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Alcohol provides protective effect, reduces mortality substantial

Injured patients were less likely to die in the hospital if they had alcohol in their blood

Injured patients were less likely to die in the hospital if they had alcohol in their blood, according to a study from the University of Illinois at Chicago School of Public Health -- and the more alcohol, the more likely they were to survive.

"This study is not encouraging people to drink," cautions UIC injury epidemiologist Lee Friedman, author of the study, which will be published in the December issue of the journal Alcohol and is now online.

That's because alcohol intoxication -- even minor inebriation -- is associated with an increased risk of being injured, he says.

"However, after an injury, if you are intoxicated there seems to be a pretty substantial protective effect," said Friedman, who is assistant professor of environmental and occupational health sciences at UIC.

"The more alcohol you have in your system, the more the protective effect."

Friedman analyzed Illinois Trauma Registry data for 190,612 patients treated at trauma centers between 1995 and 2009 who were tested for blood alcohol content, which ranged from zero to 0.5 percent at the time they were admitted to the trauma unit. Of that group, 6,733 died in the hospital.

The study examined the relationship of alcohol dosage to in-hospital mortality following traumatic injuries such as fractures, internal injuries and open wounds. Alcohol benefited patients across the range of injuries, with burns as the only exception. The benefit extended from the lowest blood alcohol concentration (below 0.1 percent) through the highest levels (up to 0.5 percent).

"At the higher levels of blood alcohol concentration, there was a reduction of almost 50 percent in hospital mortality rates," Friedman said. "This protective benefit persists even after taking into account injury severity and other factors known to be strongly associated with mortality following an injury."

Very few studies have looked at the physiological mechanisms related to alcohol and injury in humans. Some animal studies have shown a neuro-protective effect from alcohol, but the findings of most animal and previous human studies often contradict one another because of different study criteria.

Friedman says it's important for clinicians to recognize intoxicated patients but also to understand how alcohol might affect the course of treatment. Further research into the biomechanism of the protective phenomenon is needed, he said. If the mechanism behind the protective effect were understood, "we could then treat patients post-injury, either in the field or when they arrive at the hospital, with drugs that mimic alcohol," he said.

http://www.eurekalert.org/pub_releases/2012-11/uoc--epl111912.php

Estrogenic plants linked to altered hormones, possible behavior changes in monkeys

Eating certain veggies not only supplies key nutrients, it may also influence hormone levels and behaviors such as aggression and sexual activity

Berkeley - Eating certain veggies not only supplies key nutrients, it may also influence hormone levels and behaviors such as aggression and sexual activity, says a new study led by researchers at the University of California, Berkeley, that could shed light on the role of diet in human evolution.

The research is the first to observe the connection between plant-based estrogenic compounds, or phytoestrogens, and behavior in wild primates - in this case, a group of red colobus monkeys in Uganda.

The more the male monkeys dined on the leaves of Millettia dura, a tropical tree containing estrogen-like compounds, the higher their levels of estradiol and cortisol. The researchers also found that with the altered hormone levels came more acts of aggression and sex, and less time spent grooming - an important behavior for social bonding in primates.

The study, published in the current issue of the journal Hormones and Behavior, suggests how potentially important consuming phytoestrogens is in primate ecology and evolution.

"It's one of the first studies done in a natural setting providing evidence that plant chemicals can directly affect a wild primate's physiology and behavior by acting on the endocrine system," said study lead author Michael Wasserman, who conducted the research as a graduate student at UC Berkeley's Department of Environmental Science, Policy and Management. "By altering hormone levels and social behaviors important to reproduction and health, plants may have played a large role in the evolution of primate - including human - biology in ways that have been underappreciated."

For 11 months, the researchers followed a group of red colobus monkeys in Uganda's Kibale National Park and recorded what the primates ate. For behavioral observations, the researchers focused on aggression, as marked by the number of chases and fights, the frequency of mating and time spent grooming.

To assess changes in hormone levels, the researchers collected fecal samples once a week from each of 10 adult males in the group (a separate study examining phytoestrogens in females is ongoing). More than 407 samples were collected and analyzed for estradiol and cortisol levels.
The researchers found seasonal variation in the consumption of estrogenic plants, which made up 0.7 percent to as much as 32.4 percent of the red colobus diet in any given week. For red colobus adult males, higher consumption of estrogenic plants corresponded to higher levels of estradiol and cortisol, two steroid hormones important to reproduction and the stress response.
Phytoestrogens are also found in human foods, especially soy and soy-based products. Millettia dura, the tropical tree that was most important to red colobus monkey hormone levels and social behaviors, is a close relative of soy.
"With all of the concern today about phytoestrogen intake by humans through soy products, it is very useful to find out more about the exposure to such compounds in living primates and, by analogy, human ancestors," said study co-author Katharine Milton, professor in UC Berkeley's Department of Environmental Science, Policy and Management and an expert on the dietary ecology of primates. "This is particularly true when determining the influence of phytoestrogens on reproductive behavior, which is the whole keystone of natural selection."
The study authors cautioned against overinterpreting the power of phytoestrogens in altering behavior, however. They emphasized that estrogenic plant consumption is just one of multiple factors influencing primate hormone levels and behavior. Notably, the primates' own endogenous hormone levels were the stronger predictor of certain behaviors, while phytoestrogens played a secondary role.
The researchers noted that the tendency for certain behaviors to occur can be affected by complex interactions between endogenous hormones and phytoestrogens, in addition to factors such as the quality and quantity of food, competition for resources and mates and predation.
Nonetheless, previous research in laboratory and agricultural settings found that eating estrogenic plants could disrupt fertility and affect behavior in animals such as rodents, monkeys and sheep. Effects of phytoestrogen consumption in other studies have included more aggression, less body contact, more isolation, higher anxiety and impaired reproduction.
To expand on this possibility, Wasserman and his colleagues are now examining the relationship between phytoestrogens and other primate species, including our closest-living relative, the chimpanzee, to determine how common estrogenic plants are in the diets of wild primates. "Human ancestors took most of their diet from wild tropical plants, and our biology has changed little since this time, so similar relationships as those found here are expected to have occurred over our evolutionary history," said Wasserman, now a post-doctoral scholar at McGill University's Department of Anthropology in Montreal, Canada.
However, the researchers noted that the red colobus diet contains a high percentage of leaves, while the diet of chimpanzees, other apes and human ancestors consists primarily of fruits. Thus, one of Wasserman's current goals is to compare the presence of phytoestrogens in wild leaves and fruits.
"If phytoestrogens make up a significant proportion of a fruit-eating primate's diet, and that consumption has similar physiological and behavioral effects as those observed in the red colobus, then estrogenic plants likely played an important role in human evolution," said Wasserman. "After studying the effects of phytoestrogens in apes and fruit-eating primates, we can then get a better sense of how these estrogenic compounds may influence human health and behavior."
Other co-authors of the study are Colin Chapman and Jan Gogarten from McGill University, and Daniel Wittwer and Toni Ziegler from the Wisconsin National Primate Research Center at the University of Wisconsin-Madison.
The National Science Foundation and the International Primatological Society helped support this research.

http://phys.org/news/2012-11-meteorite-samples-definitive-evidence-mars.html

Meteorite samples provide definitive evidence of water and rock types on Mars

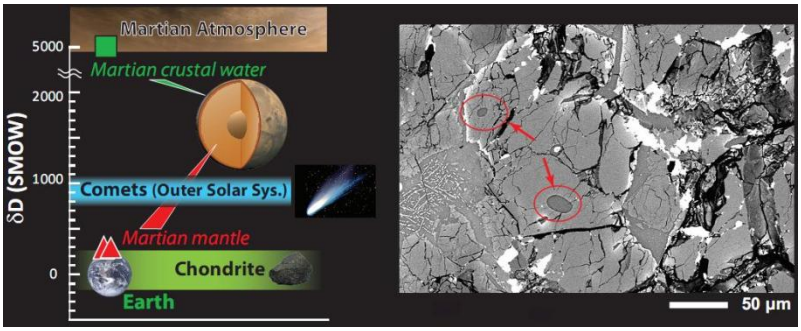
Geochemical studies that help towards settling the controversy surrounding water on Mars

Researchers at the Tokyo Institute of Technology, NASA's Johnson Space Center, Lunar Planetary Institute, and Carnegie Institute of Washington report on geochemical studies that help towards settling the controversy that surrounds the origin, abundance, and history of water on Mars.
The abundance and origin of water on Mars underpins a number of planetary science hypotheses including crust and mantle dynamics, and even the existence of life. Researchers at Tokyo Institute of Technology, NASA, the Lunar Planetary Institute, and the Carnegie Institute of Washington analyse the geochemical and isotopic composition of two different meteorites and conclude definitively that the mantle is dry and provide the first evidence of assimilation of old Martian crust into the mantle.

Despite its crucial role in biological and geological processes information about water on Mars is still controversial. In addition previous geochemical studies of Martian basalts (shergottites) have raised unsettled questions over the sources of the parental magmas.

The researchers studied two meteorites that provide different samples from the Martian mantle and crust. "There are several competing theories that account for the diverse isotopic and geochemical compositions of Martian meteorites," said Tomohiro Usui, a former NASA/ LPI postdoctoral fellow who led the research. "Until this investigation there was no direct evidence that primitive Martian lavas contained material from the surface of Mars".

The researchers also report direct evidence that the dry Martian mantle retains a primordial ratio of hydrogen and its heavier isotope deuterium that is similar to the ratio in water on Earth. This further implies that terrestrial planets including Earth have similar water sources, which are chondritic meteorites, and not comets.



Hydrogen isotopic compositions of Martian volatile reservoirs (left diagram): near-surface crustal water (green square) and primordial water in the mantle (red triangle). These hydrogen isotopic compositions were obtained from tiny (<20 µm) melt inclusions (pointed by red arrows) hosted by olivines in martian basaltic meteorites, and expressed as permillage difference (δD) relative to the reference Earth's ocean water; δD = [(D/H)sample/(D/H)reference-1] x 1000. Most terrestrial water has relatively limited δD values, which overlap with the martian primordial water and bulk-chondrites but are distinct from comets and the martian atmosphere and crustal water. The right figure is an electron microprobe image (called back-scattered electron or compositional image); brighter areas indicate denser (i.e., richer in heavy elements such as iron) than darker areas.

The search for water elsewhere in the solar system is a strong driving factor behind planetary science. Its presence may suggest the existence of life as well as a number of other geological processes.

The sculpted channels of the Martian southern hemisphere speak loudly of flowing water, but this terrain is ancient. Consequently, planetary scientists often describe early Mars as 'warm and wet' and current Mars as 'cold and dry'.

The composition of volatile elements such as hydrogen and nitrogen can differ from that of the nebular gas from which the solar system formed. Volatile gases are released from Martian interiors by volcanic activity and have a critical influence on the climate in Mars. Hydrogen (H), in particular, is an important indicator of atmospheric loss and whether climate change may result turning Mars from wet and warm to cold and dry.

As on Earth hydrogen also exists in the form of its isotope heavy hydrogen or deuterium (D), which has a neutron as well as proton at the nucleus. The ratio H/D changes as a result of lighter hydrogen being lost more readily from the Martian atmosphere. Consequently D/H ratios can provide important information on the origin of water and rocks on Mars.

Much of our information about the martian interior comes from studies of the basaltic martian meteorites (shergottites). However conclusions as to the water content range from relatively dry (1-36 ppm) to relatively wet, such as 73–290 ppm. In addition previous geochemical studies of martian meteorites indicate two sources of parental magma, one that has an enriched elemental composition and one that has a depleted elemental composition.

The researchers studied samples of shergottite –martian basalt - from two meteorites. One of the meteorites, Yamato (Y) 980459, appears to be a basalt that underwent minimal modification as it was transported to the surface of Mars from the deep martian mantle. In contrast, another meteorite, LAR06319, appears to have sampled a martian crust that had been in contact with the martian atmosphere.

As the authors also point out it can be difficult to estimate the D/H ratio of the Martian mantle from meteorite samples due to terrestrial contamination. Air left in the vacuum system during analysis, oils (and/or water) used as lubricants during polishing, and epoxy (or acrylic) resin used as amounting agent can all contribute to contaminants. Resins can be the most challenging and unavoidable sources of contaminants for Martian meteorites as they penetrate the many microfractures of the shergottite and cannot be removed. The researchers used a sample preparation method using indium metal instead of resin and thus avoided this primary source of contamination in their samples.

"Tomo was able to demonstrate that the initial hydrogen isotopic composition of Mars was Earth-like, but not from Earth because he designed and conducted an experiment that greatly reduced laboratory contamination to the meteorite sample here on Earth," said Justin Simon, a NASA cosmochemist on the team.

They analysed the isotopic composition of volatile elements in the two meteorite samples and provide direct evidence of a mantle that is dry and has a depleted elemental composition. They report definitive evidence that the Martian mantle has retained a primordial D/H ratio similar to water on Earth. They also demonstrate that that the enriched shergottite source does not represent an enriched mantle domain in the deep interior but, rather, assimilation of old Martian crust. The result is the first indication of such crust mantle interaction.
More information: Usui, T., et al. Earth and Planetary Science Letters 357–358 (2012) 119–129.

http://www.eurekalert.org/pub_releases/2012-11/uotm-rsd111912.php

Research shows diabetes drug improves memory

An FDA-approved drug initially used to treat insulin resistance in diabetics has shown promise as a way to improve cognitive performance in some people with Alzheimer's disease.

Working with genetically engineered mice designed to serve as models for Alzheimer's, University of Texas Medical Branch at Galveston researchers found that treatment with the anti-insulin-resistance drug rosiglitazone enhanced learning and memory as well as normalized insulin resistance. The scientists believe that the drug produced the response by reducing the negative influence of Alzheimer's on the behavior of a key brain-signaling molecule.

The molecule, called extracellular signal-regulated kinase (ERK), becomes hyperactive both in the brains of Alzheimer's patients and in the mice at a disease stage corresponding to mild cognitive impairment in human Alzheimer's. This excessive activity leads to improper synaptic transmission between neurons, interfering with learning and memory.

Rosiglitazone brings ERK back into line by activating what's known as the peroxisome proliferator-activated receptor gamma (PPARγ) pathway, which interacts with genes that respond to both PPARγ and ERK.

"Using this drug appears to restore the neuronal signaling required for proper cognitive function," said UTMB professor Larry Denner, the lead author of a paper describing this work now online in the Journal of Neuroscience. "It gives us an opportunity to test several FDA-approved drugs to normalize insulin resistance in Alzheimer's patients and possibly also enhance memory, and it also gives us a remarkable tool to use in animal models to understand the molecular mechanisms that underlie cognitive issues in Alzheimer's."

ERK dysfunction in the Alzheimer's mouse model was discovered several years ago by UTMB associate professor Kelly Dineley, senior author of the Journal of Neuroscience paper. But putting together the protein, gene and memory pieces of the puzzle required a multidisciplinary translational research team including animal cognitive neuroscientists, biochemists, molecular biologists, mass spectrometrists, statisticians and bioinformaticists.

"We were extraordinarily lucky to have this diverse group of experts right here on our campus at UTMB that could coalesce to bring such different ways of thinking to bear on a common problem," Denner said. "It was quite a challenge to get all of these experts communicating in a common scientific language. But now that we have this team working, we can move on to even more detailed and difficult questions."

Now the UTMB research team and other investigators across the world are starting clinical trials to investigate the value of therapies for insulin resistance in early-stage Alzheimer's disease in humans.

Other authors of the Journal of Neuroscience paper include predoctoral fellows Jennifer Rodriguez-Rivera and Jordan Jahrling, research associate Sigmund Haidacher, scientist Russ Carmichael, assistant professors Rovshan Sadygov, Jonathan Starkey and Heidi Spratt, and professors Bruce Luxon and Thomas Wood. This research was supported by the National Institutes of Health, the American Health Assistance Foundation, the Sealy Foundation for Biomedical Research, the Emmett and Miriam McCoy Foundation, the Cullen Trust for Health Care and Jerry and Winkie Mohn.

http://www.eurekalert.org/pub_releases/2012-11/uomh-sgp112012.php

Sweat glands play major role in healing human wounds, U-M research shows

As poor wound healing from diabetic ulcers and other ailments takes heavy toll on healthcare costs, U-M findings pave way for new efficient therapies

ANN ARBOR, Mich. - Turns out the same glands that make you sweat are responsible for another job vital to your health: they help heal wounds.

Human skin is rich with millions of eccrine sweat glands that help your body cool down after a trip to the gym or on a warm day. These same glands, new University of Michigan Health System research shows, also happen to play a key role in providing cells for recovering skin wounds – such as scrapes, burns and ulcers.

The findings were released online ahead of print in the American Journal of Pathology.

"Skin ulcers – including those caused by diabetes or bed sores – and other non-healing wounds remain a tremendous burden on health services and communities around the world," says lead author Laure Rittié, Ph.D., research assistant professor of dermatology at the University of Michigan Medical School. "Treating chronic

wounds costs tens of billions of dollars annually in the United States alone, and this price tag just keeps rising. Something isn't working."
Now, U-M researchers believe they have discovered one of the body's most powerful secret weapons in healing. "By identifying a key process of wound closure, we can examine drug therapies with a new target in mind: sweat glands, which are very under-studied," Rittié says. "We're hoping this will stimulate research in a promising, new direction."
Previous understanding of wound closure was that new skin cells originate from hair follicles and from intact skin at the edge of the wound. The U-M findings demonstrate that cells arise from beneath the wound, and suggest that human eccrine sweat glands also store an important reservoir of adult stem cells that can quickly be recruited to aid wound healing.
"It may be surprising that it's taken until now to discover the sweat glands' vital role in wound repair," Rittié says. "But there's a good reason why these specific glands are under-studied – eccrine sweat glands are unique to humans and absent in the body skin of laboratory animals that are commonly used for wound healing research.
"We have discovered that humans heal their skin in a very unique way, different from other mammals," Rittié adds. "The regenerative potential of sweat glands has been one of our body's best-kept secrets. Our findings certainly advance our understanding of the normal healing process and will hopefully pave the way for designing better, targeted therapies."
Additional Authors: Dana L. Sachs, M.D.; Jeffrey S. Orringer, M.D.; John J. Voorhees, M.D.; and Gary J. Fisher, Ph.D., all of the University of Michigan Department of Dermatology.
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http://www.eurekalert.org/pub_releases/2012-11/plos-hot111512.php

Human obedience: The myth of blind conformity

Awful acts involve not just obedience, but enthusiasm too

In the 1960s and 1970s, classic social psychological studies were conducted that provided evidence that even normal, decent people can engage in acts of extreme cruelty when instructed to do so by others. However, in an essay published November 20 in the open access journal PLOS Biology, Professors Alex Haslam and Stephen Reicher revisit these studies' conclusions and explain how awful acts involve not just obedience, but enthusiasm too—challenging the long-held belief that human beings are 'programmed' for conformity.
This belief can be traced back to two landmark empirical research programs conducted by Stanley Milgram and Philip Zimbardo in the 1960s and early 1970s. Milgram's 'Obedience to Authority' research is widely believed to show that people blindly conform to the instructions of an authority figure, and Zimbardo's Stanford Prison Experiment (SPE) is commonly understood to show that people will take on abusive roles uncritically.
However, Professor Haslam, from the University of Queensland, argues that tyranny does not result from blind conformity to rules and roles. Rather, it is a creative act of followership, resulting from identifying with authorities who represent vicious acts as virtuous.
"Decent people participate in horrific acts not because they become passive, mindless functionaries who do not know what they are doing, but rather because they come to believe—typically under the influence of those in authority—that what they are doing is right," Professor Haslam explained.
Professor Reicher, of the University of St Andrews, added that it is not that they were blind to the evil they were perpetrating, but rather that they knew what they were doing, and believed it to be right.
These conclusions were partly informed by Professors Haslam and Reicher's own prison experiment, conducted in 2002 in collaboration with the BBC. The study generated three findings. First, participants did not conform automatically to their assigned role; second, they only acted in terms of group membership to the extent that they identified with the group; and finally, group identity did not mean that people simply accepted their assigned position—it also empowered them to resist it.
Although Zimbardo and Milgram's findings remain highly influential, Professor Haslam argue that their conclusions do not hold up well under close empirical scrutiny.
Professor Reicher concludes that tyranny does not flourish because perpetrators are helpless and ignorant; it flourishes because they are convinced that they are doing something worthy.
Funding: The authors received no specific funding for this work.
Competing interests: The authors have declared that no competing interests exist.
Citation: Haslam SA, Reicher SD (2012) Contesting the "Nature" Of Conformity: What Milgram and Zimbardo's Studies Really Show. PLoS Biol 10(11): e1001426. doi:10.1371/journal.pbio.1001426

http://www.eurekalert.org/pub_releases/2012-11/plos-bma111512.php

Beneficial microbes are 'selected and nurtured' in the human gut

Animals actively select the gut microbes that are the best partners and nurture them with nutritious secretions

Animals, including humans, actively select the gut microbes that are the best partners and nurture them with nutritious secretions, suggests a new study led by Oxford University, and published November 20 in the open-access journal PLOS Biology.

The Oxford team created an evolutionary computer model of interactions between gut microbes and the lining (the host epithelial cell layer) of the animal gut. The model shows that beneficial microbes that are slow-growing are rapidly lost, and need to be helped by host secretions, such as specific nutrients, that favour the beneficial microbes over harmful ones.

The work also shows that the cost of such selectivity is low: the host only needs to use a very small amount of secretions to retain beneficial microbes that would otherwise have been lost.

"The cells of our bodies are greatly outnumbered by the microbes that live on us and, in particular, in our gut," said Professor Kevin Foster of Oxford University's Department of Zoology, an author of the new paper. "We know that many gut microbes are highly beneficial to us, protecting us from pathogens and helping us with digestion, but quite how such a beneficial mutual relationship evolved, and how it is maintained, has been something of a mystery."

"This research highlights the importance of growth-promoting substances in our ability to control the microbes that live inside us. It shows that nutrients are more powerful when released by the host epithelial cell layer than when coming from the food in the gut, and suggests that controlling our microbes is easier than was previously thought."

Jonas Schulter, also of Oxford University's Department of Zoology and first author of the paper, said: "The inside of our gut is rather like a war zone, with all kinds of microbes battling it out for survival and fighting over territory. Our study shows that hosts only have to secrete a small quantity of substances that slightly favour beneficial microbes to tip the balance of this conflict: it means that favoured microbial species that would otherwise be lost don't just survive on the epithelial surface but expand, pushing any other strains out."

The team's simulations show that cells affected by host epithelial selection are least likely to be lost, and instead persist longest, causing 'selectivity amplification', whereby relatively tiny changes instituted by the host (in this case a very small amount of secretions of certain compounds) can be amplified to produce a large-scale effect.

The study may have wider implications than the human gut: selectivity amplification may occur in a range of other interactions between hosts and microbes, including the microbes that grow on the surface of corals and the roots of plants.

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Competing interests: The authors have declared that no competing interests exist.

Citation: Schluter J, Foster KR (2012) The Evolution of Mutualism in Gut Microbiota Via Host Epithelial Selection. PLoS Biol 10(11): e1001424. doi:10.1371/journal.pbio.1001424

http://www.eurekalert.org/pub_releases/2012-11/mu-bh111912.php

'Obese but happy gene' challenges the common perception of link between depression and obesity

Researchers at McMaster University have discovered new genetic evidence about why some people are happier than others.

Hamilton, ON (November 20, 2012) - McMaster scientists have uncovered evidence that the gene FTO – the major genetic contributor to obesity – is associated with an eight per cent reduction in the risk of depression. In other words, it's not just an obesity gene but a "happy gene" as well.

The research appears in a study published today in the journal Molecular Psychiatry. The paper was produced by senior author David Meyre, associate professor in clinical epidemiology and biostatistics at the Michael G. DeGroote School of Medicine and a Canada Research Chair in genetic epidemiology; first author Dr. Zena Samaan, assistant professor, Department of Psychiatry and Behavioural Neurosciences, and members of the Population Health Research Institute of McMaster University and Hamilton Health Sciences.

"The difference of eight per cent is modest and it won't make a big difference in the day-to-day care of patients," Meyre said. "But, we have discovered a novel molecular basis for depression."

In the past, family studies on twins, and brothers and sisters, have shown a 40 per cent genetic component in depression. However, scientific studies attempting to associate genes with depression have been "surprisingly unsuccessful" and produced no convincing evidence so far, Samaan said.
The McMaster discovery challenges the common perception of a reciprocal link between depression and obesity: That obese people become depressed because of their appearance and social and economic discrimination; depressed individuals may lead less active lifestyles and change eating habits to cope with depression that causes them to become obese.
"We set out to follow a different path, starting from the hypothesis that both depression and obesity deal with brain activity. We hypothesized that obesity genes may be linked to depression," Meyre said.
The McMaster researchers investigated the genetic and psychiatric status of patients enrolled in the EpiDREAM study led by the Population Health Research Institute, which analyzed 17,200 DNA samples from participants in 21 countries.
In these patients, they found the previously identified obesity predisposing genetic variant in FTO was associated with an eight per cent reduction in the risk of depression. They confirmed this finding by analyzing the genetic status of patients in three additional large international studies.
Meyre said the fact the obesity gene's same protective trend on depression was found in four different studies supports their conclusion. It is the "first evidence" that an FTO obesity gene is associated with protection against major depression, independent of its effect on body mass index, he said. This is an important discovery as depression is a common disease that affects up to one in five Canadians, said Samaan.

http://www.eurekalert.org/pub_releases/2012-11/asfm-nc111612.php

New coronavirus related to viruses from bats

The virus that is causing alarm among global public health authorities after it killed a man in Jeddah, Saudi Arabia

The virus that is causing alarm among global public health authorities after it killed a man in Jeddah, Saudi Arabia earlier this year and is now linked to two other cases of disease is a novel type of coronavirus most closely related to viruses found in bats, according to a genetic analysis to be published in mBio®, the online open-access journal of the American Society for Microbiology, on November 20. Researchers studied the genome of the HCoV-EMC/2012 virus in detail to learn about its relatedness to other viruses and about possible sources. The results of the sequencing and analysis could be used to develop diagnostic methods and possibly in creating therapies and vaccines if they are eventually needed for this emerging disease.
"The virus is most closely related to viruses in bats found in Asia, and there are no human viruses closely related to it," says Ron Fouchier of the Erasmus Medical Center in the Netherlands, who headed up the study. "Therefore, we speculate that it comes from an animal source."
The case in Saudi Arabia earlier this year, in which a 60-year-old man suffered from acute pneumonia and renal failure before his death, reminded public health authorities around the world of the threat posed by coronaviruses, a group that includes the the SARS virus, a pathogen that emerged in 2002 and eventually lead to the deaths of more than 900 people.
The HCoV-EMC/2012 virus is under increasing scrutiny today as two other patients suffering from infections with similar viruses have been identified. Since the patient in Saudi Arabia died in June, an individual from Qatar has been diagnosed with a very similar condition and is currently being cared for at a hospital in London. The full genomic sequence of the virus from that patient was made available on November 13, and Fouchier says it is a very close match with the HCoV-EMC/2012 virus sequence he analyzed in the mBio® paper, showing only 99 single nucleotide differences (in an unpublished analysis).
"That makes it clear they are the same species. Ninety-nine nucleotides on the full genome amounts to only 0.3 – 0.4% difference," says Fouchier. "That, of course raises new questions."
Now a third case of illness from this new virus has been identified, this time in Saudi Arabia again, but the genome sequence of that virus is not yet available.
The genome of the HCoV-EMC/2012 virus that is the focus of the mBio® study was fully sequenced within a few days by combining an optimized random amplification deep sequencing approach, which covered about 90% of the genome, with conventional Sanger sequencing to confirm these draft findings.
Phylogenetic analyses place the virus within the Betacoronavirus genus, where its closest fully sequenced relatives are viruses called BtCoV-HKU4 and BtCoV-HKU5, both of which were originally isolated in Asia from Lesser bamboo bats (Tylonycteris pachypus) and Japanese house bats (Pipistrellus abramus), respectively. HCoV-EMC/2012 bears only 77% sequence similarity with the BtCoV-HKU5 virus, however, making it

distinct enough to be called a novel species of virus, says Fouchier. A partial sequence from a virus that was isolated from a species of bat in the Netherlands appears to be a closer match with HCoV-EMC/2012, but without a full genome sequence the exact degree of relatedness is impossible to tell.
Based on the similarities the HCoV-EMC/2012 virus shares with viruses from bats, and taking into account a separate serological study carried out in Saudi Arabia that showed 2,400 hospital visitors had no antibodies to the virus, Fouchier feels confident saying the virus is new to humans. That source may well be bats, he says, since Pipistrellus bats are present in Saudi Arabia and neighboring countries.
The relatedness between the HCoV-EMC/2012 virus and the virus that infected the patient in the unnamed London hospital is interesting, says Fouchier, since they are similar enough to be the same species but different enough that they are probably not directly linked. "It is unlikely they would be infected from the same source. We really need to understand whether these viruses are coming from a single source or multiple sources" before more cases come to light, he says.
In addition to the insights it provides for identifying the source of the virus and linking cases of illness together, the genome sequence of the HCoV-EMC/2012 virus will also enable scientists to study the virus in more detail. By making synthetic copies of the virus genome, Fouchier says scientists can reconstruct the virus in the lab and study its properties to identify the sources of its virulence.
The genome sequence could also be pivotal to protecting public health. "A well-annotated genome sequence is crucial to further the development of diagnostic methods and antivirals and vaccines that might be needed," says Fouchier. Considering that three cases of disease from the virus have already been identified, he says, "we certainly need the diagnostics already."
"Whether we would need antivirals and vaccines? Well, I certainly hope not," says Fouchier.

http://www.eurekalert.org/pub_releases/2012-11/rhuo-don111912.php

Discovery offers new treatment for epilepsy

New drugs derived from components of a specific diet used by children with severe, drug-resistant epilepsy could offer a new treatment, according to research published today in the journal Neuropharmacology.

Scientists from Royal Holloway, in collaboration with University College London, have identified specific fatty acids that have potent antiepileptic effects, which could help control seizures in children and adults.
The discovery could lead to the replacement of the ketogenic diet, which is often prescribed for children with severe drug-resistant epilepsy. The high fat, low carbohydrate diet is thought to mimic aspects of starvation by forcing the body to burn fats rather than carbohydrates. Although often effective, the diet has attracted criticism, as side effects can be significant and potentially lead to constipation, hypoglycaemia, retarded growth and bone fractures.
By pinpointing fatty acids in the ketogenic diet that are effective in controlling epilepsy, researchers hope that they can develop a pill for children and adults that could provide similar epilepsy control, but lacks the side effects of the diet.
Professor Robin Williams from the Centre of Biomedical Sciences at Royal Holloway said: "This is an important breakthrough. The family of medium chain fatty acids that we have identified provide an exciting new field of research with the potential of identifying, stronger, and safer epilepsy treatments."
The study tested a range of fatty acids found in the ketogenic diet against an established epilepsy treatment. Researchers found that not only did some of the fatty acids outperform the drug in controlling seizures, they also had fewer side effects.
Professor Matthew Walker from the Institute of Neurology, University College London said: "Epilepsy affects over 50 million people worldwide and approximately a third of these people have epilepsy that is not adequately controlled by our present treatments. This discovery offers a whole new approach to the treatment of drug-resistant epilepsies in children and adults."
The research also builds on work funded by the NC3Rs in which most of the animal testing normally used in drug development for epilepsy has been replaced by using a simple amoeba to initially screen and identify improved treatments.
Professor Williams added: "Animals are often used in the search for new epilepsy treatments. Our work provides a new approach, helping us to reduce reliance on animals and provide potential major improvements in human health."
The specific fatty acids identified in this work are the subject of a patent application, and Royal Holloway is seeking commercial collaborators to pursue the potential for new drug development.

http://bit.ly/ScQBSL

Blood cell disguise halts multiple sclerosis

A clever disguise is all it takes to bring a halt to multiple sclerosis in mice.

11:20 20 November 2012 by Will Ferguson

In MS, immune cells called T-cells treat myelin – which insulates nerves – as a foreign invader and destroy it. This disrupts nerve cell communication, causing symptoms such as numbness, paralysis and blindness. Current therapies suppress the whole immune system. To get round this, Daniel Getts of Northwestern University in Chicago and colleagues attached myelin molecules to biodegradable nanoparticles and injected them into the bloodstream of mice with MS.

The nanoparticles are consumed by another type of immune cell – macrophages – that mistake them for harmless dying red blood cells. The team thinks the macrophages then send a message to the rest of the immune system that this particle, along with its myelin accomplice, should be tolerated.

This targeted immune response prevented relapses of MS symptoms for up to 100 days without affecting other immune pathways *Journal reference: Nature Biotechnology, doi.org/jsr*

http://www.wired.com/wiredscience/2012/11/whipworm-immune-regulation/

The Potential Health Benefits of Parasitic Gut Worms

A dose of parasitic whipworms cured monkeys with chronic diarrhea, fixing immune systems gone haywire and offering a snapshot of what worms might do for people.

By Brandon Keim

Whipworms are typically considered a scourge, but there's also reason to think they have benefits. In the monkeys, they seemed to restore intestinal bacterial balance and prevent the monkeys' immune systems from dangerous overreaction. "If you compare monkeys that had colitis with healthy monkeys, there is a big difference in types of bacteria that are attached to the intestinal wall," said microbiologist P'ng Loke of New York University, co-author of a Nov. 15 PLoS Pathogens study of the worm treatment. "Immune response is calibrated to the presence of worms. In their absence, you get a different response."

Loke is part of a small community of researchers working on an emerging theory of autoimmune diseases, which are characterized by immune malfunction. The researchers hold that humans co-evolved with a host of bacteria, viruses and parasites, and actually rely on exposure to these organisms to properly regulate our immune systems.

A decade ago, this was considered a radical idea. But a large body of research now supports the notion, from population-level observations that worm eradication is often followed by autoimmune disease spikes to animal studies of the mechanisms involved.

Parasites, especially those worms known collectively as helminths, provoke a variety of anti-inflammatory responses, allowing them to stay in our bodies. In the absence of exposure, which from an evolutionary perspective is a recent, radical aberration, immune systems can behave strangely. They overreact to what should be harmless stimuli, from dust and pollen to beneficial bacteria living in our stomachs.

"Helminths awake the regulatory side of the immune system. This helps turn off immune responses that aren't needed," said cell biologist Joel Weinstock of Tufts University, who studies worms as a possible treatment for inflammatory bowel disease. "We're no longer being challenged the way Mother Nature intended. This could be one reason why people are getting more immune-mediated diseases today."

Loke's interest in whipworms was stoked by a 2009 visit from a man with ulcerative colitis who'd treated himself by swallowing the eggs of whipworms, which have been largely exterminated from the United States. The disease went into remission, came back after the worms left his body, and went into remission again after another dose.

One anecdote doesn't make for proof, but by studying the man's immune system Loke's team generated several hypotheses about the whipworm's effects. Those were put to the test in the new experiment, which allowed the researchers to study the effects in a controlled setting.

Tested in the experiment were five rhesus monkeys suffering from idiopathic chronic diarrhea, a common condition in captive monkeys that's considered similar to the human affliction of inflammatory bowel disease. In both conditions, mucous that typically lines intestinal walls becomes thin and patchy, and intestines become dangerously inflamed as cells react to bacteria that live naturally in our gut.

After receiving the worms, four of the five monkeys' conditions improved. Their diarrhea stopped. They started gaining weight. Intestinal mucous production increased. The composition of bacteria inside the monkeys' stomachs changed, coming to resemble the bacterial communities of healthy monkeys.

The researchers also measured a host of immune system-related gene activation patterns resembling what they'd seen in their human subject and also in tests on mice.

These dynamics are difficult to untangle, said Loke, and probably involve multiple immune mechanisms. An increase in mucous makes it easier to flush out the worms. "You're basically trying to sneeze the worm out from the gut," he said. But the mucous also reduces inflammation-causing contact between cell walls and bacteria. At the same time, the types of bacteria present change, perhaps becoming less irritating in the first place.

Loke is already conducting a clinical trial of whipworms for people with ulcerative colitis. Other worm trials involve multiple sclerosis, Crohn's disease and even autism, some cases of which may be triggered by immune malfunction. If the clinical trials succeed, worms could become a standard autoimmune disease treatment, or even be used in children to prevent disease — a strange thought, at first, but there's precedent. After all, many vaccines are made with live viruses.

There are also potential downsides to using worms. In the absence of proper medical care, parasites can be deadly. But Loke and Weinstock say it's possible to keep the side effects under control. It might also be possible to replicate the worms' activity with drugs, or to design worms that offer health benefits without problems. "Helminths have been neglected," said Weinstock. "When you look at all the discoveries made from plants, bacteria and fungi, helminths have definitely been overlooked. They have such amazing powers, and they've barely been studied."

Citation: "Therapeutic Helminth Infection of Macaques with Idiopathic Chronic Diarrhea Alters the Inflammatory Signature and Mucosal Microbiota of the Colon." By Mara Jana Broadhurst, Amir Ardeshir, Bittoo Kanwar, Julie Mirpuri, Uma Mahesh Gundra, Jacqueline M. Leung, Kirsten E. Wiens, Ivan Vujkovic-Cvijin, Charlie C. Kim, Felix Yarovinsky, Nicholas W. Lerche, Joseph M. McCune, P'ng Loke. PLoS Pathogens, 15 November 2012.

http://www.scientificamerican.com/article.cfm?id=a-daily-glass-of-wine-is-okay-durin

A Daily Glass of Wine Is Okay during Pregnancy

Moms' moderate drinking does not affect kids' cognition

By Stephani Sutherland | Tuesday, November 20, 2012

Many pregnant women indulge in an occasional—or even regular—glass of wine and then worry that it might put their baby at a mental disadvantage. A new study of more than 1,600 Danish five-year-old children shows that these nonteetotaler moms can breathe a sigh of relief.

Kids whose mothers had up to eight drinks a week were just as smart as their peers born to abstaining moms, according to the study, which measured brainpower in several ways. Another common concern comes from moms who had a "last blast"—a binge of five or more drinks—before realizing they were pregnant. These women, too, can breathe easy; tots whose moms had a binge episode early in pregnancy performed just as well on the mental tasks.

Heavier drinking during pregnancy does handicap children, and some previous reports had suggested that even a little daily alcohol could potentially harm the child. "Intelligence, attention and executive functions [such as planning and reasoning] are often affected in children of alcohol-abusing mothers," says lead researcher Ulrik S. Kesmodel of Aarhus University in Denmark. Therefore, he and his colleagues expected to be able to detect the effects of small amounts of alcohol on these specific abilities, he says. Yet no such changes emerged when the researchers put kids to these tasks. The results appeared in June in BJOG: An International Journal of Obstetrics and Gynaecology. Expecting moms can relax, it appears, and have a drink now and then, guilt-free.

http://www.eurekalert.org/pub_releases/2012-11/uob-neo111912.php

New evidence of dinosaurs' role in the evolution of bird flight

Prehistoric birds had a much more primitive version of the wings we see today

Academics at the Universities of Bristol, Yale and Calgary have shown that prehistoric birds had a much more primitive version of the wings we see today, with rigid layers of feathers acting as simple airfoils for gliding. Close examination of the earliest theropod dinosaurs suggests that feathers were initially developed for insulation, arranged in multiple layers to preserve heat, before their shape evolved for display and camouflage. As evolution changed the configuration of the feathers, their important role in the aerodynamics and mechanics of flight became more apparent. Natural selection over millions of years ultimately modified dinosaurs' forelimbs into highly-efficient, feathered wings that could rapidly change its span, shape and area – a key innovation that allowed dinosaurs to rule the skies.

This basic wing configuration has remained more or less the same for the past 130 million years, with bird wings having a layer of long, asymmetrical flight feathers with short covert feathers on top. They are able to separate and rotate these flight feathers to gain height, change direction and even hover.

This formation allows birds to move in such a way as to produce both lift and thrust simultaneously – a capability that man, with the help of technology, is still trying to successfully imitate.

The research, published today [21 November] in Current Biology, looked at the dinosaur Anchiornis huxleyi and the Jurassic bird Archaeopteryx lithographica. The latter is 155 million years old and widely considered to be the earliest known bird, presenting a combination of dinosaur and bird characteristics.
Their wings differed from modern day birds in being composed of multiple layers of long feathers, appearing to represent early experiments in the evolution of the wing. Although individual feathers were relatively weak due to slender feather shafts, the layering of these wing feathers is likely to have produced a strong airfoil.
The inability to separate feathers suggests that taking off and flying at low speeds may have been limited, meaning that wings were primarily used in high-speed gliding or flapping flight.
Dr Jakob Vinther, from the University of Bristol's Schools of Biological and Earth Sciences, said: "We are starting to get an intricate picture of how feathers and birds evolved from within the dinosaurs. We now seem to see that feathers evolved initially for insulation. Later in evolution, more complex vaned or pinnate feathers evolved for display.
"These display feathers turned out to be excellent membranes that could have been utilised for aerial locomotion, which only very late in bird evolution became what we consider flapping flight. This new research is shedding light not just on how birds came to fly, but more specifically on how feathers came to be the way they are today - one of the most amazing and highly specialised structures in nature."
Dr Nicholas Longrich of Yale University added: "By studying fossils carefully, we are now able to start piecing together how the wing evolved. Before, it seemed that we had more or less modern wings from the Jurassic onwards. Now it's clear that early birds were more primitive and represented transitional forms linking birds to dinosaurs. We can see the wing slowly becoming more advanced as we move from Anchiornis, to Archaeopteryx, to later birds."

http://www.eurekalert.org/pub_releases/2012-11/hu-uc110912.php

Uncovering complexity

1 cell does it all: Sensory input to motor output in 1 worm neuron

It's one of the basic tenets of biological research – by studying simple "model" systems, researchers hope to gain insight into the workings of more complex organisms.
Caenorhabditis elegans –tiny, translucent worms with just 302 neurons – have long been studied to understand how a whole nervous system is capable of translating sensory input into motion and behavior.
New research conducted by the laboratory of Aravi Samuel in the Harvard Physics Department and the Center for Brain Sciences, however, is uncovering surprising sophistication in the individual neurons of the worms' "simple" nervous system.
As described in a November 21 paper in Neuron, Dr. Quan Wen, a postdoctoral fellow in the Samuel lab who spearheaded the work, has shown that a single type of neuron in the C. elegans nerve cord (the worm equivalent of the spinal cord) packs both sensory and motor capabilities. The locomotory systems of most creatures, including humans, use different neurons to gather sensory information about animal movement or to send signals to muscle cells. C. elegans encodes an entire sensorimotor loop into one particularly sophisticated type of motor neuron.
"This type of circuit is completely new – this is not the way people think about any motor circuit," Samuel said.
The unusual discovery arose from researchers asking a single, simple question: How does C. elegans organize its movements?
"What sent us down this road was a phenomenon that we've observed in the lab," Samuel explained. "If we place the worms in a wet environment, they will swim. On surfaces, however, they crawl. The question was how the animal 'knew' to do each. The answer had to be feedback – something is telling the worm that it's in a low viscous environment here, and a high viscous environment there.
"The general name for this is proprioceptive feedback," Samuel continued. "It's that process that allows your brain to understand what each of your legs is doing and coordinate your ability to walk, it gives you an awareness of your body posture. The real puzzle in this case, however, was that C. elegans has so few neurons – just 302 – we didn't understanding how proprioceptive feedback could come back into the system."
To test how the worms receive that feedback, the lab turned to remarkable microfluidic devices designed by the laboratory of George Whitesides, the Woodford L. and Ann A. Flowers University Professor in the Harvard Chemistry Department. These microfluidic devices – small machines constructed from soft, silicone rubber – can change shape when inflated with air or liquid, ideal for probing the wiggles of worms.
These cleverly designed devices allowed the scientists, for example, to restrain the movement of the worms' midsection while leaving its head and tail free to move. The results were immediately illuminating – while the worms' heads continued to move, their tails remained immobile.

"That very simple experiment was our first clue to what was going on with the worms' neural system," Samuel said. "Basically, the tail is detecting the bending of the middle and then bending. By holding it still, we're interrupting that message."
The finding was surprising, Samuel said, because earlier research had showed that other, similar animals, such as leeches and lamprey, behaved in very different ways.
"If you restrain the middle portions of larger undulatory animals, the head and the tail can move independently," he said. "The role of feedback in bigger animals is simply to coordinate independent rhythmic units. That's not what we see in C. elegans – the tail does not move by itself, feedback is the signal that drives motion itself. The tail cannot move unless the head moves first. By distributing a chain of these sensorimotor reflex arcs along the body, an undulatory wave that starts at the head travels to the tail."
Later tests, in which researchers used microfluidic devices to force the worms' midsection to bend, led to a detailed characterization of this remarkable feedback system in C. elegans.
Definitive proof that the worms' motor neurons can double as sensory neurons was obtained with optogenetics, using genetically-engineered animals with light-sensitive protein that allowed the scientists to activate or inactivate specific cells with focused laser light.
Just as they had in earlier experiments, the worms' tails initially bent in response to movements in their midsections. When hit by a laser, however, the neurons controlling such movement were inactivated, causing the animals' tails to stay locked in a single position.
"That proves that the whole sensorimotor loop is contained in these neurons," Samuel said. "One of the general rules of biology is that the fewer neurons a creature has, the 'smarter' each neuron has to be. With just 302 neurons, each neuron in the worm can become incredibly sophisticated."
"This role of proprioceptive feedback and how it helps organize the movements of this animal, it's an entirely new principle of locomotory control," he continued. "This research shows that all that functionality is in the motor circuit. The head doesn't have to tell every segment of the body what to do, it can just give a master command, and the rest of the body follows through local sensorimotor interactions."

http://www.eurekalert.org/pub_releases/2012-11/plos-cta111912.php

Call that a ball? Dogs learn to associate words with objects differently than humans do

When learning names for objects, dogs and humans use different information

Dogs learning to associate words with objects form these associations in different ways than humans do, according to research published November 21 in the open access journal PLOS ONE by Emile van der Zee and colleagues from the University of Lincoln, UK.
Previous studies have shown that humans between the ages of two to three typically learn to associate words with the shapes of objects, rather than their size or texture. For example, toddlers who learn what a 'ball' is and are then presented other objects with similar shapes, sizes or textures will identify a similarly-shaped object as 'ball', rather than one of the same size or texture.
Earlier research with dogs has shown that they can learn to associate words with categories of objects (such as 'toy'), but whether their learning process was the same as that of humans was unknown.
In this new study, the scientists presented Gable, a five year old Border Collie, with similar choices to see if this 'shape bias' exists in dogs. They found that after a brief training period, Gable learned to associate the name of an object with its size, identifying other objects of similar size by the same name. After a longer period of exposure to both a name and an object, the dog learned to associate a word to other objects of similar textures, but not to objects of similar shape.
According to the authors, these results suggest that dogs (or at least Gable) process and associate words with objects in qualitatively different ways than humans do. They add that this may be due to differences in how evolutionary history has shaped human and dog senses of perceiving shape, texture or size.
The bottom line: Though your dog understands the command "Fetch the ball", but he may think of the object in a very different way than you do when he hears it. As the authors explain, "Where shape matters for us, size or texture matters more for your dog. This study shows for the first time that there is a qualitative difference in word comprehension in the dog compared to word comprehension in humans."
Citation*: van der Zee E, Zulch H, Mills D (2012) Word Generalization by a Dog (Canis familiaris): Is Shape* ***Important?*** *PLoS ONE 7(11): e49382. doi:10.1371/ journal.pone.0049382*
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http://rss.sciam.com/click.phdo?i=e5f6078f706678770f9e5dc415fd9cc4

Hunt for Life under Antarctic Ice Heats Up

On the heels of a Russian drilling effort that reached Lake Vostok, British and American teams also aim to penetrate ancient subglacial lakes

By Quirin Schiermeier and Nature magazine | Wednesday, November 21, 2012 | 5

Nestled in a steep fjord beneath three kilometers of Antarctic ice, the lost world of Lake Ellsworth has haunted Martin Siegert's dreams ever since he got involved in subglacial research a dozen years ago. Finally, the time has come for him to explore its mysterious waters.

Next week, Siegert, a glaciologist at the University of Bristol, UK, packs his bags for the long journey to the opposite end of the world. Once he has reached the Rothera Research Station of the British Antarctic Survey (BAS) on an island off the Antarctic Peninsula, he and his science crew will fly about 1,000 kilometers into western Antarctica. On 5 December, the real work begins: drilling straight down through the ice to the pristine lake beneath. In its shadowy waters they hope to find forms of life that have not seen the light of day in millions of years (see 'Trapped under ice'). And in the lake bed sediments, the team will search for records of the poorly understood history of the West Antarctic Ice Sheet, potentially revealing how the mighty glacier has waxed and waned over time.

Is Siegert excited? "This is the very pinnacle of the science I've been doing since the turn of the millennium," he says. "Now guess if I'm excited."

Almost 380 subglacial lakes have been discovered and mapped in Antarctica, and have been explored remotely with ice-penetrating radar, gravity measurements and seismic investigations (A. Wright and M. Siegert Antarctic Science http://doi.org/jsn; 2012). These ancient lakes, large and small, owe their existence to geothermal heat that melts the Antarctic ice from below. Gravity and ice pressure force the melt water to flow, and it collects in the hollows and valleys of the continent under the ice.

If all goes to plan, Lake Ellsworth will be the second such lake to be breached. In February, a Russian team penetrated Lake Vostok — the largest and deepest Antarctic lake — completing a project that was launched more than 20 years ago (see Nature 482, 287; 2012). And a third effort is about to begin: next week, a US drilling team will set out for McMurdo Station in Antarctica. In January, the researchers will move to their target — subglacial Lake Whillans, a small, shallow body of water close to the edge of the Ross Ice Shelf.

The quest to find exotic microbial life that may have evolved in or beneath these lakes is for many the most thrilling aspect of the research. Scientists have discovered a catalogue of bacteria elsewhere that mine their energy from rocks and minerals, and many assume that specialized microbes living in Antarctica's hidden lakes might do the same.

"Life exists in extreme ecosystems, from the deep lithosphere to the high atmosphere," says David Pearce, an environmental microbiologist with the BAS who will join the UK expedition. "I would be incredibly surprised if we get there and find no organisms at all."

The Lake Vostok team found evidence that heat-loving bacteria may live in the bedrock surrounding that lake. The clues came from DNA in sediment that had become trapped in accretion ice — the lake water that freezes to the bottom of the massive glacier (S. A. Bulat et al. Adv. Space Res. 48, 697–701; 2011).

But the upper layers of the lake itself seem to be lifeless, reported Sergey Bulat, a microbiologist at the Petersburg Nuclear Physics Institute in Russia, at the 12th European Workshop on Astrobiology in Stockholm last month. No native microbes turned up in a preliminary analysis of lake water that had frozen onto the Russians' drill bit, although the team will return to the site this season to collect more samples.

Lake Ellsworth might be a better bet for microbe-hunters, because it offers fewer hiding places. At roughly 12 kilometers long by 3 kilometers wide, with a depth of around 150 meters, it is but a puddle compared with the vast Lake Vostok. Measuring about 250 kilometers long by 50 kilometers wide, Vostok ranks among the world's largest freshwater bodies. Ellsworth is neatly settled in a subglacial valley near the continental divide, where the overlying ice moves at its slowest. At around −30 °C, ice at the site is also twice as 'warm' as the ice on the Vostok plateau in East Antarctica, and is thinner by almost a kilometer. All this will make Lake Ellsworth much easier to access and extensively sample than its prominent cousin, says Siegert.

Even if Ellsworth and Whillans turn out to be sterile, the exploration might provide clues about what constrains life on Earth and elsewhere in the Solar System. Siegert says that it would be a "phenomenal result" if the lakes were found to be devoid of life, because they offer everything that bacteria need — including liquid water and nutrients — and their water temperatures are just a few degrees below zero.

The UK team hopes to reach Ellsworth in a single three-day session, using a drill that will melt the ice with a high-pressure jet of water, heated to 90 °C. Once the borehole is finished, the team will have around 24 hours to deploy a water-sampling probe and a sediment corer before the hole refreezes.

The equipment, fastidiously prepared to make sure that it does not contaminate the lake with microbes from the surface, was approved last year by the parties to the Antarctic Treaty. Siegert reckons that drilling will consume some 60,000 liters of water, produced by melting snow at the site. The water will pass through a five-stage filtration system and then be treated with ultraviolet light to sterilize it. "The water we will use to melt into the lake is cleaner than the ice that naturally melts into the lake," says Siegert. The 5-meter-long cylindrical titanium probe that will travel down the hole on the end of a tether, taking samples at different depths in the lake, was assembled in a clean room in Southampton, UK, and will be unwrapped from its sterilized bag only once it sits in the clean borehole.

The main challenge, says Siegert, will be to complete all sampling operations within the very short window of time. If things go badly, however, the team has enough fuel to reopen the hole by pumping in more hot water. If the probe gets lost or stuck, the researchers may drill a second hole and deploy a second set of sampling instruments. Indeed, they might do this anyway to get an extra round of sampling, potentially adding confidence to the scientific results, says Siegert.

If Lake Ellsworth does host life, it could be identified by the end of the year. But the exploration of Antarctica's hidden lakes has just begun, says John Priscu, a glaciologist at Montana State University in Bozeman, who is overseeing the Lake Whillans foray. Data from more than just three sites are needed, he says, before scientists can hope to understand how the hidden lakes and rivers interact with the overlying ice sheet by lubricating its movement, for example. Studying more lakes could also reveal whether their discharges of minerals affect the chemistry and biological productivity of the Southern Ocean.

"We have come a long way since the time, not long ago, when people thought that Antarctica was but a benign block of ice," says Priscu. "It makes me happy to see the excitement surrounding our science. But I'm afraid we know still less about Antarctica's subglacial environments than we know about some places on Mars."

http://www.sciencedaily.com/releases/2012/11/121121145402.htm

Autism-Like Behaviors Reversed in Mice: New Hope for Understanding Autism

Researchers have identified a crucial link between protein synthesis and autism spectrum disorders

ScienceDaily - Researchers from McGill University and the University of Montreal have identified a crucial link between protein synthesis and autism spectrum disorders (ASD), which can bolster new therapeutic avenues. Regulation of protein synthesis, also termed mRNA translation, is the process by which cells manufacture proteins. This mechanism is involved in all aspects of cell and organism function. A new study in mice has found that abnormally high synthesis of a group of neuronal proteins called neuroligins results in symptoms similar to those diagnosed in ASD. The study also reveals that autism-like behaviors can be rectified in adult mice with compounds inhibiting protein synthesis, or with gene-therapy targeting neuroligins. Their results are published in the journal Nature.

Autism spectrum disorders (ASD) encompass a wide array of neurodevelopmental diseases that affect three areas of behaviour: social interactions, communication and repetitive interests or behaviors. According to the U.S.-based Centers for Disease Control and Prevention, 1 in 88 children suffer from ASD, and the disorder is reported to occur in all racial, ethnic, and socioeconomic groups. ASDs are almost five times more common among boys (1 in 54) than among girls (1 in 252).

"My lab is dedicated to elucidating the role of dysregulated protein synthesis in cancer etiology. However, our team was surprised to discover that similar mechanisms may be implicated in the development of ASD", explained Prof. Nahum Sonenberg, from McGill's Dept. of Biochemistry, Faculty of Medicine, and the Goodman Cancer Research Centre. "We used a mouse model in which a key gene controlling initiation of protein synthesis was deleted. In these mice, production of neuroligins was increased. Neuroligins are important for the formation and regulation of connections known as synapses between neuronal cells in the brain and essential for the maintenance of the balance in the transmission of information from neuron to neuron."

"Since the discovery of neuroligin mutations in individuals with ASD in 2003, the precise molecular mechanisms implicated remain unknown," said Christos Gkogkas, a postdoctoral fellow at McGill and lead author. "Our work is the first to link translational control of neuroligins with altered synaptic function and autism-like behaviors in mice. The key is that we achieved reversal of ASD-like symptoms in adult mice. Firstly, we used compounds, which were previously developed for cancer treatment, to reduce protein synthesis. Secondly, we used non-replicating viruses as vehicles to put a break on exaggerated synthesis of neuroligins."

Computer modeling played an important role in this research. "By using a new sophisticated computer algorithm that we specially developed to answer Dr. Sonenberg's questions, we identified the unique structures of mRNAs of the neuroligins that could be responsible for their specific regulation," explained Prof. François

Major, of the University of Montreal's Institute for Research in Immunology and Cancer and Department of Computer Science.
The researchers found that dysregulated synthesis of neuroligins augments synaptic activity, resulting in an imbalance between excitation and inhibition in single brain cells, opening up exciting new avenues for research that may unlock the secrets of autism.
"The autistic behaviours in mice were prevented by selectively reducing the synthesis of one type of neuroligin and reversing the changes in synaptic excitation in cells," explained Prof. Jean-Claude Lacaille at the University of Montreal's Groupe de Recherche sur le Système Nerveux Central and Department of Physiology. "In short, we manipulated mechanisms in brain cells and observed how they influence the behaviour of the animal." The researchers were also able to reverse changes in inhibition and augment autistic behaviors by manipulating a second neuroligin. "The fact that the balance can be affected suggests that there could be a potential for pharmacological intervention by targeting these mechanisms," Lacaille concluded.
This work is funded by grants from the Canadian Institutes of Health Research (CIHR), the Autism Speaks Agency and the Fonds de la recherche du Québec – Santé. Prof. Lacaille holds the Canada Research Chair in Cellular and Molecular Neurophysiology. The University of Montreal is officially known as Université de Montréal.
Christos G. Gkogkas, Arkady Khoutorsky, Israeli Ran, Emmanouil Rampakakis, Tatiana Nevarko, Daniel B. Weatherill, Cristina Vasuta, Stephanie Yee, Morgan Truitt, Paul Dallaire, François Major, Paul Lasko, Davide Ruggero, Karim Nader, Jean-Claude Lacaille, Nahum Sonenberg. Autism-related deficits via dysregulated eIF4E-dependent translational control. Nature, 2012; DOI: 10.1038/nature11628

http://www.eurekalert.org/pub_releases/2012-11/ci-mof112112.php

Magnesium oxide: From Earth to super-Earth

New work shows how magnesium oxide behaves under the extreme conditions deep within planets andfound evidence that alters our understanding of planetary evolution

Washington, D.C.- The mantles of Earth and other rocky planets are rich in magnesium and oxygen. Due to its simplicity, the mineral magnesium oxide is a good model for studying the nature of planetary interiors. New work from a team led by Carnegie's Stewart McWilliams studied how magnesium oxide behaves under the extreme conditions deep within planets and found evidence that alters our understanding of planetary evolution. It is published November 22 by Science Express.
Magnesium oxide is particularly resistant to changes when under intense pressures and temperatures. Theoretical predictions claim that it has just three unique states with different structures and properties present under planetary conditions: solid under ambient conditions (such as on the Earth's surface), liquid at high temperatures, and another structure of the solid at high pressure. The latter structure has never been observed in nature or in experiments.
McWilliams and his team observed magnesium oxide between pressures of about 3 million times normal atmospheric pressure (0.3 terapascals) to 14 million times atmospheric pressure (1.4 terapascals) and at temperatures reaching as high as 90,000 degrees Fahrenheit (50,000 Kelvin), conditions that range from those at the center of our Earth to those of large exo-planet super-Earths. Their observations indicate substantial changes in molecular bonding as the magnesium oxide responds to these various conditions, including a transformation to a new high-pressure solid phase. In fact, when melting, there are signs that magnesium oxide changes from an electrically insulating material like quartz (meaning that electrons do not flow easily) to a metal similar to iron (meaning that electrons do flow easily through the material).
Drawing from these and other recent observations, the team concluded that while magnesium oxide is solid and non-conductive under conditions found on Earth in the present day, the early Earth's magma ocean might have been able to generate a magnetic field. Likewise, the metallic, liquid phase of magnesium oxide can exist today in the deep mantles of super-Earth planets, as can the newly observed solid phase.
"Our findings blur the line between traditional definitions of mantle and core material and provide a path for understanding how young or hot planets can generate and sustain magnetic fields," McWilliams said.
"This pioneering study takes advantage of new laser techniques to explore the nature of the materials that comprise the wide array of planets being discovered outside of our Solar System," said Russell Hemley, director of Carnegie's Geophysical Laboratory. "These methods allow investigations of the behavior of these materials at pressures and temperatures never before explored experimentally."
The experiments were carried out at the Omega Laser Facility of the University of Rochester, which is supported by DOE/NASA. The research involved a team of scientists from University of California Berkley and Lawrence Livermore National Laboratory.
This work was supported by the Department of Energy, the U.S. Army Research Office, A Krell Institute graduate fellowship, the DOE/NNSA National Laser User Facility Program, the Miller Institute for Basic Research in Science, and the University of California.

http://bit.ly/QE2m6i

Curiosity result could confirm Mars life, says Levin

A positive sign of organics by Curiosity would confirm the claim that NASA has already seen evidence for life on Mars

18:21 23 November 2012 by David Chandler

As space fans anticipate news of organic molecules from the Mars Curiosity rover – cryptically teased by the mission's chief scientist, John Grotzinger, in a US radio interview – there's one man who is even more excited than most.

Former NASA researcher Gilbert Levin says that a positive sign of organics by Curiosity would confirm his claim that NASA has already seen evidence for life on Mars – from an experiment called Labeled Release that went to the Red Planet aboard the Viking mission.

If Curiosity has found evidence for organics, as many are hoping, "that removes the last barrier to my interpretation of the Labeled Release results, and leaves us free and clear", Levin told New Scientist.

Though the prospect of new Curiosity findings have set the internet abuzz, nobody from NASA has yet said publicly what they are: Grotzinger has refused to elaborate, pointing New Scientist, and other journalists, to a presentation scheduled for the American Geophysical Union annual meeting in San Francisco, which begins on 3 December.

'History books'

Grotzinger's key comment to US National Public Radio – "this data is going to be one for the history books. It's looking really good" – concerned an instrument called SAM, for sample analysis at Mars, which, among other things, is tasked with finding organic molecules in the Martian soil.

Ordinarily, finding organics on the surface would not count as evidence for life, nor would it be surprising, since such molecules are constantly raining down throughout the solar system in meteorites. But in the case of Mars, it's more complicated, says Levin.

That's because the failure to detect any organics at all by an instrument aboard the Viking lander was the counter-evidence that cancelled out an apparent detection of active biology by Levin's Labeled Release experiment. That experiment showed that radioactively labelled carbon from a nutrient solution added to the soil was released into the air in the test chamber – an apparent sign of metabolism.

Though Levin has long argued otherwise, the consensus has been that Viking did not find evidence of life on Mars.

Caution urged

Levin acknowledges that, after more than three decades of argument over what the Viking results really mean, opinions are not likely to change overnight, no matter what the new Curiosity results may show. Although proving the presence of organics in the soil will "remove all rationale against" his interpretation, he says, "it's hard to change a paradigm". Most scientists are convinced that Viking's results were inconclusive. "I doubt this will change the consensus" he adds.

Chris McKay of the NASA Ames Research Center in Moffett Field, California, is a leading researcher on the possibility of life on Mars, and he, too, urges caution. "This is probably not as exciting as the internet rumors suggest," he says – as someone who is privy to what Curiosity has found.

Then again, McKay was never convinced that Viking failed to find organics. He has argued, in a peer-reviewed paper, that the Viking non-detection of organics was invalid, by demonstrating that soils from the Atacama desert in Chile, known to contain organics, showed no signs of them in a test that replicated the one on Viking.

http://www.scientificamerican.com/article.cfm?id=single-photon-could-detect-quantum-black-holes

Single Photon Could Detect Quantum-Scale Black Holes

Tabletop experiment proposed to show whether space-time is made of indivisible units.

By Ron Cowen

Space is not smooth: physicists think that on the quantum scale, it is composed of indivisible subunits, like the dots that make up a pointillist painting. This pixellated landscape is thought to seethe with black holes smaller than one trillionth of one trillionth of the diameter of a hydrogen atom, continuously popping in and out of existence. That tumultuous vista was proposed decades ago by theorists struggling to marry quantum theory with Einstein's theory of gravity -- the only one of nature's four fundamental forces not to have been incorporated into the standard model of particle physics. If it is true, the idea could provide a deeper understanding of space-time and the birth of the Universe.

Scientists have attempted to use the Large Hadron Collider, gravitational wave detectors and observations of distant cosmic explosions to determine whether space is truly grainy, but results have so far been inconclusive.

Now, Jacob Bekenstein, a theoretical physicist at the Hebrew University of Jerusalem, has proposed a simple tabletop experiment to find out, using readily available equipment.
As in previous experiments, Bekenstein's set-up is designed to examine the problem on the scale of 1.6×10^{-35} metres. This 'Planck length' is thought to mark the scale at which the macroscopic concept of distance ceases to have meaning and quantum fluctuations begin to cause space-time to resemble a foamy sea.
No instrument can directly measure a displacement as small as 10^{-35} metres. Instead, Bekenstein proposes firing a single particle of light, or photon, through a transparent block, and indirectly measuring the minuscule distance that the block moves as a result of the photon's momentum.

Light and mass

The wavelength of the photon and the mass and size of the block are carefully chosen so that the momentum is just large enough to move the block's centre of mass by one Planck length. If space-time is not grainy on this scale, then each photon will pass through the block and be recorded by a detector on the other side. However, if space-time is grainy, the photon is significantly less likely to make it all the way through the block. "I argue that the consequence of that crossing -- the translation of the block by a Planck length or so -- is something nature would not like," says Bekenstein.
If quantum fluctuations in length are important on the Planck scale, a sea of black holes, each with a Planck-scale radius, will readily form. Anything that falls into one of those black holes will be unable to escape until the hole disappears. So if the centre of mass of the moving block falls into one of the holes, the block's movement will be impeded (the photons are much larger than the Plank length, and so are not bothered by the miniature black holes).
Conservation of momentum in the experimental set-up requires that the photon cannot make it through the block if the block fails to move by a Planck length. So if fewer photons than expected are seen by the detector, it would indicate that the block's movement has been impeded by black holes, and that space-time exhibits quantum features at the Planck scale.
Bekenstein's design is simple, so the experiment could easily be put into practice using established methods of generating and detecting single photons, says Igor Pikovski, a quantum physicist at the Vienna Center for Quantum Science and Technology. Nevertheless, he adds, "distinguishing possible quantum gravitational effects from other effects will be very challenging".
Earlier this year, Pikovski and his colleagues published another scheme for probing the graininess of space-time in the laboratory, using optical pulses and and the principles of quantum theory to drive a system from an initial configuration to the desired final state. "The truth is that we do not know at what exact scale quantum gravity will play a significant role," says Pikovski. "There is plenty of room for granularity at much larger lengths [than the Planck length] and we do not have a full theory that could tell us the answer." Experiments such as Bekenstein's or his own may provide some of the first evidence for an answer, he adds.

http://www.jaxa.jp/projects/sat/hayabusa2/index_e.html

Hayabusa2 to clarify the origin and evolution of the solar system as well as life matter

Asteroid Explorer "Hayabusa2" is a successor of "Hayabusa" (MUSES-C), which revealed several new technologies and returned to Earth in June 2010.

While establishing a new navigation method using ion engines, Hayabusa brought back samples from the asteroid "Itokawa" to help elucidate the origin of the solar system. Hayabusa2 will target a C-type asteroid "1999 JU3" to study the origin and evolution of the solar system as well as materials for life by leveraging the experience acquired from the Hayabusa mission.
To learn more about the origin and evolution of the solar system, it is important to investigate typical types of asteroids, namely S-, C-, and D-type asteroids. A C-type asteroid, which is a target of Hayabusa2, is a more primordial body than Itokawa, which is an S-type asteroid, and is considered to contain more organic or hydrated minerals -- although both S- and C- types have lithologic characteristics. Minerals and seawater which form the Earth as well as materials for life are believed to be strongly connected in the primitive solar nebula in the early solar system, thus we expect to clarify the origin of life by analyzing samples acquired from a primordial celestial body such as a C-type asteroid to study organic matter and water in the solar system and how they coexist while affecting each other.

Establishing deep space exploration technology and new challenges

Hayabusa2 will utilize new technology while further confirming the deep space round-trip exploration technology by inheriting and improving the already verified knowhow established by Hayabusa to construct the basis for future deep-space exploration. The configuration of Hayabusa2 is basically the same as that of Hayabusa, but we will modify some parts by introducing novel technologies that evolved after the Hayabusa

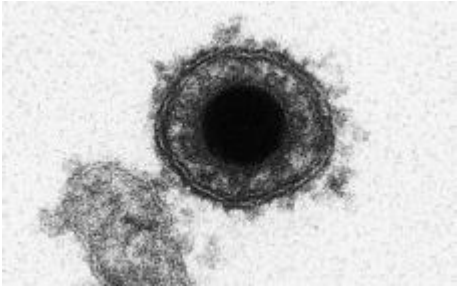
era. For example, the antenna for Hayabusa was in a parabolic shape, but the one for Hayabusa2 will be flattened. Also, a new function, “collision device”, is considered to be onboard to create a crater artificially. An artificial crater that can be created by the device is expected to be a small one with a few meters in diameter, but still, by acquiring samples from the surface that is exposed by a collision, we can get fresh samples that are less weathered by the space environment or heat.
Hayabusa2 is scheduled for launch in 2014. It should arrive at the C-type asteroid in mid 2018, staying around there for one and half years before leaving the asteroid at the end of 2019 and returning to Earth around the end of 2020.

http://arstechnica.com/science/2012/11/self-boosting-vaccine-could-give-single-shot-immunity/

Self-boosting vaccine could give single-shot immunity

The cost: a lingering, symptomless viral infection.

by John Timmer - Nov 25 2012, 1:30am TST



Relatives of this herpes virus might some day be used to combat disease. **CDC**

Vaccines are one of the most successful public health interventions we've developed—a simple injection can lead to a life-long immunity to disease-causing agents. But not every vaccine is so successful; for a number of agents, regular booster shots are needed to prevent immunity from fading. But researchers are starting to look into a possible route around this problem: a self-boosting vaccine. The challenge will be making one that's safe and acceptable to the public.

Immunity works because some of the cells that recognize pathogens we're exposed to get set aside as "memory" cells. When the pathogen reappears, these cells are able to rapidly mobilize an assault on the invader, clearing it before it can even cause much in the way of symptoms. But some pathogens never manage to set off a full-intensity immune response, and the resulting memory gradually fades. To maintain immunity, sporadic re-exposures (either to the pathogen or another dose of vaccine) are needed. But, as with many other things, adults have a habit of forgetting these shots or putting them off.
But a paper published in PNAS earlier this week made me aware that researchers are now looking at ways to avoid the requirement for extra shots. A self-boosting vaccine would, with a single dose, give people regular re-exposure to the proteins of dangerous infectious agents possibly handling several risks with a single dose. The downside? The method would involve giving the vaccine's recipients a lifelong viral infection.
Of course, many people already have these infections. Herpes viruses and cytomegalovirus often set up shop in human cells without causing any symptoms for years. But they also sporadically come out of hiding (rather famously in the case of the herpes family) and start a brief flare up. Although the immune system can clear the active infection, it never manages to eliminate the reservoir of quiescent virus hiding out in some cells.
In many ways, this is exactly the sort of behavior that a self-boosting vaccine would need. The sporadic activity would re-expose the immune system to any proteins carried by the virus. Since these viruses have very large genomes to start with, it would be relatively simple to engineer in additional genes without interfering with its normal cycle. In fact, it should be possible to engineer in proteins from multiple viruses, with a single vaccine providing life-long exposure to a variety of threats.
That's all on the positive side. The negative sides, however, are very substantial. Cytomegalovirus doesn't normally cause symptoms in healthy people, but it tends to be active in very young babies and among those with immune defects, where it can cause serious complications. Herpes viruses cause unpleasant symptoms as well. Plus, with public acceptance of vaccines having issues at the moment, convincing people that they should voluntarily get infected with one might be a very hard sell.
Obviously, the goal will be to develop attenuated versions of the viruses that are much less likely to re-activate in a way that produces any symptoms. But it can't be so attenuated that it never reactivates, or it wouldn't accomplish the whole goal of the vaccine: re-exposure to the proteins it encodes. And, right now, we don't really have a strong grasp on precisely what leads the virus to be reactivated in the first place.
The PNAS paper that pointed me towards the idea also highlights another issue with this approach to vaccination: it could change the dynamics of the herd immunity we currently rely on for public health. The paper modeled the pathogen pertussis, which children receive vaccinations against, but adults need continued boosting. Because the pathogen is still circulating at low levels, a population contains a complicated mix of people: unvaccinated, partly immune, etc. As a result, the pathogen itself helps keep immunity high by exposing some of the unvaccinated and giving others a boost without causing any symptoms.
In their model, the researchers found that the self-boosting vaccine changed the dynamics of herd immunity. Those that were vaccinated, of course, never had to worry again. But this cut down the circulation of the

pathogen in general, meaning that the unvaccinated were less likely to ever get exposed. That actually led to increased disease incidence among the unvaccinated. In any case, we're still a long way off from developing these self-boosting vaccines. But it's a clever idea that could lead to a dramatic change in the dynamics of disease prevention. *PNAS, 2012. DOI: 10.1073/pnas.1209683109 (About DOIs).*

http://www.sciencedaily.com/releases/2012/11/121125193049.htm

Patient's Own Immune Cells May Blunt Viral Therapy for Brain Cancer

The body responds to anticancer virus as it does to an infection

ScienceDaily - Doctors now use cancer-killing viruses to treat some patients with lethal, fast-growing brain tumors. Clinical trials show that these therapeutic viruses are safe but less effective than expected.

A new study led by researchers at the Ohio State University Comprehensive Cancer Center -- Arthur G. James Cancer Hospital and Richard J. Solove Research Institute (OSUCCC -- James) shows that the reason for this is in part due to the patient's own immune system, which quickly works to eliminate the anticancer virus.

The findings, published in the journal Nature Medicine, show that the body responds to the anticancer virus as it does to an infection. Within hours, specialized immune cells called natural killer (NK) cells move in to eliminate the therapeutic virus in the brain.

The researchers discovered that the NK cells attack the viruses when they express specific molecules on their surface called NKp30 and NKp46. "These receptor molecules enable the NK cells to recognize and destroy the anticancer viruses before the viruses can destroy the tumor," says co-senior author Dr. Michael A. Caligiuri, director of Ohio State's Comprehensive Cancer Center and CEO of the James Cancer Hospital and Solove Research Institute, and a senior author of the study.

"When we blocked those receptors, the virus has more time to work, and mice with these brain tumors live longer. The next step is to block these molecules on NK cells in glioblastoma patients and see if we can improve their outcome," says Caligiuri, who is also the John L. Marakas Nationwide Insurance Enterprise Foundation Chair in Cancer Research. This study of cancer-cell-killing, or oncolytic, viruses is an example of the value of translational research, in which a problem observed during clinical trials is studied in the laboratory to devise a solution.

"In this case, clinical trials of oncolytic viruses proved safe for use in the brain, but we noticed substantial numbers of immune cells in brain tumors after treatment," says senior author and neurosurgeon Dr. E. Antonio Chiocca, who was professor and chair of neurological surgery while at Ohio State University.

"To understand this process, we went back to the laboratory and showed that NK cells rapidly infiltrate tumors in mice that have been treated with the therapeutic virus. These NK cells also signal other inflammatory cells to come in and destroy the cancer-killing virus in the tumor."

The study used an oncolytic herpes simplex virus, human glioblastoma tumor tissue and mouse models, one of which hosted both human glioblastoma cells and human NK cells. Key technical findings include:

Replication of the therapeutic virus in tumor cells in an animal model rapidly attracted subsets of NK cells to the tumor site;

NK cells in tumors activated other immune cells (i.e., macrophages and microglia) that have both antiviral and anticancer properties;

Depletion of NK cells improves the survival of tumor-bearing mice treated with the therapeutic virus;

NK cells that destroy virus-infected tumor cells express the NKp30 and NKp46 receptors molecules that recognize the virus.

"Once we identify the molecules on glioblastoma cells that these NK cell receptors bind with, we might be able to use them to identify patients who will be sensitive to this therapy," Caligiuri says.

Christopher A Alvarez-Breckenridge, Jianhua Yu, Richard Price, Jeffrey Wojton, Jason Pradarelli, Hsiaoyin Mao, Min Wei, Yan Wang, Shun He, Jayson Hardcastle, Soledad A Fernandez, Balveen Kaur, Sean E Lawler, Eric Vivier, Ofer Mandelboim, Alessandro Moretta, Michael A Caligiuri, E Antonio Chiocca. NK cells impede glioblastoma virotherapy through NKp30 and NKp46 natural cytotoxicity receptors. Nature Medicine, 2012; DOI: 10.1038/nm.3013

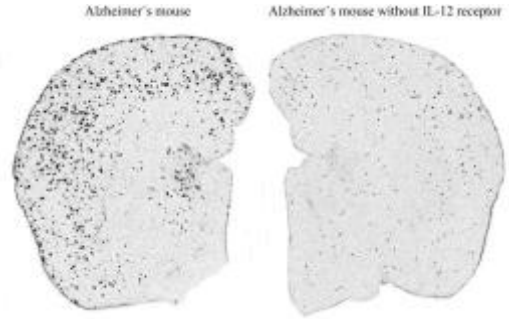
http://www.sciencedaily.com/releases/2012/11/121125193051.htm

Alzheimer's Disease in Mice Alleviated: Promising Therapeutic Approach for Humans

Changes typical of Alzheimer's disease were significantly reduced in mice by blockade of an immune system transmitter

ScienceDaily- Pathological changes typical of Alzheimer's disease were significantly reduced in mice by blockade of an immune system transmitter. A research team from Charité - Universitätsmedizin Berlin and the University of Zurich has just published a new therapeutic approach in fighting Alzheimer's disease in the current issue of Nature Medicine. This approach promises potential in prevention, as well as in cases where the disease has already set in.

Alzheimer's disease is one of the most common causes of dementia. In Germany and Switzerland alone, around 1.5 million people are affected, and forecasts predict a doubling of the number of patients worldwide within the next 20 years. The accumulation of particular abnormal proteins, including amyloid-ß (Aβ) among others, in patients' brains plays a central role in this disease. Prof. Frank Heppner from the Department of Neuropathology at Charité and his colleague Prof. Burkhard Becher from the Institute for Experimental Immunology at the University of Zurich were able to show that turning off particular cytokines (immune system signal transmitters) reduced the Alzheimer's typical amyloid-ß deposits in mice with the disease. As a result, the strongest effects were demonstrated after reducing amyloid-ß by approximately 65 percent, when the immune molecule p40 was affected, which is a component of the cytokines interleukin (IL)-12 and -23.



Deficiency (or inhibition) of molecules of the interleukin (IL)-12 and/or IL-23 signal pathway reduces Alzheimer-like pathological changes – depicted here as so-called ß-amyloid plaques (spot-like areas, stained in black) – substantially. Left: Brain hemisphere of an Alzheimer's mouse; right: Brain hemisphere of an Alzheimer's mouse without IL-12 receptor. **(Credit: Image courtesy of University of Zurich)**

Relevant for human therapy

Follow-up experiments also relevant for humans showed that substantial improvements in behavioral testing resulted when mice were given the antibody blocking the immune molecule p40. This effect was also achieved when the mice were already showing symptoms of the disease. Based on the current study by Prof. Heppner's and Prof. Becher's team, the level of p40 molecules is higher in Alzheimer's patients' brain fluid, which is in agreement with a recently published study by American colleagues demonstrating increased p40 levels in blood plasma of subjects with Alzheimer's disease, thus showing obvious relevance for human therapy.

The significance of the immune system in Alzheimer's research is the focus of current efforts. Prof. Heppner and Prof. Becher suspect that cytokines IL-12 and IL-23 themselves are not causative in the pathology, and that the mechanism of the immune molecule p40 in Alzheimer's requires additional clarification. However, they are convinced that the results of their six-years of research work justify the step toward clinical studies in humans, for which they plan to collaborate with a suitable industrial partner.

IIn the context of other illnesses, such as psoriasis, a medication that suppresses p40 in humans has already been applied. "Based on the safety data in patients," comment Profs. Heppner and Becher, "clinical studies could now be implemented without delay. Now, the goal is to bring the new therapeutic approach to Alzheimer patients quickly."

Johannes vom Berg, Stefan Prokop, Kelly R Miller, Juliane Obst, Roland E Kälin, Ileana Lopategui-Cabezas, Anja Wegner, Florian Mair, Carola G Schipke, Oliver Peters, York Winter, Burkhard Becher, Frank L Heppner. Inhibition of IL-12/IL-23 signaling reduces Alzheimer's disease–like pathology and cognitive decline. Nature Medicine, 2012; DOI: 10.1038/nm.2965

http://www.eurekalert.org/pub_releases/2012-11/rson-rdq111612.php

Researchers discover gender-based differences in Alzheimer's disease

The pattern of gray matter loss is significantly different in men and women

CHICAGO – All patients with Alzheimer's disease (AD) lose brain cells, which leads to a shrinking, or atrophy, of the brain. But the pattern of gray matter loss is significantly different in men and women, according to a study presented today at the annual meeting of the Radiological Society of North America (RSNA).

"We found that the extent and distribution of regional gray matter volume loss in the brain was strongly influenced by gender," said lead researcher Maria Vittoria Spampinato, M.D., associate professor of radiology at the Medical University of South Carolina in Charleston.

According to the Alzheimer's Association, 5.4 million Americans have AD, the sixth-leading cause of death in the U.S. Currently, there is no cure for AD, which lends urgency to research efforts designed to better understand, diagnose and treat this devastating illness.

"There is a strong interest in using magnetic resonance imaging (MRI) to assess brain atrophy with the purpose of monitoring dementia progression noninvasively and to aid in understanding which factors can influence brain atrophy progression and distribution in the Alzheimer's brain," Dr. Spampinato said.

In the study, Dr. Spampinato and colleagues analyzed data on 109 patients, including 60 men and 49 women (mean age 77), who participated in the Alzheimer's Disease Neuroimaging Initiative (ADNI), a major study that followed hundreds of cognitively healthy individuals and individuals with mild cognitive impairment (MCI) and AD over a period of five years. During the five-year period, each of the 109 patients progressed from amnestic MCI (in which the patient suffers memory loss but maintains cognitive function) to AD. Using MR

images of the patients' brains taken when they were diagnosed with AD and 12 months before and after the diagnosis, the researchers created brain maps that illustrated gray matter changes.
The brain maps revealed that compared to male patients, the women had greater atrophy in gray matter 12 months prior to their AD diagnosis and at the time of their diagnosis. The brain maps also showed that the men and women in the study lost gray matter volume in different areas of the brain as their disease progressed from MCI to AD. "The female patients in our study initially had more gray matter atrophy than the male patients but over time, the men caught up," Dr. Spampinato said. "In the men, the disease developed more aggressively in a shorter period of time."
Dr. Spampinato said the gender differences in atrophy patterns have important implications for the development of therapies for MCI and AD. "These differences should be taken into consideration when testing new drugs in clinical trials," she said. "Knowing the difference between the male and female patterns of atrophy will help researchers better decipher a patient's response to drug therapy."
Coauthors are Zoran Rumboldt, M.D., Markus Weininger, M.D., Vavro Hrvoje, M.D., Karen Patrick, M.D., and Ryan O'Neal Parker, Ph.D.

http://www.eurekalert.org/pub_releases/2012-11/iu-thd112112.php

The hidden disorder: Unique treatment proposed for children's neurological disorder

An innovative treatment for developmental coordination disorder

BLOOMINGTON, Ind. -- An Indiana University study in the Journal of Child Neurology proposes an innovative treatment for developmental coordination disorder, a potentially debilitating neurological disorder in which the development of a child's fine or gross motor skills, or both, is impaired.
DCD strikes about one in 20 children, predominantly boys, and frequently occurs alongside ADHD, autism spectrum disorders and other better known conditions. Like ADHD, DCD has broad academic, social and emotional impact. It can severely affect reading, spelling and handwriting abilities; and insofar as children with DCD both struggle with and avoid physical activity, it can also lead to problems with self-esteem, obesity and injury.
Severity of the disorder varies, and as the researchers explain, it is sometimes called the "hidden disorder" because of the way those with milder cases develop coping strategies that conceal the disorder, such as using computers to avoid handwriting tasks, and wearing shirts without buttons, or shoes without laces. But children with DCD have been generally thought unable to learn or improve their motor skills.
"The results of this study were remarkable," said lead author Geoffrey Bingham, professor in the Department of Psychological and Brain Sciences in the College of Arts and Sciences. "After training the children over a five- to six-week period, one day a week for 20 minutes at a time, the differences between children with DCD and typically developing children were all but obliterated."
Key to the training was a unique technology: a three-dimensional virtual reality device, the PHANTOM Omni from Sensable Technologies, developed for the visualization of knots by topologists, who study geometric forms in space. Holding a stylus attached to a robot, participants in the study developed their fine motor skills by playing a game in which they traced a three-dimensional virtual path in the air, visually represented on a computer screen. Forces such as magnetic attraction and friction can be applied to the path and adjusted so participants could actually feel a surface that changed as the parameters were altered.
The study compared the progress of a group of eight 7- to 8-year-olds with DCD to a group of eight 7- to 8-year-old typically developing children in a three-dimensional tracing game. The task was to push a brightly colored fish along a visible path on a computer screen from the starting location to the finish point while racing a competitor fish.
The training started with the highest level of magnetic attraction, slowest competitor and shortest path. The goal of the training was to allow the children to progress at their own pace through the different combinations and levels of attraction, paths and competitors.
THE CHILDREN'S 'CATCH-22'
As Bingham's collaborator Winona Snapp-Childs, a post-doctoral fellow in the Department of Psychological and Brain Sciences, explains, the particular challenge facing children with DCD is a "Catch-22" situation. Children must first be able to approximate a movement by actively generating it themselves before they can improve it through practice and repetition. But because children with DCD have been unable to produce this initial movement, they have been unable to improve their skills.
The technology provided the tool needed to overcome this impasse. It gave both the support needed to produce the movement, as well as the flexibility to let children actively generate the movement themselves. It allowed the children to do what they otherwise could not do: produce the requisite initial movements that could then be practiced to yield quantitative improvements.

The researchers say the technology could potentially be widely accessible: It can be used without a therapist and is portable enough to be put in clinics, classrooms or the home. It can also be adjusted to suit the needs of children across the spectrum of DCD severity.

The study, "A Sensorimotor Approach to the Training of Manual Actions in Children With Developmental Coordination Disorder," is appearing on the Journal of Child Neurology Online First. Co-authors are Snapp-Child; and Mark Mon-Williams, Institute of Psychological Sciences, University of Leeds, U.K. Bingham directs the Perception/Action Lab at IU Bloomington. This work was supported by a grant from the National Institute of Child Health and Human Development.

http://bit.ly/V7L96F

Let's make sure he WON'T be back!

Cambridge to open 'Terminator centre' to study threat to humans from artificial intelligence

By Amanda Williams

A centre for 'terminator studies', where leading academics will study the threat that robots pose to humanity, is set to open at Cambridge University

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A centre for 'terminator studies', where leading academics will study the threat that robots pose to humanity, is set to open at Cambridge University.

Its purpose will be to study the four greatest threats to the human species - artificial intelligence, climate change, nuclear war and rogue biotechnology.

The Centre for the Study of Existential Risk (CSER) will be co-launched by Lord Rees, the astronomer royal and one of the world's top cosmologists.

Rees's 2003 book Our Final Century had warned that the destructiveness of humanity meant that the species could wipe itself out by 2100.

The idea that machines might one day take over humanity has featured in many science fiction books and films, including the Terminator, in which Arnold Schwarzenegger stars as a homicidal robot.

In 1965, Irving John ‘Jack’ Good and wrote a paper for New Scientist called Speculations concerning the first ultra-intelligent machine.

Good, a Cambridge-trained mathematician, Bletchley Park cryptographer, pioneering computer scientist and friend of Alan Turing, wrote that in the near future an ultra-intelligent machine would be built.

This machine, he continued, would be the 'last invention' that mankind will ever make, leading to an 'intelligence explosion.'

For Good, who went on to advise Stanley Kubrick on 2001: a Space Odyssey, the 'survival of man' depended on the construction of this ultra-intelligent machine.

The Centre for the Study of Existential Risk (CSER) will be opened at Cambridge and will examine the threat of technology to human kind

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Huw Price, Bertrand Russell Professor of Philosophy and another of the centre's three founders, said such an 'ultra-intelligent machine, or artificial general intelligence (AGI)' could have very serious consequences.

He said: 'Nature didn’t anticipate us, and we in our turn shouldn’t take AGI for granted.

'We need to take seriously the possibility that there might be a ‘Pandora’s box’ moment with AGI that, if missed, could be disastrous.

'I don’t mean that we can predict this with certainty, no one is presently in a position to do that, but that’s the point.

'With so much at stake, we need to do a better job of understanding the risks of potentially catastrophic technologies

He added: 'The basic philosophy is that we should be taking seriously the fact that we are getting to the point where our technologies have the potential to threaten our own existence – in a way that they simply haven’t up to now, in human history.

'What better place than Cambridge, one of the oldest of the world’s great scientific universities, to give these issues the prominence and academic respectability that they deserve?

'Cambridge recently celebrated its 800th anniversary – our aim is to reduce the risk that we might not be around to celebrate its millennium.'