect the protection afforded by the vaccines," he explains. Webby says that the approach could guide vaccine development for other looming avian flu viruses, such as H7N9.

But Simon Wain-Hobson, chair of the Foundation for Vaccine Research in Washington DC, is less convinced that the synthetic virus will exactly predict what a real pandemic H5N1 may do. Moreover, he says that the artificial virus did not lead to a better vaccine, which some scientists have claimed is the point of doing research with human-transmissible viruses.

http://bit.ly/14oufRb

Carbon dating shows ancient Egypt's rapid expansion

The powerful civilisation of ancient Egypt took just a few centuries to build, according to a radiocarbon dating study that sets the first solid chronology for the period.

00:01 04 September 2013 by Jo Marchant

Five thousand years ago, Egypt became the world's first territorial state with strict borders, organised religion, centralised administration and intensive agriculture. It lasted for millennia and set a template that countries still follow today.

Archaeologists have assumed it developed gradually from the pastoral communities that preceded it, but physicist Mike Dee from the University of Oxford and his colleagues now suggest that the transition could have taken as little as 600 years.

The early history of ancient Egypt is murky because although there are plenty of archaeological finds, including royal tombs, there is no reliable way to attribute firm dates to the various reigns and periods. Radiocarbon dating has previously been of limited use because dating individual objects gives ranges of up to 300 years.

To improve on that, Dee and his colleagues used a computerised statistical approach known as Bayesian modelling. They compiled radiocarbon dates from nearly 200 artefacts, including hair, plants and bone, from known reigns or periods during Egypt's First Dynasty and the Predynastic period before it. They entered these into a computer model to estimate the most likely dates of transition between the different periods.

It is illegal to remove archaeological samples from Egypt, so the researchers dated items from museum collections in Europe and North America, as well as freshly excavated seed samples from Tell es-Sakan on the Gaza Strip, which was an outpost of ancient Egypt.

The first king

For the First Dynasty, the estimated reign lengths match the human lifespan, which was around 30 to 40 years at the time. This suggests that Egypt was ruled by individual kings right from the start, rather than by clans, as some experts have suggested. The researchers used carbon dating to estimate with 68 per cent probability that the first ruler, King Aha, took to the throne between 3111 and 3045 BC, and died between 3073 and 3036 BC. They also concluded that the Predynastic period began in 3800-3700 BC, so it lasted just 600-700 years, several centuries less than previously thought. "This is a period during which Egypt goes through a major transition," says Dee. It started with small, cattle-owning communities who migrated with the seasons. "At the end you've got a state."

"All the important things that our societies do were invented then," says Günter Dreyer who, until recently, was the director of the German Archaeological Institute in Cairo, and has led excavations at Abydos, one of ancient Egypt's oldest cities, for more than 30 years. "We're still standing on their shoulders."

He is sceptical about the accuracy of radiocarbon measurements when it comes to absolute dates, but agrees the technique gives a valuable indication of the lengths of different historical periods. During the Predynastic period, progress "becomes faster and faster, so much happens", he says. "In the last two centuries, around 3200 BC, it is breathtaking." Dee hopes that archaeologists will now reappraise the period, to start to understand what triggered such dramatic changes.

Journal reference: Proceedings of the Royal Society A, DOI: 10.1098/rspa.2013.0395

http://www.bbc.co.uk/news/health-23932577

Sleep 'boosts brain cell numbers'

Scientists believe they have discovered a new reason why we need to sleep - it replenishes a type of brain cell.

Sleep ramps up the production of cells that go on to make an insulating material known as myelin which protects our brain's circuitry. The findings, so far in mice, could lead to insights about sleep's role in brain repair and growth as well as the disease MS, says the Wisconsin team. The work is in the Journal of Neuroscience.

Dr Chiara Cirelli and colleagues from the University of Wisconsin found that the production rate of the myelin making cells, immature oligodendrocytes, doubled as mice slept. The increase was most marked during the type of sleep that is associated with dreaming - REM or rapid eye movement sleep - and was driven by genes. In contrast, the genes involved in cell death and stress responses were turned on when the mice were forced to stay awake.

Precisely why we need to sleep has baffled scientists for centuries. It's obvious that we need to sleep to feel rested and for our mind to function well - but the biological processes that go on as we slumber have only started to be uncovered relatively recently.

Growth and repair

Dr Cirelli said: "For a long time, sleep researchers focused on how the activity of nerve cells differs when animals are awake versus when they are asleep. "Now it is clear that the way other supporting cells in the nervous system operate also changes significantly depending on whether the animal is asleep or awake."

The researchers say their findings suggest that sleep loss might aggravate some symptoms of multiple sclerosis (MS), a disease that damages myelin.

In MS, the body's immune system attacks and destroys the myelin coating of nerves in the brain and spinal cord. Future studies could look at whether or not sleep affects the symptoms of MS, says Dr Cirelli. Her team is also interested in testing whether lack of sleep, especially during adolescence, may have long-term consequences for the brain.

Sleep appears necessary for our nervous systems to work properly, says the US National Institute of Neurological Disorders and Stroke (NINDS). Deep sleep coincides with the release of growth hormone in children and young adults. Many of the body's cells also show increased production and reduced breakdown of proteins during deep sleep. Since proteins are the building blocks needed for cell growth and for repair of damage from factors like stress and ultraviolet rays, deep sleep may truly be "beauty sleep", says NINDS.

http://www.eurekalert.org/pub_releases/2013-09/sfri-uhv082713.php

Using harsh verbal discipline with teens found to be harmful

Many American parents yell or shout at their teenagers. A new longitudinal study has found that using such harsh verbal discipline in early adolescence can be harmful to teens later.

Instead of minimizing teens' problematic behavior, harsh verbal discipline may actually aggravate it. The study, from researchers at the University of Pittsburgh and the University of Michigan, appears in the journal Child Development.

Harsh verbal discipline happens when parents use psychological force to cause a child to experience emotional pain or discomfort in an effort to correct or control behavior. It can vary in severity from yelling and shouting at a child to insulting and using words to humiliate. Many parents shift from physical to verbal discipline as their children enter adolescence, and harsh verbal discipline is not uncommon. A nationally representative survey found that about 90 percent of American parents reported one or more instances of using harsh verbal discipline with children of all ages; the rate of the more severe forms of harsh verbal discipline (swearing and cursing, calling names) directed at teens was 50 percent.

Few studies have looked at harsh verbal discipline in adolescence. This study found that when parents use it in early adolescence, teens suffer detrimental outcomes later. The children of mothers and fathers who used harsh verbal discipline when they were 13 suffered more depressive symptoms between ages 13 and 14 than their peers who weren't disciplined in this way; they were also more likely to have conduct problems such as misbehaving at school, lying to parents, stealing, or fighting.

Moreover, the study found that not only does harsh verbal discipline appear to be ineffective at addressing behavior problems in youths, it actually appears to increase such behaviors. Parents' hostility increases the risk of delinquency by lowering inhibition and fostering anger, irritability, and belligerence in adolescents, the researchers found. The effect went the other way, too. Children who had conduct problems at 13 elicited more harsh verbal discipline from their parents between ages 13 and 14.

The study looked at 967 two-parent families and their children. About half were European American; 40 percent were African American and the rest were of other ethnic backgrounds. Most of the families were middle class. Students and parents completed surveys over a two-year period on topics related to their mental health, childrearing practices, the quality of the parent-child relationship, and general demographics.

Adolescents' conduct problems were assessed at ages 13 and 14 by survey questions like "In the past year, how often have you: a) been disobedient in school, b) lied to your parents, c) stolen from a store, d) been involved in a gang fight, and e) damaged public or private property for fun?" The response format ranged from 1 (never) to 5 (10 or more times).

Parents' behaviors indicating harsh verbal discipline were measured by questions like "In the past year, after your child has disobeyed you or done something wrong, how often have you: a) shouted, yelled, or screamed at the child, b) swore or cursed at the child, and c) called the child dumb or lazy or some other name like that?" Items were rated on a 5-point scale, ranging from 1 (never) to 5 (always).

"This is one of the first studies to indicate that parents' harsh verbal discipline is damaging to the developing adolescent," says Ming-Te Wang, assistant professor of psychology in education at the University of Pittsburgh, who led the study. "The notion that harsh discipline is without consequence, once there is a strong parent-child bond—that the adolescent will understand that 'they're doing this because they love me'—is misguided because parents' warmth didn't lessen the effects of harsh verbal discipline.

"Indeed, harsh verbal discipline appears to be detrimental in all circumstances," Wang concludes.

Wang suggests that parents who want to modify their teenage children's behavior would do better by discussing with them their concerns about the consequences of the behavior. The study's findings can inform parenting programs so that parents can learn alternatives to shouting and insulting their teens.

http://www.eurekalert.org/pub_releases/2013-09/uosf-sps090313.php

Stress-related protein speeds progression of Alzheimer's disease

University of South Florida-led preclinical study suggests FKBP51 is a new treatment target for diseases with tau pathology

Tampa, FL - A stress-related protein genetically linked to depression, anxiety and other psychiatric disorders contributes to the acceleration of Alzheimer's disease, a new study led by researchers at the University of South Florida has found. The study is published online today in the Journal of Clinical Investigation.

When the stress-related protein FKBP51 partners with another protein known as Hsp90, this formidable chaperone protein complex prevents the clearance from the brain of the toxic tau protein associated with Alzheimer's disease.

Under normal circumstances, tau helps make up the skeleton of our brain cells. The USF study was done using test tube experiments, mice genetically engineered to produce abnormal tau protein like that accumulated in the brains of people with Alzheimer's disease, and post-mortem human Alzheimer's brain tissue.

The researchers report that FKBP51 levels increase with age in the brain, and then the stress-related protein partners with Hsp90 to make tau more deadly to the brain cells involved in memory formation.

Hsp90 is a chaperone protein, which supervises the activity of tau inside nerve cells. Chaperone proteins typically help ensure that tau proteins are properly folded to maintain the healthy structure of nerve cells.

However, as FKBP51 levels rise with age, they usurp Hsp90's beneficial effect to promote tau toxicity.
"We found that FKB51 commandeers Hsp90 to create an environment that prevents the removal of tau and makes it more toxic," said the study's principal investigator Chad Dickey, PhD, associate professor of molecular medicine at the USF Health Byrd Alzheimer's Institute. "Basically, it uses Hsp90 to produce and preserve the bad tau."
The researchers conclude that developing drugs or other ways to reduce FKB51 or block its interaction with Hsp90 may be highly effective in treating the tau pathology featured in Alzheimer's disease, Parkinson's disease dementia and several other disorders associated with memory loss. A previous study by Dr. Dickey and colleagues found that a lack of FKBP51 in old mice improved resilience to depressive behavior.
The latest study was supported by a grant from the National Institute of Neurological Disorders and Stroke.
"Accelerated neurodegeneration through chaperone-mediated oligomerization of tau;" Laura J. Blair, Bryce A. Nordhues, Shannon E. Hill, K. Matthew Scaglione, John C. O'Leary III, Sarah N. Fontaine, Leonid Breydo, Bo Zhang, Pengfei Li, Li Wang, Carl Cotman, Henry L. Paulson, Martin Muschol, Vladimir N. Uversky, Torsten Klengel, Elisabeth B. Binder, Rakez Kayed, Todd E. Golde, Nicole Berchtold, and Chad A. Dickey; Journal of Clinical Investigation, Vol. 123, No. 10. DOI:10.1172/JCI69003.

http://www.eurekalert.org/pub_releases/2013-09/uow--ssf090313.php

Study: Simian foamy viruses readily occur between humans and macaques in urban Bangladesh

Researchers hope to protect humans from another deadly outbreak like HIV

Throughout Asia, humans and monkeys live side-by side in many urban areas. An international research team from the University of Washington, Fred Hutchinson Cancer Research Center and Jahangirnagar University has been examining transmission of a virus from monkeys to humans in Bangladesh, one of the world's most densely populated countries. The scientists have found that some people in these urban areas are concurrently infected with multiple strains of simian foamy virus (SFV), including strains from more than one source (recombinant) that researchers originally detected in the monkeys.
Simian foamy viruses, which are ubiquitous in nonhuman primates, are retroviruses like HIV. Retroviruses are shown to exhibit high levels of mutation and recombination – a potentially explosive combination.
Their paper, "Zoonotic simian foamy virus in Bangladesh reflects diverse patterns of transmission and co-infection" published in the Sept. 4 issue of Emerging Microbes and Infections (EMI), characterizes the simian retroviral strains that are being zoonotically transmitted and provides a glimpse into the behaviors of humans and monkeys contributing to the infections.
By analyzing what is happening at the human-primate interface, the researchers hope to protect humans from another deadly outbreak like HIV. Their focus is in Asia because it is a continent that has witnessed the emergence of several infectious diseases in the past decade. Asia also has a volatile combination of an increasingly mobile and immunocompromised population living in proximity with animals.
Since more humans have been shown to have been infected with SFV through primate contact than with any other simian-borne virus, the researchers reason that pinpointing the factors that influence SFV transmission and infection are important to a general understanding of how viruses can jump the species barrier.
"If we want to understand how, where and why these primate viruses are being transmitted, we need to be looking at SFV in Asia where millions of people and tens of thousands of macaques are interacting everyday and where we estimate that thousands of people could be infected with strains of SFV," said Lisa Jones-Engel, a primatologist with the National Primate Research Center at the University of Washington and the project leader. "These Asian rhesus macaques are Darwinian superstars. They are very responsive to change and, unlike many other species of primates, they are going to continue to thrive in human-altered habitats."
Jones-Engel said if researchers had been on the ground 50 years ago, they may have seen how simian immunodeficiency viruses (SIV) crossed the species barrier resulting in HIV.
"We have been playing catch up with the SIV-HIV question for years," she said. "We still don't know why only some viral strains are capable of establishing persistent infections in humans."
Jones-Engel said long-term surveillance is needed in the areas where humans and primates come into contact since it's unlikely that SIV/HIV will be the last primate virus to emerge into the human population.
In this study, researchers collected biological samples from hundreds of people and macaques from five urban sites as well as from a group of nomadic people who travel throughout Bangladesh with their performing monkeys.
According to the paper, the towns and villages that constituted research sites for the study are likely similar to hundreds or even thousands of sites throughout Asia, where humans live alongside macaques accustomed to their presence.

The research team found that zoonotic transmission of SFV occurred most commonly through bites. SFV replicates in oral tissues and is secreted in the saliva of infected primates. In their study, more than half of the subjects reported having being bitten at least once by a rhesus macaque, but the percentage of subjects reporting having being bitten at each site varied significantly by subjects' sex and religion. Researchers also found that primates, both human and nonhuman, can be infected with more than one strain of SFV; this is significant because co-infection may lead to viral recombination.
Among those infected with more than one strain of SFV – humans or macaques – recombination between the strains could occur.
Maxine Linial, a retrovirologist at the Fred Hutchinson Cancer Research Center (FHCRC), said successful viruses are readily transmitted and viruses evolve to be successful. She said sometimes viruses have effects on hosts to aid in transmission and these effects can have pathogenic consequences.
"Despite the fact that SFV is currently not known to be pathogenic, this was also the case for SIV before recombination and mutation allowed infection of and transmission between new hosts," Linial said. "The possibility that a pathogenic SFV strain could arise makes it essential to monitor natural infections. If a viral strain with pathogenic potential arises, we will know about it early rather than too late, which was the situation with the emergence of HIV."
By using mutations in the viruses that differentiated them from one another, the researchers were able to group the viruses into strains. They found that these strains showed a strong geographic signal, where monkeys from each given area primarily had strains characteristic of that site. However, deforestation and human transport of monkeys concentrated then moved the strains around.
"These data show a population in transition," said Frederick Matsen, a computational biologist at FHCRC. "If we were to sample 25 years earlier or 25 years later we would have seen a completely different story."
Regardless of whether SFV becomes a significant pathogen, researchers called for continued monitoring of the virus at the human and nonhuman primate interface.

http://www.eurekalert.org/pub_releases/2013-09/uoc--tap090313.php

TB and Parkinson's disease linked by unique protein

UCSF researchers seek way to boost Parkin to fight both diseases

A protein at the center of Parkinson’s disease research now also has been found to play a key role in causing the destruction of bacteria that cause tuberculosis, according to scientists led by UC San Francisco microbiologist and tuberculosis expert Jeffery Cox, PhD.
The protein, named Parkin, already is the focus of intense investigation in Parkinson’s disease, in which its malfunction is associated with a loss of nerve cells. Cox and colleagues now report that Parkin also acts on tuberculosis, triggering destruction of the bacteria by immune cells known as macrophages. Results appear online today (September 4, 2013) in the journal Nature.
The finding suggests that disease-fighting strategies already under investigation in pre-clinical studies for Parkinson’s disease might also prove useful in fighting tuberculosis, according to Cox. Cox is investigating ways to ramp up Parkin activity in mice infected with tuberculosis using a strategy similar to one being explored by his UCSF colleague Kevan Shokat, PhD, as a way to ward off neurodegeneration in Parkinson’s disease. Globally, tuberculosis kills 1.4 million people each year, spreading from person to person through the air. Parkinson’s disease, the most common neurodegenerative movement disorder, also affects millions of mostly elderly people worldwide.
Cox homed in on the enzyme Parkin as a common element in Parkinson’s and tuberculosis through his investigations of how macrophages engulf and destroy bacteria. In a sense the macrophage — which translates from Greek as "big eater” — gobbles down foreign bacteria, through a process scientists call xenophagy. Mycobacterium tuberculosis, along with a few other types of bacteria, including Salmonella and leprosy-causing Mycobacterium leprae, are different from other kinds of bacteria in that, like viruses, they need to get inside cells to mount a successful infection.
The battle between macrophage and mycobacterium can be especially intense. M. tuberculosis invades the macrophage, but then becomes engulfed in a sac within the macrophage that is pinched off from the cell’s outer membrane. The bacteria often escape this intracellular jail by secreting a protein that degrades the sac, only to be targeted yet again by molecular chains made from a protein called ubiquitin. Previously, Cox discovered molecules that escort these chained mycobacteria to more secure confinement within compartments inside cells called lysosomes, where the bacteria are destroyed.
The cells of non-bacterial organisms ranging in complexity from baker’s yeast to humans also use a similar mechanism — called autophagy — to dispose of their own unneeded molecules or worn out cellular

components. Among the most abundant and crucial of these components are the cell's mitochondria, metabolic powerhouses that convert food molecules into a source of energy that the cell can readily use to carry out its everyday housekeeping chores, as well as its more specialized functions.
Like other cellular components, mitochondria can wear out and malfunction, and often require replacement. The process through which mitochondria are disposed of, called mitophagy, depends on Parkin.
Cox became curious about the enzyme when he learned that specific, naturally occurring variations in the Parkin gene, called polymorphisms, are associated with increased susceptibility to tuberculosis infection.
"Because of the commonalities between mitophagy and the xenophagy of intracellular mycobacteria, as well as the links between Parkin gene polymorphisms and increased susceptibility to bacterial infection in humans, we speculated that Parkin may also be recruited to M. tuberculosis and target it for xenophagy," Cox said.
In both mouse and human macrophages infected with M. tuberculosis in the lab, Parkin played a key role in fighting the bacteria, Cox and colleagues found. In addition, genetically engineered mice lacking Parkin died when infected with M. tuberculosis, while mice with normal Parkin survived infection.
The involvement of Parkin in targeting both damaged mitochondria and infectious mycobacteria arose long ago in evolution, Cox argues. As part of the Nature study, the research team found that Parkin-deficient mice and flies – creatures quite distant from humans in evolutionary time – also are more sensitive than normal mice and flies to intracellular bacterial infections. Looking back more than 1 billion years, Cox noted that mitochondria evolved from bacteria that were taken up by cells in a symbiotic relationship.
In the same way that the immune system recognizes infectious bacteria as foreign, Cox said, "The evolutionary origin of mitochondria from bacteria suggests that perhaps mitochondrial dysfunction triggers the recognition of a mitochondrian as non-self."
Having now demonstrated the importance of Parkin in fighting mycobacterial infection, Cox has begun working with Shokat to find a way to boost Parkin activity against cell-invading bacteria. "We are exploring the possibility that small-molecule drugs could be developed to activate Parkin to better fight tuberculosis infection," Cox said.
UCSF co-authors of the study include former graduate student Paolo S. Manzanillo, PhD; graduate student Gianne Souza; postdoctoral fellow Robert O.Watson, PhD, and Gladstone Institutes investigator Ken Nakakura, MD, PhD. Additional co-authors include Janelle Ayres, PhD, from the Salk Institute in San Diego; David Schneider, PhD, from Stanford University; and Michael Shiloh, MD, PhD, from the University of Texas Southwestern Medical Center in Dallas. The study was funded by the National Institutes of Health.

http://www.eurekalert.org/pub_releases/2013-09/jhm-ecr082913.php

Experimental compound reverses Down syndrome-like learning deficits in mice

Researchers at Johns Hopkins and the National Institutes of Health have identified a compound that dramatically bolsters learning and memory when given to mice with a Down syndrome-like condition on the day of birth.

As they report in the Sept. 4 issue of Science Translational Medicine, the single-dose treatment appears to enable the cerebellum of the rodents' brains to grow to a normal size.
The scientists caution that use of the compound, a small molecule known as a sonic hedgehog pathway agonist, has not been proven safe to try in people with Down syndrome, but say their experiments hold promise for developing drugs like it.
"Most people with Down syndrome have a cerebellum that's about 60 percent of the normal size," says Roger Reeves, Ph.D., a professor in the McKusick-Nathans Institute of Genetic Medicine at the Johns Hopkins University School of Medicine. "We treated the Down syndrome-like mice with a compound we thought might normalize the cerebellum's growth, and it worked beautifully. What we didn't expect were the effects on learning and memory, which are generally controlled by the hippocampus, not the cerebellum."
Reeves has devoted his career to studying Down syndrome, a condition that occurs when people have three, rather than the usual two, copies of chromosome 21. As a result of this "trisomy," people with Down syndrome have extra copies of the more than 300 genes housed on that chromosome, which leads to intellectual disabilities, distinctive facial features and sometimes heart problems and other health effects. Since the condition involves so many genes, developing treatments for it is a formidable challenge, Reeves says.
For the current experiments, Reeves and his colleagues used mice that were genetically engineered to have extra copies of about half of the genes found on human chromosome 21.
The mice have many characteristics similar to those of people with Down syndrome, including relatively small cerebellums and difficulty learning and remembering how to navigate through a familiar space. (In the case of the mice, this was tested by tracking how readily the animals located a platform while swimming in a so-called water maze.)

Based on previous experiments on how Down syndrome affects brain development, the researchers tried supercharging a biochemical chain of events known as the sonic hedgehog pathway that triggers growth and development. They used a compound — a sonic hedgehog pathway agonist — that could do just that.
The compound was injected into the Down syndrome-like mice just once, on the day of birth, while their cerebellums were still developing. "We were able to completely normalize growth of the cerebellum through adulthood with that single injection," Reeves says.
But the research team went beyond measuring the cerebellums, looking for changes in behavior, too. "Making the animals, synthesizing the compound and guessing the right dose were so difficult and time-consuming that we wanted to get as much data out of the experiment as we could," Reeves says. The team tested the treated mice against untreated Down syndrome-like mice and normal mice in a variety of ways, and found that the treated mice did just as well as the normal ones on the water maze test.
Reeves says further research is needed to learn why exactly the treatment works, because their examination of certain cells in the hippocampus known to be involved in learning and affected by Down syndrome appeared unchanged by the sonic hedgehog agonist treatment. One idea is that the treatment improved learning by strengthening communication between the cerebellum and the hippocampus, he says.
As for the compound's potential to become a human drug, the problem, Reeves says, is that altering an important biological chain of events like sonic hedgehog would likely have many unintended effects throughout the body, such as raising the risk of cancer by triggering inappropriate growth. But now that the team has seen the potential of this strategy, they will look for more targeted ways to safely harness the power of sonic hedgehog in the cerebellum. Even if his team succeeds in developing a clinically useful drug, however, Reeves cautions that it wouldn't constitute a "cure" for the learning and memory-related effects of Down syndrome. "Down syndrome is very complex, and nobody thinks there's going to be a silver bullet that normalizes cognition," he says. "Multiple approaches will be needed."
Other authors on the paper were Jung H. Shin of the National Institute on Alcohol Abuse and Alcoholism, and Ishita Das, Joo-Min Park, Soo Kyeong Jeon, Hernan Lorenzi, David J. Linden and Paul F. Worley, all of the Johns Hopkins University School of Medicine.
The study was funded by the Down Syndrome Research and Treatment Foundation, Research Down Syndrome, the National Institute of Child Health and Human Development (grant number R01 HD38384), the intramural programs of the National Institute on Alcohol Abuse and Alcoholism, the National Institute of Mental Health (grant number MH51106) and the National Institute of Neurological Disorders and Stroke (grant number R01 NS39156).

http://www.eurekalert.org/pub_releases/2013-09/tfri-cta083013.php

Clinical tool accurately classifies benign and malignant spots on lung scans of smokers

Terry Fox Research Institute-led study assesses new software

Vancouver, BC – A Terry Fox Research Institute(TFRI)-led study has developed a new clinical risk calculator software that accurately classifies, nine out of ten times, which spots or lesions (nodules) are benign and malignant on an initial lung computed tomography (CT) scan among individuals at high risk for lung cancer. The findings are expected to have immediate clinical impact worldwide among health professionals who currently diagnose and treat individuals at risk for or who are diagnosed with lung cancer, and provide new evidence for developing and improving lung-cancer screening programs. A total of 12,029 lung cancer nodules observed on CTs of 2,961 current and former smokers were examined in the population-based study.
The results, to be published in the Sept. 5th issue of the New England Journal of Medicine (NEJM), will have an immediate impact on clinical practice, says co-principal investigator Dr. Stephen Lam, chair of BC's Provincial Lung Tumour Group at the BC Cancer Agency and a professor of medicine at the University of British Columbia.
"We already know that CT screening saves lives. Now, we have evidence that our model and risk calculator can accurately predict which abnormalities that show up on a first CT require further follow up, such as a repeat CT scan, a biopsy, or surgery, and which ones do not. This is extremely good news for everyone – from the people who are high risk for developing lung cancer to the radiologists, respirologists and thoracic surgeons who detect and treat it. Currently, there are no Canadian guidelines for us to use in clinical practice."
In countries where guidelines do exist, they largely relate to nodule size. The pan-Canadian team's prediction model, developed by Brock University epidemiologist Dr. Martin Tammemägi, includes a risk calculator that considers several factors in addition to size: older age, female sex, family history of lung cancer, emphysema, location of the nodule in the upper lobe, part-solid nodule type, lower nodule count and spiculation (presence of sharp or needle-like points). "Reducing the number of needless tests and increasing rapid, intensive diagnostic workups in individuals with high-risk nodules are major goals of the model," says Dr. Tammemägi.

The TFRI team used two sets of data to determine their findings, studying a total of 12,029 nodules from 2,961 persons – current and former smokers, aged 50-75, who had undergone low-dose CT screening. One set involved participants in the TFRI Pan-Canadian Early Detection of Lung Cancer Study from 2008 to 2010, where 1,871 persons with a total of 7,008 nodules (102 of which were malignant) were screened and followed. The other set involved 1,090 persons with 5,021 nodules (of which 42 were malignant) who took part in several lung cancer prevention trials conducted by the BC Cancer Agency during 2000-2010 and were funded through the U.S. National Cancer Institute (NCI). In the former study, participants were followed for an average of three years; in the latter, for an average of eight-and-a-half years.

Dr. Lam says the prediction model holds up even in cases where clinicians are faced with the toughest challenges; for example, deciding what to do when nodules are one centimeter (the approximate width of an adult thumbnail) or smaller. While nodule size is one predictor of lung cancer, the largest nodule appearing on the CT was not necessarily cancerous. The pan-Canadian study team found that nodules located in the upper lobes of the lung carry an increased probability of cancer. In both data sets studied, researchers found that where cancer was present, fewer nodules were found. This model will simplify the work involved, especially for radiologists, in evaluating and assessing nodules on scans, as well as respirologists and thoracic surgeons who must make decisions about tests and treatment for their patients.

"An accurate and practical model that can predict the probability that a lung nodule is malignant and that can be used to guide clinical decision making will reduce costs and the risk of morbidity and mortality in screening programs," wrote Dr. Lam and study colleagues in the article, titled: Probability of Cancer in Pulmonary Nodules Detected on First Screening Computed Tomography."

"The findings in this study bolster the potential for the successful implementation of a lung cancer screening program using low-dose computed tomography (CT) within a high-risk population. This tool, combined with CT-screening, will increase our success in earlier detection, diagnosis and treatment of the disease. Further, this model combined with new guidelines for best clinical practice, will provide our health care system with both effective and affordable tools to implement such a program," says Nova Scotia thoracic surgeon Dr. Michael Johnston, a member of the study team. Dr. Johnston serves on the executive of the Terry Fox Research Institute and is chair of the medical advisory committee of Lung Cancer Canada.

"Many jurisdictions throughout the world are now considering whether or how to best implement lung cancer screening. Studies like this one are key to answering important questions so decisions are most likely to result in good practice and planning, and ultimately benefit patients," says Dr. Heather Bryant, vice-president, cancer control at the Canadian Partnership Against Cancer.

The significant findings come on the heels of the U.S. National Lung Screening Trial (2011) that found a 20% reduction in lung cancer mortality with the use of low-dose thoracic computed tomography.

Dr. Christine Berg, co-principal investigator of the National Lung Screening Trial and former chief, Early Detection Research Group, division of cancer prevention, for the National Cancer Institute in the United States, says: "This important work of Dr. Lam and colleagues is a major advance for clinicians performing lung cancer screening. They provide a tool to grapple with the problem of the high rate of positive low-dose computed tomography scans. Fewer follow-up scans with their attendant cost and fewer biopsies with their complications will need to be performed while continuing to diagnosis lung cancer at an early stage to lower mortality. Coupled with continued public health efforts to lower cigarette smoking, this work will have international impact on the leading cause of cancer death worldwide."

http://www.eurekalert.org/pub_releases/2013-09/eic-bao090313.php

Bizarre alignment of planetary nebulae

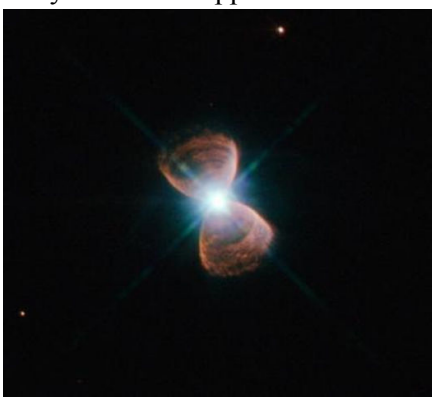
Astronomers have used the NASA/ESA Hubble Space Telescope and ESO's New Technology Telescope to explore more than 100 planetary nebulae in the central bulge of our galaxy.

They have found that butterfly-shaped members of this cosmic family tend to be mysteriously aligned — a surprising result given their different histories and varied properties.

The final stages of life for a star like our Sun result in the star puffing its outer layers out into the surrounding space, forming objects known as planetary nebulae in a wide range of beautiful and striking shapes. One type of such nebulae, known as bipolar planetary nebulae, create ghostly hourglass or butterfly shapes around their parent stars.

All these nebulae formed in different places and have different characteristics. Neither the individual nebulae, nor the stars that formed them, interact with other planetary nebulae. However, a new study by astronomers from the University of Manchester, UK, now shows surprising similarities between some of these nebulae: many of them line up in the sky in the same way [1].

"This really is a surprising find and, if it holds true, a very important one," explains Bryan Rees of the University of Manchester, one of the paper's two authors. "Many of these ghostly butterflies appear to have their long axes aligned along the plane of our galaxy. By using images from both Hubble and the NTT we could get a really good view of these objects, so we could study them in great detail."



The astronomers looked at 130 planetary nebulae in the Milky Way's central bulge. They identified three different types, and peered closely at their characteristics and appearance [2].

"While two of these populations were completely randomly aligned in the sky, as expected, we found that the third -- the bipolar nebulae -- showed a surprising preference for a particular alignment," says the paper's second author Albert Zijlstra, also of the University of Manchester. "While any alignment at all is a surprise, to have it in the crowded central region of the galaxy is even more unexpected."

This image shows an example of a bipolar planetary nebula known as PN Hb 12 -- popularly known as Hubble 12 -- in the constellation of Cassiopeia. The striking shape of this nebula, reminiscent of a butterfly or an hourglass, was formed as a Sun-like star approached the end of its life and puffed its outer layers into the surrounding space. For bipolar nebulae, this material is funnelled towards the poles of the ageing star, creating the distinctive double-lobed structure. **NASA, ESA Acknowledgement: Josh Barrington**

Planetary nebulae are thought to be sculpted by the rotation of the star system from which they form. This is dependent on the properties of this system -- for example, whether it is a binary [3], or has a number of planets orbiting it, both of which may greatly influence the form of the blown bubble. The shapes of bipolar nebulae are some of the most extreme, and are thought to be caused by jets blowing mass outwards from the star system perpendicular to its orbit.

"The alignment we're seeing for these bipolar nebulae indicates something bizarre about star systems within the central bulge," explains Rees. "For them to line up in the way we see, the star systems that formed these nebulae would have to be rotating perpendicular to the interstellar clouds from which they formed, which is very strange."

While the properties of their progenitor stars do shape these nebulae, this new finding hints at another more mysterious factor. Along with these complex stellar characteristics are those of our Milky Way; the whole central bulge rotates around the galactic centre. This bulge may have a greater influence than previously thought over our entire galaxy -- via its magnetic fields. The astronomers suggest that the orderly behaviour of the planetary nebulae could have been caused by the presence of strong magnetic fields as the bulge formed. As such nebulae closer to home do not line up in the same orderly way, these fields would have to have been many times stronger than they are in our present-day neighbourhood [4].

"We can learn a lot from studying these objects," concludes Zijlstra. "If they really behave in this unexpected way, it has consequences for not just the past of individual stars, but for the past of our whole galaxy."

[1] The "long axis" of a bipolar planetary nebula slices though the wings of the butterfly, whilst the "short axis" slices through the body.

[2] The shapes of the planetary nebula images were classified into three types, following conventions: elliptical, either with or without an aligned internal structure, and bipolar.

[3] A binary system consists of two stars rotating around their common centre of gravity.

[4] Very little is known about the origin and characteristics of the magnetic fields that were present in our galaxy when it was young, so it is unclear how they have changed over time.

Research paper - http://www.spacetelescope.org/static/archives/releases/science_papers/heic1315a.pdf

http://www.eurekalert.org/pub_releases/2013-09/uoc-bhi090413.php

Better hygiene in wealthy nations may increase Alzheimer's risk

New research has found a "very significant" relationship between a nation's wealth and hygiene and the Alzheimer's "burden" on its population.

Using 'age-standardised'* data - which predict Alzheimer's rates if all countries had the same population birth rate, life expectancy and age structure -- the study found strong correlations between national sanitation levels and Alzheimer's.

This latest study adds further weight to the "hygiene hypothesis" in relation to Alzheimer's: that sanitised environments in developed nations result in far less exposure to a diverse range of bacteria, viruses and other microorganisms -- which might actually cause the immune system to develop poorly, exposing the brain to the inflammation associated with Alzheimer's disease, say the researchers.

"The 'hygiene hypothesis', which suggests a relationship between cleaner environments and a higher risk of certain allergies and autoimmune diseases, is well-- established. We believe we can now add Alzheimer's to this list of diseases," said Dr Molly Fox, lead author of the study and Gates Cambridge Alumna, who conducted the research at Cambridge's Biological Anthropology division.
"There are important implications for forecasting future global disease burden, especially in developing countries as they increase in sanitation."
The researchers tested whether "pathogen prevalence" can explain the levels of variation in Alzheimer's rates across 192 countries.
After adjusting for differences in population age structures, the study found that countries with higher levels of sanitation had higher rates of Alzheimer's. For example, countries where all people have access to clean drinking water, such as the UK and France, have 9% higher Alzheimer's rates than countries where less than half have access, such as Kenya and Cambodia.
Countries that have much lower rates of infectious disease, such as Switzerland and Iceland, have 12% higher rates of Alzheimer's compared with countries with high rates of infectious disease, such as China and Ghana.
More urbanised countries exhibited higher rates of Alzheimer's, irrespective of life expectancy. Countries where more than three-quarters of the population are located in urban areas, such as the UK and Australia, exhibit 10% higher rates of Alzheimer's compared to countries where less than one-tenth of people inhabit urban areas, such as Bangladesh and Nepal.
Differences in levels of sanitation, infectious disease and urbanisation accounted respectively for 33%, 36% and 28% of the discrepancy in Alzheimer's rates between countries.
Researchers said that, although these trends had "overlapping effects", they are a good indication of a country's degree of hygiene which, when combined, account for 42.5% of the "variation" in countries' Alzheimer's disease rates -- showing that countries with greater levels of hygiene have much higher Alzheimer's rates regardless of general life expectancy.
Previous research has shown that in the developed world, dementia rates doubled every 5.8 years compared with 6.7 years in low income, developing countries; and that Alzheimer's prevalence in Latin America, China and India are all lower than in Europe, and, within those regions, lower in rural compared with urban settings -- supporting the new study's findings.
The results of the study are newly published by the journal Evolution, Medicine and Public Health, with these latest results coming hard on the heels of previous research led by Fox on the benefits of breastfeeding for Alzheimer's prevention.
"Exposure to microorganisms is critical for the regulation of the immune system," write the researchers, who say that say that -- since increasing global urbanisation beginning at the turn of the 19th century -- the populations of many of the world's wealthier nations have increasingly very little exposure to the so-called 'friendly' microbes which "stimulate" the immune system -- due to "diminishing contact with animals, faeces and soil."
Aspects of modern life -- antibiotics, sanitation, clean drinking water, paved roads and so on -- lead to lower rates of exposure to these microorganisms that have been "omnipresent" for the "majority of human history", they say.
This lack of microbe and bacterial contact can lead to insufficient development of the white blood cells that defend the body against infection, particularly those called T-cells -- the foot soldiers of the immune system that attack foreign invaders in the bloodstream.
Deficiency of anti-inflammatory ("regulatory") T-cells has links to the types of inflammation commonly found in the brain of those suffering with Alzheimer's disease, and the researchers' proposal that Alzheimer's risk is linked to the general hygiene levels of a nation's population is reinforced by their analysis of global Alzheimer's rates.
"The increase in adult life expectancy and Alzheimer's prevalence in developing countries is perhaps one of the greatest challenges of our time. Today, more than 50% of people with Alzheimer's live in the developing world, and by 2025 it is expected that this figure will rise to more than 70%," said Fox.
"A better understanding of how environmental sanitation influences Alzheimer's risk could open up avenues for both lifestyle and pharmaceutical strategies to limit Alzheimer's prevalence. An awareness of this by-product of increasing wealth and development could encourage the innovation of new strategies to protect vulnerable populations from Alzheimer's."
While childhood -- when the immune system is developing -- is typically considered critical to the 'hygiene hypothesis', the researchers say that regulatory T-cell numbers peak at various points in a person's life --

adolescence and middle age for example -- and that microorganism exposure across a lifetime may be related to Alzheimer's risk, citing previous research showing fluctuations in Alzheimer's risk in migrants.
The team used the disability-adjusted life year (DALY) rates to calculate the incidence of Alzheimer's across the countries studied. The DALY measurement is the sum of years lost due to premature mortality combined with years spent in disability – the World Health Organisation (WHO) says that one DALY can be thought of as "one lost year of 'healthy' life".
The researchers say this method is a much better measure than death rates as it "omits the effects of differential mortality rates" between developed and developing countries. The study was based on the WHO's 'Global Burden of Disease' report, which presents world dementia data for 2004.

Age-standardised data:

The process of age-standardisation presents a "single summary rate that reflects the number of events that would have been expected if the populations being compared had had identical age distribution" (WHO 2001)

The age-standardised data is calculated by adjusting the crude data for 5-year age groups by age-weights reflecting the age-distribution of the standard population. In the version of the WHO's Global Burden of Disease report we utilised, the terminal age category has been extended from the previous 85+ to 100+, which allows for better adjustment for differences in the proportion of population in older strata.

The age-adjusted and disability-adjusted life year (DALY) rates are calculated by "adjusting the crude estimates to an artificial population structure, the WHO Standard Population, that closely reflects the age and sex structure of most low and middle income countries" (WHO 2013).

The effort to construct a standard population for comparing data across populations with varied age-structures began in the 1840s, and progressed to an international scale in 1960 and was then adopted by the WHO. Statisticians have been researching and improving this process for the past five decades.

The new WHO World Standard was developed in 2000 to best reflect projections of world age-structures for the period 2000-2025. This new standard is based on the UN Population Division's assessments every two years and future projections for every five years of each country's population age-structure. This standardised procedure is widely accepted across the world, and is the basis for all relevant WHO-sponsored analyses.

http://www.eurekalert.org/pub_releases/2013-09/uoa-wsc090413.php

What scientists can see in your pee

***Researchers at the University of Alberta announced today that they have determined the chemical* composition of human urine.**

The study, which took more than seven years and involved a team of nearly 20 researchers, has revealed that more than 3,000 chemicals or "metabolites" can be detected in urine. The results are expected to have significant implications for medical, nutritional, drug and environmental testing.
"Urine is an incredibly complex biofluid. We had no idea there could be so many different compounds going into our toilets," noted David Wishart, the senior scientist on the project.
Wishart's research team used state-of-the-art analytical chemistry techniques including nuclear magnetic resonance spectroscopy, gas chromatography, mass spectrometry and liquid chromatography to systematically identify and quantify hundreds of compounds from a wide range of human urine samples.
To help supplement their experimental results, they also used computer-based data mining techniques to scour more than 100 years of published scientific literature about human urine.
This chemical inventory—which includes chemical names, synonyms, descriptions, structures, concentrations and disease associations for thousands of urinary metabolites—is housed in a freely available database called the Urine Metabolome Database, or UMDB. The UMDB is a worldwide reference resource to facilitate clinical, drug and environmental urinalysis. The UMDB is maintained by The Metabolomics Innovation Centre, Canada's national metabolomics core facility.
The chemical composition of urine is of particular interest to physicians, nutritionists and environmental scientists because it reveals key information not only about a person's health, but also about what they have eaten, what they are drinking, what drugs they are taking and what pollutants they may have been exposed to in their environment.
Analysis of urine for medical purposes dates back more than 3,000 years. In fact, up until the late 1800s, urine analysis using colour, taste and smell (called uroscopy) was one of the primary methods early physicians used to diagnose disease. Even today, millions of chemically based urine tests are performed every day to identify newborn metabolic disorders, diagnose diabetes, monitor kidney function, confirm bladder infections and detect illicit drug use.
"Most medical textbooks only list 50 to 100 chemicals in urine, and most common clinical urine tests only measure six to seven compounds," said Wishart. "Expanding the list of known chemicals in urine by a factor of 30 and improving the technology so that we can detect hundreds of urine chemicals at a time could be a real game-changer for medical testing." Wishart says this study is particularly significant because it will allow a

whole new generation of fast, cheap and painless medical tests to be performed using urine instead of blood or tissue biopsies. In particular, he notes that new urine-based diagnostic tests for colon cancer, prostate cancer, celiac disease, ulcerative colitis, pneumonia and organ transplant rejection are already being developed or are about to enter the marketplace, thanks in part to this work.
The Human Urine Metabolome paper appeared today in PLOS ONE. The word metabolome (which is derived from the words "metabolism" and "genome") is defined as the complete collection of metabolites or chemicals found in a particular organism or tissue.
The human urine study is part of a series of studies by researchers at the University of Alberta aimed at systematically characterizing the entire human metabolome. In 2008 the same U of A team described the chemical composition of human cerebrospinal fluid and in 2011 they determined the chemical composition of human blood.
"This is certainly not the final word on the chemical composition of urine," Wishart said. "As new techniques are developed and as more sensitive instruments are produced, I am sure that hundreds more urinary compounds will be identified. In fact, new compounds are being added to the UMDB almost every day.
"While the human genome project certainly continues to capture most of the world's attention, I believe that these studies on the human metabolome are already having a far more significant and immediate impact on human health."

http://www.eurekalert.org/pub_releases/2013-09/asfm-pcd090513.php

Programmed cell death activates latent herpesviruses

Researchers have found that apoptosis, a natural process of programmed cell death, can reactivate latent herpesviruses in the dying cell.

The results of their research, which could have broad clinical significance since many cancer chemotherapies cause apoptosis, was published ahead of print in the Journal of Virology.
Human herpesviruses (HHV) are linked to a range of childhood and adult diseases, including chickenpox, mononucleosis, cold sores, and genital sores, and are of a particular concern for patients who are immunosuppressed due cancer or AIDS. Some HHV types are so common they are nearly universal in humans. A key feature of these viruses is their ability to remain latent for long periods of time, and then reactivate after the latent phase. Previously, reactivation was thought to be primarily due to waning immunity, immunosuppression, or exposure to certain inducing agents.
This study began when principal investigator Steven Zeichner of Children's National Medical Center and George Washington University in Washington, DC, followed up earlier findings that high concentrations of the antibiotic doxycycline can induce apoptosis, and can also activate replication by the Kaposi's Sarcoma-associated Herpesvirus (KSHV), and a study by his former mentor, Bernard Roizman of the University of Chicago, which showed that apoptosis also triggers replication of herpes simplex virus-1, which causes cold sores in the mouth.
"We decided to test… several additional human herpesviruses that cause notable diseases and which have good latent infection cell line models, including human herpesviruses (HHV)-6A, =6B, and -7, and Epstein-Bar virus (EBV)," says Zeichner. That all of these herpesviruses were activated by apoptosis suggested that this mechanism might apply to all herpesviruses.
The clinical implications could be staggering. Some important cytotoxic cancer chemotherapeutic drugs, including doxorubicin, vincristine, and prednisone act in part by inducing apoptosis, according to the study. Additionally, treatment with glucocorticoids has been known to worsen Kaposi's Sarcoma. The investigators also note that herpesvirus activation has been associated with poor outcomes following bone marrow transplantation.
"Activation of herpesviruses in these states and disorders has previously been variably attributed to general immune suppression, suppression of specific arms of the immune system, and increased concentrations of inflammatory and activating cytokines," write the researchers in the article.
"If this activation occurs in potentially damaging ways, then perhaps patients at risk for herpesvirus activation should be treated with antiviral medications in addition to antineoplastic cytotoxic chemotherapy.
Almost all humans are infected with HHV-6, and many are infected with the other aforementioned herpesviruses, as well as cytomegalovirus, oral and genital herpes, and Varicella zoster, the virus that causes chicken pox and shingles.
A copy of the manuscript can be found online at http://bit.ly/asmtip0913b. Formal publication is scheduled for the October 2013 issue of Journal of Virology.

http://www.eurekalert.org/pub_releases/2013-09/hcfa-cbd090513.php

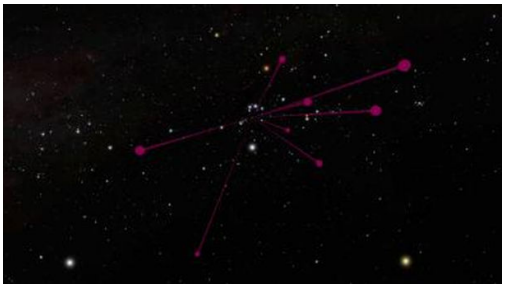
Coldest brown dwarfs blur lines between stars and planets

Astronomers are constantly on the hunt for ever-colder star-like bodies, and two years ago a new class of such objects was discovered by researchers using NASA's WISE space telescope.

However, until now no one has known exactly how cool their surfaces really are - some evidence suggested they could be room temperature.

A new study shows that while these brown dwarfs, sometimes called failed stars, are indeed the coldest known free-floating celestial bodies, they are warmer than previously thought with temperatures about 250-350 degrees Fahrenheit. To reach such low surface temperatures after cooling for billions of years means that these objects can only have about 5 to 20 times the mass of Jupiter. Unlike the Sun, these objects' only source of energy is from their gravitational contraction, which depends directly on their mass.

"If one of these objects was found orbiting a star, there is a good chance that it would be called a planet," says Trent Dupuy, a Hubble Fellow at the Harvard-Smithsonian Center for Astrophysics. But because they probably formed on their own and not in a proto-planetary disk, astronomers still call these objects brown dwarfs even if they are "planetary mass."



Characterizing these cold brown dwarfs is challenging because they emit most of their light at infrared wavelengths, and they are very faint due to their small size and low temperature.

Locations of brown dwarfs: The locations of brown dwarfs discovered by NASA's Wide-field Infrared Survey Explorer, or WISE, and mapped by NASA's Spitzer Space Telescope, are shown here in this diagram. The view is from a vantage point about 100 light-years away from the sun, looking back towards the constellation Orion. At this distance our sun is barely visible as a speck of light. The vastly fainter brown dwarfs would not even be visible in this view. The red lines all link back to the location of the sun. **NASA/JPL-Caltech**

To get accurate temperatures, astronomers need to know the distances to these objects. "We wanted to find out if they were colder, fainter, and nearby or if they were warmer, brighter, and more distant," explains Dupuy.

Using NASA's Spitzer Space Telescope, the team determined that the brown dwarfs in question are located at distances 20 to 50 light-years away.

To determine the distances to these objects the team measured their parallax - the apparent change in position against background stars over time. As the Spitzer Space Telescope orbits the Sun its perspective changes and nearby objects appear to shift back and forth slightly. The same effect occurs if you hold up a finger in front of your face and close one eye and then the other. The position of your finger seems to shift when viewed against the distant background.

But even for these relatively nearby brown dwarfs, the parallax motion is small. "To be able to determine accurate distances, our measurements had to be the same precision as knowing the position of a firefly to within 1 inch from 200 miles away," explains Adam Kraus, professor at the University of Texas at Austin and the other author of the study.

The new data also present new puzzles to astronomers that study cool, planet-like atmospheres. Unlike warmer brown dwarfs and stars, the observable properties of these objects don't seem to correlate as strongly with temperature. This suggests increased roles for other factors, such as convective mixing, in driving the chemistry at the surface. They also find evidence for disappearing alkali elements that are likely getting incorporated into noxious clouds. This study examined the initial sample of the coldest brown dwarfs discovered in the WISE survey data. Additional objects discovered in the past two years remain to be studied and will hopefully shed light on some of these outstanding issues.

http://www.eurekalert.org/pub_releases/2013-09/uoic-rdd090513.php

Researchers determine digestibility of blood products as feed in weanling pigs

Because weanling pigs do not tolerate great quantities of soybean meal in the diet, alternative sources of protein must be used.

URBANA, Ill. - Blood products, such as blood meal and plasma protein, are common ingredients in weanling pig diets and are considered high-quality sources of amino acids. Researchers at the University of Illinois have determined the amino acid digestibility of five blood products produced in the U.S. to provide swine producers with guidance for the use of these products in formulating diets.

"Blood meal usually is considered a good source of amino acids, but we don't know how the different blood products compare, and we don't know how the drying procedures influence digestibility," said Hans H. Stein, a U of I professor in animal sciences. "So that was what we wanted to determine."

To determine amino acid digestibility values, Stein and his team fed weanling pigs diets containing one of five different blood products. They used three spray-dried products: whole animal blood, blood cells, and blood plasma protein. They also tested two flash-dried products: avian blood meal and porcine blood meal. The researchers compared these blood products with each other and with casein.

The digestibility of crude protein and all amino acids in spray dried blood products were greater than or equal to that of casein. Digestibility values did not differ among the spray-dried products with the exception of isoleucine, which was less digestible in spray-dried blood cells than in spray-dried animal blood.

"The digestibility of amino acids in all the spray-dried products was very high. It was actually as good as casein in all cases, so whether it was spray-dried animal blood, or blood cells, or blood plasma, amino acids were virtually 100 percent digestible," Stein said.

Flash drying, however, appeared to damage amino acids and reduce their digestibility. Amino acid digestibility values in both avian blood meal and porcine blood meal were about one-third less than those of spray-dried products.

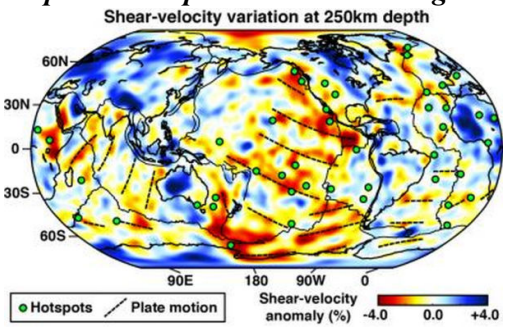
These findings will help producers and feed companies determine the value of the blood products they use in weanling pigs diets. "The spray dried products are very good sources of amino acids for pigs," Stein said. "But if producers buy flash-dried blood meal, they should pay less than for the spray-dried products because it doesn't have nearly the same value in diets fed to pigs."

The study, "Comparative amino acid digestibility in US blood products fed to weanling pigs," was published in Animal Feed Science and Technology and was co-authored by Ferdinando Almeida of U of I, John Htoo of Evonik Industries AG, and John Thomson of Evonik Degussa Corporation. The manuscript is available at http://www.sciencedirect.com/science/article/pii/S0377840113000588. Evonik Industries provided funding for this research.

http://www.eurekalert.org/pub_releases/2013-09/uoc--nmo090413.php

New model of Earth's interior reveals clues to hotspot volcanoes

Scientists at the University of California, Berkeley, have detected previously unknown channels of slow-moving seismic waves in Earth's upper mantle, a discovery that helps explain "hotspot volcanoes" that give birth to island chains such as Hawaii and Tahiti.



This is a map view of seismic shear-wave speed in the earth's upper mantle, highlighting the slow wave-speed channels (warm colors) imaged in this study. Where present, the channels align with the direction of tectonic-plate motion (dashed lines). **Berkeley Seismological Laboratory, UC Berkeley**

Berkeley — Unlike volcanoes that emerge from collision zones between tectonic plates, hotspot volcanoes form in the middle of the plates. The prevalent theory for how a mid-plate volcano forms is that a single upwelling of hot, buoyant rock rises vertically as a plume from deep within Earth's mantle the layer found between the planet's crust and core and supplies the heat to feed volcanic eruptions.

However, some hotspot volcano chains are not easily explained by this simple model, suggesting that a more complex interaction between plumes and the upper mantle is at play, said the study authors.

The newfound channels of slow-moving seismic waves, described in a paper to be published Thursday, Sept. 5, in Science Express, provide an important piece of the puzzle in the formation of these hotspot volcanoes and other observations of unusually high heat flow from the ocean floor.

The formation of volcanoes at the edges of plates is closely tied to the movement of tectonic plates, which are created as hot magma pushes up through fissures in mid-ocean ridges and solidifies. As the plates move away from the ridges, they cool, harden and get heavier, eventually sinking back down into the mantle at subduction zones.

But scientists have noticed large swaths of the seafloor that are significantly warmer than expected from this tectonic plate-cooling model. It had been suggested that the plumes responsible for hotspot volcanism could also play a role in explaining these observations, but it was not entirely clear how.

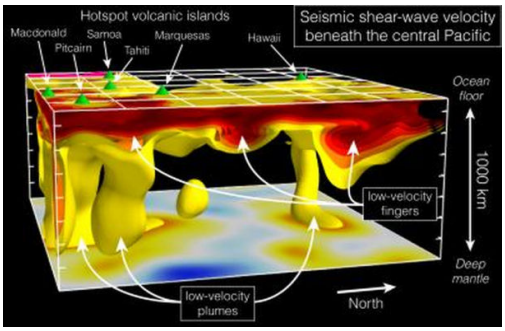
"We needed a clearer picture of where the extra heat is coming from and how it behaves in the upper mantle," said the study's senior author, Barbara Romanowicz, UC Berkeley professor of earth and planetary sciences and a researcher at the Berkeley Seismological Laboratory. "Our new finding helps bridge the gap between processes deep in the mantle and phenomenon observed on the earth's surface, such as hotspots."

The researchers utilized a new technique that takes waveform data from earthquakes around the world, and then analyzed the individual "wiggles" in the seismograms to create a computer model of Earth's interior. The technology is comparable to a CT scan.

The model revealed channels dubbed "low-velocity fingers" by the researchers where seismic waves traveled unusually slowly. The fingers stretched out in bands measuring about 600 miles wide and 1,200 miles apart, and moved at depths of 120-220 miles below the seafloor.

Seismic waves typically travel at speeds of 2.5 to 3 miles per second at these depths, but the channels exhibited a 4 percent slowdown in average seismic velocity.

"We know that seismic velocity is influenced by temperature, and we estimate that the slowdown we're seeing could represent a temperature increase of up to 200 degrees Celsius," said study lead author Scott French, UC Berkeley graduate student in earth and planetary sciences.



This is a 3D view of the top 1,000 kilometers of the earth's mantle beneath the central Pacific showing the relationship between seismically-slow "plumes" and channels imaged in the study. Green cones on the ocean floor mark islands associated with "hotspot" volcanoes, such as Hawaii. **Berkeley Seismological Laboratory, UC Berkeley**

The formation of channels, similar to those revealed in the computer model, has been theoretically suggested to affect plumes in Earth's mantle, but it has never before been imaged on a global scale. The fingers are also observed to align with the motion of the overlying tectonic plate, further evidence of "channeling" of plume material, the researchers said.

"We believe that plumes contribute to the generation of hotspots and high heat flow, accompanied by complex interactions with the shallow upper mantle," said French. "The exact nature of those interactions will need further study, but we now have a clearer picture that can help us understand the 'plumbing' of Earth's mantle responsible for hotspot volcano islands like Tahiti, Reunion and Samoa."

Vedran Lekic, a graduate student in Romanowicz's laboratory at the time of this research and now an assistant professor of geology at the University of Maryland, co-authored this study.

The National Science Foundation and the National Energy Research Scientific Computing Center helped support this research.

http://www.eurekalert.org/pub_releases/2013-09/uoh-sce_1090513.php

Scientists confirm existence of largest single volcano on earth

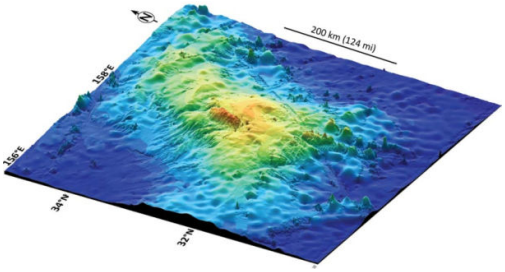
UH researcher says massive underwater shield volcano rivals largest in solar system

HOUSTON - A University of Houston (UH) professor led a team of scientists to uncover the largest single volcano yet documented on Earth. Covering an area roughly equivalent to the British Isles or the state of New Mexico, this volcano, dubbed the Tamu Massif, is nearly as big as the giant volcanoes of Mars, placing it among the largest in the Solar System.

William Sager, a professor in the Department of Earth and Atmospheric Sciences at UH, first began studying the volcano about 20 years ago at Texas A&M's College of Geosciences. Sager and his team's findings appear in the Sept. 8 issue of Nature Geoscience, the monthly multi-disciplinary journal reflecting disciplines within the geosciences.

Located about 1,000 miles east of Japan, Tamu Massif is the largest feature of Shatsky Rise, an underwater mountain range formed 130 to 145 million years ago by the eruption of several underwater volcanoes. Until now, it was unclear whether Tamu Massif was a single volcano, or a composite of many eruption points. By integrating several sources of evidence, including core samples and data collected on board the JOIDES Resolution research ship, the authors have confirmed that the mass of basalt that constitutes Tamu Massif did indeed erupt from a single source near the center.

"Tamu Massif is the biggest single shield volcano ever discovered on Earth," Sager said. "There may be larger volcanoes, because there are bigger igneous features out there such as the Ontong Java Plateau, but we don't know if these features are one volcano or complexes of volcanoes."



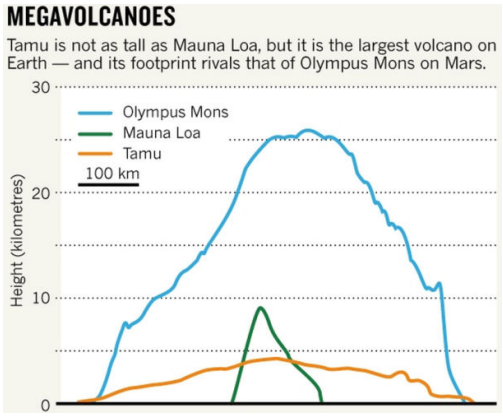
Tamu Massif stands out among underwater volcanoes not just for its size, but also its shape. It is low and broad, meaning that the erupted lava flows must have traveled long distances compared to most other volcanoes on Earth. The seafloor is dotted with thousands of underwater volcanoes, or seamounts, most of which are small and steep compared to the low, broad expanse of Tamu Massif.

The slope of lava layers within Tamu Massif indicate that it formed from a central volcanic vent. **William Sager, University of Houston**

"It's not high, but very wide, so the flank slopes are very gradual," Sager said. "In fact, if you were standing on its flank, you would have trouble telling which way is downhill. We know that it is a single immense volcano

constructed from massive lava flows that emanated from the center of the volcano to form a broad, shield-like shape. Before now, we didn't know this because oceanic plateaus are huge features hidden beneath the sea. They have found a good place to hide."

Tamu Massif covers an area of about 120,000 square miles. By comparison, Hawaii's Mauna Loa – the largest active volcano on Earth – is approximately 2,000 square miles, or roughly 2 percent the size of Tamu Massif. To find a worthy comparison, one must look skyward to the planet Mars, home to Olympus Mons. That giant volcano, which is visible on a clear night with a good backyard telescope, is only about 25 percent larger by volume than Tamu Massif.



The study relies on two distinct, yet complementary, sources of evidence – core samples collected on Integrated Ocean Drilling Program (IODP) Expedition 324 (Shatsky Rise Formation) in 2009, and seismic reflection data gathered on two separate expeditions of the R/V Marcus G. Langseth in 2010 and 2012. The core samples, drilled from several locations on Tamu Massif, showed that thick lava flows (up to 75 feet thick), characterize this volcano. Seismic data from the R/V Langseth cruises revealed the structure of the volcano, confirming that the lava flows emanated from its summit and flowed hundreds of miles downhill into the adjacent basins.

According to Sager, Tamu Massif is believed to be about 145 million years old, and it became inactive within a few million years after it was formed. Its top lies about 6,500 feet below the ocean surface, while much of its base is believed to be in waters that are almost four miles deep.

"It's shape is different from any other sub-marine volcano found on Earth, and it's very possible it can give us some clues about how massive volcanoes can form," Sager said. "An immense amount of magma came from the center, and this magma had to have come from the Earth's mantle. So this is important information for geologists trying to understand how the Earth's interior works."

The project was funded by the National Science Foundation, both through direct grants and through its Integrated Ocean Drilling Program, an international research program dedicated to advancing scientific understanding of the Earth through drilling, coring and monitoring the subsea floor.

http://scitechdaily.com/physicists-take-new-approach-unify-quantum-theory-theory-relativity/

Physicists Take a New Approach to Unify Quantum Theory and Theory of Relativity

Scientists Take a New Approach to the Unification of General Theory of Relativity and Quantum Theory

September 5, 2013 by Staff

Physicists from the Max Planck Institute and the Perimeter Institute in Canada have developed a new approach to the unification of the general theory of relativity and quantum theory.

Present-day physics cannot describe what happened in the Big Bang. Quantum theory and the theory of relativity fail in this almost infinitely dense and hot primal state of the universe. Only an all-encompassing theory of quantum gravity which unifies these two fundamental pillars of physics could provide an insight into how the universe began. Scientists from the Max Planck Institute for Gravitational Physics (Albert Einstein Institute) in Golm/Potsdam and the Perimeter Institute in Canada have made an important discovery along this route. According to their theory, space consists of tiny “building blocks”. Taking this as their starting point, the scientists arrive at one of the most fundamental equations of cosmology, the Friedmann equation, which describes the universe. This shows that quantum mechanics and the theory of relativity really can be unified.

For almost a century, the two major theories of physics have coexisted but have been irreconcilable: while Einstein’s General Theory of Relativity describes gravity and thus the world at large, quantum physics describes the world of atoms and elementary particles. Both theories work extremely well within their own boundaries; however, they break down, as currently formulated, in certain extreme regions, at extremely tiny distances, the so-called Planck scale, for example. Space and time thus have no meaning in black holes or, most notably, during the Big Bang.

Daniele Oriti from the Albert Einstein Institute uses a fluid to illustrate this situation: “We can describe the behavior of flowing water with the long-known classical theory of hydrodynamics. But if we advance to smaller and smaller scales and eventually come across individual atoms, it no longer applies. Then we need quantum physics.” Just as a liquid consists of atoms, Oriti imagines space to be made up of tiny cells or “atoms of space”, and a new theory is required to describe them: quantum gravity.

Continuous space is broken down into elementary cells

In Einstein's relativity theory, space is a continuum. Oriti now breaks down this space into tiny elementary cells and applies the principles of quantum physics to them, thus to space itself and to the theory of relativity describing it. This is the unification idea.
A fundamental problem of all approaches to quantum gravity consists in bridging the huge dimensional scales from the space atoms to the dimensions of the universe. This is where Oriti, his colleague Lorenzo Sindoni and Steffen Gielen, a former postdoc at the AEI who is now a researcher at the Perimeter Institute in Canada, have succeeded. Their approach is based on so-called group field theory. This is closely related to loop quantum gravity, which the AEI has been developing for some time.
The task now consisted in describing how the space of the universe evolves from the elementary cells. Staying with the idea of fluids: How can the hydrodynamics for the flowing water be derived from a theory for the atoms?
This extremely demanding mathematical task recently led to a surprising success. "Under special assumptions, space is created from these building blocks, and evolves like an expanding universe," explains Oriti. "For the first time, we were thus able to derive the Friedmann equation directly as part of our complete theory of the structure of space," he adds. This fundamental equation, which describes the expanding universe, was derived by the Russian mathematician Alexander Friedman in the 1920s on the basis of the General Theory of Relativity. The scientists have therefore succeeded in bridging the gap from the microworld to the macroworld, and thus from quantum mechanics to the General Theory of Relativity: they show that space emerges as the condensate of these elementary cells and evolves into a universe which resembles our own.
Quantum gravity could now answer questions regarding the Big Bang
Oriti and his colleagues thus see themselves at the start of a difficult but promising journey. Their current solution is valid only for a homogeneous universe – but our real world is much more complex. It contains inhomogeneities, such as planets, stars and galaxies. The physicists are currently working on including them in their theory.
And they have planned something really big as their ultimate goal. On the one hand, they want to investigate whether it is possible to describe space even during the Big Bang. A few years ago, former AEI researcher Martin Bojowald found clues, as part of a simplified version of loop quantum gravity, that time and space can possibly be traced back through the Big Bang. With their theory, Oriti and his colleagues are hoping to confirm or improve this result.
If it continues to prove successful, the researchers could perhaps use it to explain also the assumed inflationary expansion of the universe shortly after the Big Bang as well, and the nature of the mysterious dark energy. This energy field causes the universe to expand at an ever-increasing rate.
Oriti's colleague Lorenzo Sindoni therefore adds: "We will only be able to really understand the evolution of the universe when we have a theory of quantum gravity." The AEI researchers are in good company here: Einstein and his successors, who have been searching for this for almost one hundred years.
Publication: Steffen Gielen, et al., "Cosmology from Group Field Theory Formalism for Quantum Gravity," Phys. Rev. Lett. 111, 031301 (2013); DOI:10.1103/PhysRevLett.111.031301
PDF Copy of the Study: Cosmology from Group Field Theory Formalism for Quantum Gravity

http://www.sciencedaily.com/releases/2013/09/130905142808.htm

Inner-Ear Disorders May Cause Hyperactivity

For years, scientists have observed that many children and adolescents with severe inner-ear disorders - particularly disorders affecting both hearing and balance - also have behavioral problems, such as hyperactivity.

Behavioral abnormalities are traditionally thought to originate in the brain. But a new study by researchers at Albert Einstein College of Medicine of Yeshiva University has found that inner-ear dysfunction can directly cause neurological changes that increase hyperactivity. The study, conducted in mice, also implicated two brain proteins in this process, providing potential targets for intervention.
The findings were published today in the online edition of Science.
For years, scientists have observed that many children and adolescents with severe inner-ear disorders -- particularly disorders affecting both hearing and balance -- also have behavioral problems, such as hyperactivity. Until now, no one has been able to determine whether the ear disorders and behavioral problems are actually linked.
"Our study provides the first evidence that a sensory impairment, such as inner-ear dysfunction, can induce specific molecular changes in the brain that cause maladaptive behaviors traditionally considered to originate exclusively in the brain," said study leader Jean M. Hébert, Ph.D., professor in the Dominick P. Purpura Department of Neuroscience and of genetics at Einstein.

The inner ear consists of two structures, the cochlea (responsible for hearing) and the vestibular system (responsible for balance). Inner-ear disorders are typically caused by genetic defects but can also result from infection or injury.
The idea for the study arose when Michelle W. Antoine, a Ph.D. student at Einstein at the time, noticed that some mice in Dr. Hébert's laboratory were unusually active -- in a state of near-continual movement, chasing their tails in a circular pattern. Further investigation revealed that the mice had severe cochlear and vestibular defects and were profoundly deaf. "We then realized that these mice provided a good opportunity to study the relationship between inner-ear dysfunction and behavior," said Dr. Hébert.
The researchers established that the animals' inner-ear problems were due to a mutation in a gene called Slc12a2, which mediates the transport of sodium, potassium, and chloride molecules in various tissues, including the inner ear and central nervous system (CNS). The gene is also found in humans.
To determine whether the gene mutation was linked to the animals' hyperactivity, the researchers took healthy mice and selectively deleted Slc12a2 from either the inner ear, various parts of the brain that control movement or the entire CNS. "To our surprise, it was only when we deleted the gene from the inner ear that we observed increased locomotor activity," said Dr. Hébert.
The researchers hypothesized that inner-ear defects cause abnormal functioning of the striatum, a central brain area that controls movement. Tests revealed increased levels of two proteins involved in a signaling pathway that controls the action of neurotransmitters: pERK (phosphorylated extracellular signal-regulated kinase) and pCREB (phospho-cAMP response-element binding protein), which is further down the signaling pathway from pERK. Increases in levels of the two proteins were seen only in the striatum and not in other forebrain regions.
To discover whether increased pERK levels caused the abnormal increase in locomotor activity, Slc12a2-deficient mice were given injections of SL327, a pERK inhibitor. Administering SL327 restored locomotor activity to normal, without affecting activity levels in controls. The SL327 injections did not affect grooming, suggesting that increased pERK in the striatum selectively elevates locomotor activity and not general activity.
According to the researchers, the findings suggest that hyperactivity in children with inner-ear disorders might be controllable with medications that directly or indirectly inhibit the pERK pathway in the striatum.
"Our study also raises the intriguing possibility that other sensory impairments not associated with inner-ear defects could cause or contribute to psychiatric or motor disorders that are now considered exclusively of cerebral origin," said Dr. Hébert. "This is an area that has not been well studied."
M. W. Antoine, C. A. Hubner, J. C. Arezzo, J. M. Hebert. A Causative Link Between Inner Ear Defects and Long-Term Striatal Dysfunction. Science, 2013; 341 (6150): 1120 DOI: 10.1126/science.1240405

http://www.eurekalert.org/pub_releases/2013-09/qmuo-obi090513.php

1 baby in every 46 born with a congenital anomaly says new report

The report [1] by researchers at Queen Mary University of London collates data from six regional registers [2], a national coverage of 36 per cent of the births in England and Wales.

Examples of congenital anomalies include heart and lung defects, Down syndrome, neural tube defects such as spina bifida, and limb malformations such as club foot.
Funded by Public Health England (PHE), the study is the most up-to-date and comprehensive of its kind, bringing together existing data in England and Wales from 2007 to 2011. However, the editor of the report, Professor Joan Morris, from the Wolfson Institute of Preventive Medicine, part of Queen Mary said: "We remain concerned that data for substantial parts of the country, including London, are not currently monitored, meaning large regional increases in congenital anomalies could go unnoticed and their causes not investigated. Currently there are no registers in London, the South East, the North West and East Anglia."
With formal responsibility for surveillance of congenital anomalies in England being met by PHE, there is an opportunity to expand the current system to the whole of England. Professor Elizabeth Draper from the University of Leicester, who is Chair of BINOCAR, commented: "This important report again highlights the value of the existing regional registers. We are working closely with PHE to establish regional registers in those areas not currently covered by a congenital anomaly register."
The number and types of congenital anomalies have been monitored since the thalidomide epidemic in the 1960s. Since the 1980s, regional registers have been established in some parts of the country to actively collect data from hospital, laboratories and health records. In the intervening years, lack of strategic funding coupled with a lack of support at national level has led to the closure of some of the regional registers. The creation of a stable system of funding for an entire surveillance network would make it possible to fulfil the potential that the existing registers offer for public health, service planning, clinical audit, outcomes monitoring, research and other purposes.
The main findings from today's report are:

2.2% of babies had a congenital anomaly in England and Wales in 2011.

The prevalence of major congenital anomalies in England and Wales was higher than those in other European registers.

The researchers estimate that there were at least 16,000 babies born with congenital anomalies in England and Wales in 2011.

The most common anomalies were congenital heart defects, which affected at least six in 1,000 births. Some cases required major operations and around six per cent of babies born with a heart anomaly died before the age of one.

Neural tube defects, such as spina bifida, affected one in 1,000 babies; the use of folic acid supplements before becoming pregnant as well as in early pregnancy is known to reduce the risk of this defect.

Gastroschisis – an anomaly where the intestines develop outside the abdomen – affected one in 1,000 babies. Regional monitoring has shown that this condition has become more common in some areas including Wales and that babies born to younger mothers were at greater risk. Gastroschisis was more likely in England and Wales than in other European registers. Over half of all major congenital anomalies were detected during pregnancy.

Mothers who were between 25 and 29 years of age had the lowest prevalence for all anomalies. The prevalence was higher in the under-20 age group and considerably higher in the 40 and over age group.

The target detection rates were achieved or exceeded for four out of the 11 Fetal Anomaly Screening Program (FASP) anomalies.

[1] "Congenital Anomaly Statistics 2011, England and Wales". British Isles Network of Congenital Anomaly Registers (BINOCAR). Published online at: http://www.binocar.org/Publications/Reports

[2] The six BINOCAR regional registers contributing to the report are:
Congenital Anomaly Register and Information Service for Wales (CARIS)
Congenital Anomaly Register for Oxfordshire, Berkshire and Buckinghamshire (CAROBB)
East Midlands and South Yorkshire Congenital Anomalies Register (EMSYCAR)
Northern Congenital Abnormality Survey (NorCAS)
South West Congenital Anomaly Register (SWCAR)
Wessex Antenatally Detected Anomalies Register (WANDA)

http://www.wired.com/wiredscience/2013/09/fda-arsenic-and-rice/

The FDA sidesteps on arsenic and rice

Today, the U.S. Food and Drug Administration issued a statement offering the reassurance that you will not drop dead in the street from eating rice at lunch.

- **By Deborah Blum**

Of course, if you're still breathing you already know that.

And since you're alive to read this, I'll also admit that's not exactly what they said. But it's not that far off either.

The FDA officially announced that the levels of arsenic found in some 1,300 rice products tested were too low to cause "immediate or short term" adverse effects on health. In other words, the amount of arsenic found in rice is low enough (in the part per billion range) that it is unlikely to make you sick (or dead) on the day that you eat it and unlikely to produce visible symptoms of poisoning over a period of weeks or months.

This would actually be more reassuring if we didn't already know it. More than a decade of analyzing rice for arsenic – especially the more poisonous inorganic (without carbon) forms – has consistently found that levels hover in the part per billion range. And not a single study in that same period has suggested that low-dose arsenic in rice is acutely, drop-you-in-the-street poisonous. All the studies tell us that we should instead worry about damage to long term health, track low-dose arsenic's association with skin and bladder cancer, lung and heart disease.

As since we already know that short term is not the problem, why did the FDA feel a need to state the obvious today?

My own suspicion is that the agency is part responding to growing consumer concerns about the safety of rice. The issue was bumped up in prominence last fall when Consumer Reports published a detailed analysis of rice products sold in the US, concluding that far too many rice products contained "worrisome levels" of arsenic. They were referring to worrisome, of course, in the long term sense. The FDA responded by announcing that it had begun its own analysis of rice, that early results showed no real problem, but that more information would be forthcoming. This did not stop people from worrying. I think I actually appreciated how deep those concerns were running when a story in The New York Times food section, mostly about a recipe for beet green, rice and ricotta blinis was titled "Brown Rice and the Arsenic Conundrum."

So I see in today's move a deliberate move to more loudly reassure. And I also suspect that it's also designed to reassure the US rice industry, which has expressed growing unhappiness over the arsenic story. In most coverage of the FDA announcement, you'll find representatives of the USA Rice Federation basically celebrating: "The FDA has provided American consumers with renewed assurances that there is no need to

change a well-balanced diet that includes rice," a spokeswoman told USA Today. A notable exception to such cheer is the story from The Consumerist, which is published by the same company that publishes Consumer Reports, and which hailed the FDA announcement merely as confirmation of widespread arsenic contamination of rice.

For instance, the FDA analysis found that, on average, brown rice had 160 parts per billion inorganic arsenic per serving, infant rice cereal 120 and rice wine 11. For comparison, the U.S. Environmental Protection agency sets a limit of 10 parts per billion arsenic in drinking water so these are actually not meaningless numbers. We should acknowledge that people drink water at a more consistent and steady rate than they eat rice in general – meaning a more consistent exposure. But we should also acknowledge that there may be more vulnerable groups in terms of exposure – those who do eat rice more than once a day, small children, in an early stage of development, on a steady diet of rice cereal, people with gluten allergies who may be packing their cupboards with rice products.

And we should also acknowledge the bigger message, somewhat unfortunately buried in today's FDA statement, that the really serious work has yet to be done. Agency scientists are preparing to do a health analysis of long-term effects because that's actually the major issue here. They're also planning to do more analysis of individual rice species and to look at geographic issues – where are the highest arsenic rice plants grown in the United States (mostly the South), are there species of rice that tend to take less arsenic out of the soil (most researchers praise basmati rice in that regard." In other words, the real serious work, the one that addresses the big picture health questions, has yet to be done.

I am genuinely glad to see the FDA tackling this complicated and important public health issue. I could wish that the agency had done a better job of explaining the work. I heard the same reaction from the toxicologists I talked to today – their worry that people in the high risk groups would suddenly believe there was no risk at all. "That message needs to be retooled," one told me. "It sounds like the FDA missed the point," agreed another. "It's a dodge," said yet another. "The issue is long term exposure and the surprisingly serious and widespread health issues now clearly associated with this exposure."

So let's focus on one of the very useful points in today's statement – the agency recommendation that, regardless of the rice findings, people should eat a varied diet. We know from low-dose toxicology, from the kind of poison levels we find in rice, that these are most dangerous when delivered as a daily dose. Eat a varied diet, mix it up, is starting to sound to me like one of our best health recommendations. It could even help you survive the effect of many, many lunches in your very long life.

Deborah Blum is a Pulitzer-Prize winning science writer and the author of five books, most recently the best-seller, ***The Poisoner's Handbook: Murder and the Birth of Forensic Medicine in Jazz Age New York***. She writes for a range of publications including *Time*, *Scientific American*, *Slate*, *The Wall Street Journal*, *The Los Angeles Times* (and even the literary journal, *Tin House*). She is currently working on a sixth book about poisonous food.

http://www.eurekalert.org/pub_releases/2013-09/luhs-ssf082713.php

Study suggests fish oil could help protect alcohol abusers from dementia

A Loyola University Chicago Stritch School of Medicine study suggests that omega-3 fish oil might help protect against alcohol-related dementia.

MAYWOOD, Il. – Previous studies have shown that long-term alcohol abuse increases the risk of dementia. The Loyola study found that in the brain cells of rats exposed to high levels of alcohol, a fish oil compound protected against inflammation and cell death.

The study by Michael A. Collins, PhD, and colleagues was reported Sept. 8 at the 14th Congress of the European Society for Biomedical Research on Alcoholism in Warsaw.

An earlier analysis by Collins and Loyola colleague Edward J. Neafsey, PhD, which pooled the results of 143 studies, found that moderate social drinking may reduce the risk of dementia and cognitive impairment. (Moderate drinking is defined as a maximum of two drinks per day for men and 1 drink per day for women.)

It appears that small amounts of alcohol might, in effect, make brain cells more fit. Alcohol in moderate amounts stresses cells and thus toughens them up to cope with major stresses down the road that could cause dementia. But too much alcohol overwhelms the cells, leading to inflammation and cell death.

In the new study, Collins and colleagues exposed cultures of adult rat brain cells to amounts of alcohol equivalent to more than four times the legal limit for driving. These cell cultures were compared with cultures of brain cells exposed to the same high levels of alcohol, plus a compound found in fish oil called omega-3 docosahexaenoic acid (DHA).

Researchers found there was about 90 percent less neuroinflammation and neuronal death in the brain cells exposed to DHA and alcohol than in the cells exposed to alcohol alone.

Further studies are needed to confirm whether fish oil protects against alcohol-related dementia. "Fish oil has the potential of helping preserve brain integrity in abusers," Collins said. "At the very least, it wouldn't hurt them."
But Collins added that best way for an alcohol abuser to protect the brain is, if possible, to quit drinking or cut back to moderate amounts. "We don't want people to think it's okay to take a few fish oil capsules and then continue to go on abusing alcohol."
Collins, principal investigator of the study, is a professor in the Department of Molecular Pharmacology and Therapeutics at Loyola University Chicago Stritch School of Medicine. Co-authors are Neafsey, Nuzhath Tajuddin, MS, and Kwan-Hoon Moon, PhD, of the Stritch School of Medicine; Kimberly Nixon, PhD, of the University of Kentucky; and Hee-Yong Kim, PhD, of the National Institute on Alcohol Abuse and Alcoholism.

http://www.eurekalert.org/pub_releases/2013-09/acs-ana081413.php

A new approach to early diagnosis of influenza

New technology shows promise of a home test for rapid home diagnosis of influenza before antiviral drug window closes and virus spreads

INDIANAPOLIS - A new technology is showing promise as the basis for a much-needed home test to diagnose influenza quickly, before the window for taking antiviral drugs slams shut and sick people spread the virus to others, scientists reported here today. In a presentation at the 246th National Meeting & Exposition of the American Chemical Society (ACS), they described how it also could determine the specific strain of flu virus and help select the most effective drug for treatment.
The meeting of the world's largest scientific society, which features almost 7,000 presentations on new discoveries in science and other topics, continues here through Thursday.
Suri Iyer, Ph.D., explained that such a fast, inexpensive diagnostic test — similar to the quick throat swabs for strep throat and to home pregnancy tests — is especially important for flu, which causes widespread illness and an average of 36,000 deaths annually in the United States alone.
"Just going to the doctor's office or hospital for diagnosis can be counterproductive during a major flu outbreak," Iyer explained. "It carries the risk of spreading the disease. During the last swine flu outbreak, hospitals in some areas went on TV to tell people not come to the ER. Not only could they spread the virus, but ERs did not have the facilities to test hundreds of worried people."
Such a test also is important because antiviral drugs can ease symptoms of the disease and enable people to recover sooner and return to school, work and other activities, Iyer added. But to be most effective, the medications must be taken within two days after symptoms first appear.
Iyer, of Georgia State University in Atlanta, and University of Cincinnati colleague Allison Weiss, Ph.D., launched research on a fundamentally new approach for diagnosing flu and other viral disease because of drawbacks with existing tests.
Those tests can produce results in about 15 minutes. However, they are expensive and sometimes come up negative when the patient actually does have the flu. As a result of that uncertainty, the U.S. Centers for Disease Control and Prevention encourages doctors to confirm test results with viral culture, which takes 3 to 10 days. But waiting this long for confirmation shuts the window on antiviral treatment.
Existing flu tests use antibodies that recognize flu virus antigens, proteins on the flu virus' surface. Iyer and Weiss took a different approach, which involves using carbohydrates to detect the antigens, and has advantages over antibody-based approaches.
Flu viruses have two major antigens, hemagglutinin and neuraminidase, which determine the specific strain of flu virus. Changes in hemagglutinin and/or new combinations of hemagglutinin and neuraminidase signal the emergence of a new strain of virus. That happened in the spring of 2009, when the new "swine flu" ignited concerns about a worldwide epidemic.
In the ACS presentation, Iyer explained how the new test technology uses various forms of carbohydrates that can capture the hemagglutinin and neuraminidase, and via a color change or other signal, indicate both infection and the specific type or strain of flu virus. Information on the strain would be important, enabling doctors to pick the most effective antiviral drug. The new approach has other potential advantages, including quicker results, lower cost and greater reliability, he said.
So far, the approach is living up to expectations, with laboratory experiments verifying that it can detect flu viruses. Iyer and Weiss plan to move ahead in the autumn with tests on samples taken from human volunteers. Their vision is for a package similar to a strep throat or pregnancy test that gives an easy-to-read color change.

http://nyti.ms/1fMSq0O

Drug Cocktail That Protects Monkeys From Deadly Virus May Aid Humans

A combination of two well-known antiviral drugs protects monkeys against MERS and could potentially be used to save humans from the lethal disease, scientists said on Sunday.

By DONALD G. McNEIL Jr.

Researchers at the National Institute of Allergy and Infectious Diseases gave the drugs, ribavirin and interferon, to half of six rhesus monkeys eight hours after they were infected with the virus, now known as Middle East Respiratory Syndrome coronavirus.

The three that got the two-drug cocktail had less virus in their blood, no breathing difficulties and only minimal X-ray evidence of pneumonia, while the untreated animals became very ill, said the authors of the study published by Nature Medicine. Dr. Anthony S. Fauci, the institute's director, called the study "not a game changer, but an important observation."

The number of monkeys was minimal, treatment was started very soon after infection, and drugs that work in monkeys sometimes fail in humans, he said, adding: "But if I were a doctor with MERS patients, and I had nothing else to give them, I wouldn't hesitate. If someone has advanced disease, there's 50 percent mortality."

Dr. Ziad A. Memish, the deputy health minister of Saudi Arabia, where most of the known MERS cases have occurred, said doctors there had already tried the two-drug combination on patients. It did not work well, he said, but that might have been because it was started late, when patients were hospitalized and already severely ill. "This is great news and much-needed information, although it's very preliminary," he said.

Saudi doctors tried the regimen, Dr. Memish added, because of a recent article in the International Journal of Infectious Diseases reviewing therapies that seemed to help during the 2003 global epidemic of SARS, which is also caused by a coronavirus.

According to the World Health Organization, there have been 108 known human cases of MERS since it emerged in 2012, of which 50 have been fatal.

There is no recommended treatment, although patients are often put on ventilators and given corticosteroids to fight inflammation in their lungs and other supportive therapy.

The ribavirin/interferon cocktail tested on the monkeys is currently used to treat chronic hepatitis C in humans. It does have side effects; interferon can cause sleeplessness and depression, while ribavirin is toxic to red and white blood cells, which can be very dangerous if it is prolonged.

Hepatitis treatment lasts for months, Dr. Fauci said, while treatment for MERS would presumably be short-lived because the virus replicates quickly.

MERS was isolated only last year, but may have infected humans many times before without having been recognized. Scientists believe that it originated in bats, and a fragment of viral gene identical to the virus taken from human cases was recently found in a Saudi bat.

But it does not jump readily from person to person, and another animal may help it jump from bats to humans. Camels in several countries have been found to harbor antibodies that attach to MERS, suggesting that they have recovered from infection with a similar virus.

"But if that is suggestive that camels are the most likely intermediate host, why are we not seeing clinical human cases in Sudan, Egypt, Oman, Spain and the Canary Islands?" Dr. Memish asked. "The puzzle is still not solved."