

<http://www.sciencedaily.com/releases/2014/02/140202132333.htm>

Red alert: Body kills 'spontaneous' blood cancers on a daily basis

The immune system removes errant B cells before they become cancerous.

Immune cells undergo 'spontaneous' changes on a daily basis that could lead to cancers if not for the diligent surveillance of our immune system, Melbourne scientists have found. The research team from the Walter and Eliza Hall Institute found that the immune system was responsible for eliminating potentially cancerous immune B cells in their early stages, before they developed into B-cell lymphomas (also known as non-Hodgkin's lymphomas). The results of the study were published in the journal *Nature Medicine*.

This immune surveillance accounts for what researchers at the institute call the 'surprising rarity' of B-cell lymphomas in the population, given how often these spontaneous changes occur. The discovery could lead to the development of an early-warning test that identifies patients at high risk of developing B-cell lymphomas, enabling proactive treatment to prevent tumours from growing.

Dr Axel Kallies, Associate Professor David Tarlinton, Dr Stephen Nutt and colleagues made the discovery while investigating the development of B-cell lymphomas.

Dr Kallies said the discovery provided an answer to why B-cell lymphomas occur in the population less frequently than expected. "Each and every one of us has spontaneous mutations in our immune B cells that occur as a result of their normal function," Dr Kallies said. "It is then somewhat of a paradox that B cell lymphoma is not more common in the population. "Our finding that immune surveillance by T cells enables early detection and elimination of these cancerous and pre-cancerous cells provides an answer to this puzzle, and proves that immune surveillance is essential to preventing the development of this blood cancer."

B-cell lymphoma is the most common blood cancer in Australia, with approximately 2800 people diagnosed each year and patients with a weakened immune system are at a higher risk of developing the disease.

The research team made the discovery while investigating how B cells change when lymphoma develops. "As part of the research, we 'disabled' the T cells to suppress the immune system and, to our surprise, found that lymphoma developed in a matter of weeks, where it would normally take years," Dr Kallies said. "It seems that our immune system is better equipped than we imagined to identify and eliminate cancerous B cells, a process that is driven by the immune T cells in our body."

Associate Professor Tarlinton said the research would enable scientists to identify pre-cancerous cells in the initial stages of their development, enabling early intervention for patients at risk of developing B-cell lymphoma.

"In the majority of patients, the first sign that something is wrong is finding an established tumour, which in many cases is difficult to treat" Associate Professor Tarlinton said. "Now that we know B-cell lymphoma is suppressed by the immune system, we could use this information to develop a diagnostic test that identifies people in early stages of this disease, before tumours develop and they progress to cancer. There are already therapies that could remove these 'aberrant' B cells in at-risk patients, so once a test is developed it can be rapidly moved towards clinical use."

Shoukat Afshar-Sterle, Dimitra Zotos, Nicholas J Bernard, Anna K Scherger, Lisa Rödling, Amber E Alsop, Jennifer Walker, Frederick Masson, Gabrielle T Belz, Lynn M Corcoran, Lorraine a O'reilly, Andreas Strasser, Mark J Smyth, Ricky Johnstone, David M Tarlinton, Stephen L Nutt & Axel Kallies. Fas ligand-mediated immune surveillance by T cells is essential for the control of spontaneous B cell lymphomas. Nature Medicine, February 2014 DOI: 10.1038/nm.3442

http://www.eurekalert.org/pub_releases/2014-02/stri-gm020114.php

Greenhouse 'time machine' sheds light on corn domestication

Simulating the environment when corn was first exploited by people and then domesticated reveals that teosinte, may have looked more like corn than it does today

By simulating the environment when corn was first exploited by people and then domesticated, Smithsonian scientists discovered that corn's ancestor; a wild grass called teosinte, may have looked more like corn than it does today. The fact that it looked more like corn under past conditions may help to explain how teosinte came to be selected by early farmers who turned it into one of the most important staple crops in the world.

The vegetative and flowering structures of modern teosinte are very different from those of corn. These and other differences led to a century-long dispute as to whether teosinte could really be the ancestor of corn.

But new findings reported in the journal *Quaternary International* show that teosinte may have looked very different in the past. "We grew teosinte in the conditions that it encountered 10,000 years ago during the early Holocene period: temperatures 2–3 degrees Celsius cooler than today's with atmospheric carbon dioxide levels at around 260 parts per million," said Dolores Piperno, senior scientist and curator of archaeobotany and South American archaeology at the Smithsonian's National Museum of Natural History and the Smithsonian Tropical Research Institute, who led the project. "Intriguingly, the teosinte plants grown under past conditions exhibit

characteristics more like corn; a single main stem topped by a single tassel, a few, very short branches tipped by female ears and synchronous seed maturation.

After the Industrial Revolution, carbon dioxide rose to today's 405 parts per million, the level in the control chamber where teosinte plants look like plants in the wild today—tall, with many long branches tipped by tassels and seed maturation taking place over a period of a few months. Co-author Klaus Winter usually studies the effects of rising atmospheric carbon dioxide levels on tropical plants as a senior staff scientist at STRI. Piperno and Winter devised a scheme to essentially travel back in time by comparing plants grown in modern conditions with plants grown in the early Holocene chamber.

"Now it appears to be an open question when in the Holocene teosinte became the plant very distinctive from maize in vegetative architecture and inflorescence sexuality that we see today and use as the baseline for research on maize domestication," said Piperno. "When humans first began to cultivate teosinte about 10,000 years ago, it was probably more maize-like—naturally exhibiting some characteristics previously thought to result from human selection and domestication. The environment may have played a significant, if serendipitous, role in the transition through inducing phenotypic plasticity that gave early farmers a head start." Phenotypic plasticity is an organism's ability to change in response to the environment, causing genetically identical organisms to look very different when they live in different conditions. As they formulate a "new modern evolutionary synthesis," in part with concepts that Darwin could not have known of, evolutionary biologists continue to debate the importance of the environment and plasticity on evolutionary change and the origins of the diverse forms of life on Earth today. However, new evidence shows that these environmental–phenotypic interactions are in a growing number of organisms. This is one of the first studies to examine the influence of these processes on plant domestication.

"Extending these concepts to domestication research allows anthropologists to become more fully engaged in modern evolutionary theory and practice," Piperno said.

The Smithsonian Tropical Research Institute, headquartered in Panama City, Panama, is a unit of the Smithsonian Institution. The Institute furthers the understanding of tropical nature and its importance to human welfare, trains students to conduct research in the tropics and promotes conservation by increasing public awareness of the beauty and importance of tropical ecosystems. Website: <http://www.stri.si.edu>.

*Piperno, D.R., et al., Teosinte before domestication: Experimental study of growth and phenotypic variability in Late Pleistocene and early Holocene environments. *Quaternary International* (2014).*

<http://www.sciencedirect.com/science/article/pii/S104061821300983X> Copies of this paper are available to credentialed journalists upon request; please contact Elsevier's Newsroom at newsroom@elsevier.com or +31 20 4853564.

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Simple, at-home test will detect most colorectal cancers

Largest and most comprehensive review of 'FIT' finds it is an effective cancer-screening tool

OAKLAND, Calif. -Tests that require patients to collect a single stool sample at home and then send it to a lab for analysis will detect about 79 percent of colorectal cancers, according to a new evidence review published in the *Annals of Internal Medicine*. The review of 19 studies examining eight different fecal immunochemical tests, know as "FITs", also finds that the tests will correctly identify about 94 percent of patients who do not have cancers of the rectum or colon. "We know the FIT is easy to use, and now we also know that it is a great tool for assessing which patients have cancer and which patients don't," said Beth Liles, MD, review co-author and clinical investigator at the Kaiser Permanente Center for Health Research in Portland, Ore.

Colorectal cancer is the second leading cause of cancer death in the United States, according to the Centers for Disease Control and Prevention. Yet one in three adults is not adequately screened.

"FIT is simple, can be done at home, and can save lives," said Jeffrey Lee, MD, MAS, the study's lead author and post-doctoral researcher at the Kaiser Permanente Division of Research in Oakland, Calif. and University of California, San Francisco. "The American Cancer Society and other professional organizations have recommended FIT as a screening tool for colorectal cancer since 2008, but there are still many people who don't know about it."

The U.S. Preventive Services Task Force recommends that people with normal risk for colorectal cancer should begin screening at age 50 and end at age 75. Unlike older stool tests, FIT does not require people to restrict their diets or to stop taking medications. Conducted annually, the test detects small amounts of blood in the stool, and people who test positive are much more likely to have colorectal cancer. People who have a positive FIT need a follow-up colonoscopy to look for cancer or pre-cancerous polyps.

Other screening options for colorectal cancer include sigmoidoscopy, which involves physical examination of the lower colon, recommended every five years; or colonoscopy, which examines the entire colon, every 10 years.

Review Details:

The evidence review, funded by the National Institutes of Health, found that the FITs were fairly sensitive. On average, the tests detected 79 percent, or about 4 of 5 cancers with only one round of testing. The tests were also highly specific: on average, 94 percent of people who did not have cancer tested negative with a single FIT. By comparison, studies indicate that another at-home test called fecal occult blood test (also known as FOBT) detects only about 13 to 50 percent of cancers after a single round of testing. The FOBT is the predecessor to FIT and requires three stool samples as well as medication and dietary restrictions.

According to the evidence review, no single FIT performed markedly better than another, but the authors caution that there was only one study comparing brands head-to-head. Most of the FITs required collection of only one stool sample. Surprisingly, the authors found that brands requiring two or three stool samples were no more accurate than those requiring only one sample.

The 19 studies reviewed included between 80 and 27,860 patients, with the average age ranging from 45 to 63. Study settings varied, but all included patients with no symptoms of colorectal cancer. In 12 of the studies, all patients took the FIT and received a colonoscopy. In seven studies, patients only had a colonoscopy to follow-up on a positive FIT. Approximately two years later, researchers followed up with patients who had had a negative FIT to determine whether they had been diagnosed with colorectal cancer.

This research is part of Kaiser Permanente's ongoing efforts to promote prevention and evidence-based care. Last year Kaiser Permanente researchers found that patients who visited their doctor for any reason were nearly six times more likely to get screened for colon cancer compared to those who didn't visit their doctor.

The review was supported by grants from the National Institute of Diabetes and Digestive and Kidney Diseases, the National Cancer Institute, and the NCI consortium Population-Based Research Optimizing Screening through Personalized Regimens (T32DK007007, U24 CA171524, and U54 CA163262).

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Study suggests women 35+ are at decreased risk to have anatomically abnormal child***Women ages 35 and older are at a decreased risk of having a child with a major congenital malformation***

In a study to be presented on Feb. 6 at 3 p.m. CST, at the Society for Maternal-Fetal Medicine's annual meeting, The Pregnancy Meeting™, in New Orleans, researchers will report that women ages 35 and older are at a decreased risk of having a child with a major congenital malformation, after excluding chromosomal abnormalities.

Advanced maternal age, traditionally defined as 35 and older, is a well-established risk factor for having a child with a chromosomal abnormality, such as Down syndrome. However, little information is available regarding the association between advanced maternal age and the risk for having a child with a major congenital malformation—a physical defect present at birth that can involve different parts of the body, including but not limited to the heart, brain, kidney, bones or intestinal track.

In order to address this question, this retrospective study used obstetric and ultrasound information collected from over 76,000 women at the time they presented for their routine second trimester ultrasound at Washington University in St. Louis (Mo.). Researchers compared the incidence of having one or more major congenital malformations diagnosed at the time of ultrasound in women who were younger than 35 versus those women 35 years and older.

Also examined was the incidence of major malformations of women categorized by organ system including heart, brain and kidney. Overall, we found that advanced maternal age was associated with a 40 percent decreased risk of having a child with one or more major congenital malformations, after controlling for other risk factors. Specifically, the incidence of brain, kidney, and abdominal wall defects were decreased in this group of women, while the incidence of heart defects was unchanged.

"As more women are choosing to delay childbearing, they are faced with many increased pregnancy risks," said Katherine R. Goetzinger M.D., M.S.C.I., one of the study's researchers. "Findings from this study may provide some reassurance for these women regarding the likelihood of having an anatomically normal child."

Goetzinger, an assistant professor of maternal-fetal medicine at Washington University in St. Louis School of Medicine, also noted that it is possible that advanced maternal age conveys a "survival of the fittest" effect, in which anatomically normal fetuses are more likely to survive.

http://www.eurekalert.org/pub_releases/2014-02/bmj-hwd013014.php

Hot weather deaths projected to rise 257 percent by 2050s, experts warn

Demographic changes this century mean that elderly will be most vulnerable to impact of climate change

The number of annual excess deaths caused by hot weather in England and Wales is projected to surge by 257% by the middle of the century, as a result of climate change and population growth, concludes research published online in the Journal of Epidemiology and Community Health.

The elderly (75+) will be most at risk, particularly in the South and the Midlands, the findings suggest.

The research team, from the London School of Hygiene and Tropical Medicine, and Public Health England, used time-series regression analysis to chart historic (1993-2006) fluctuations in weather patterns and death rates to characterise the associations between temperature and mortality, by region and by age group.

They then applied these to projected population increases and local climate to estimate the future number of deaths likely to be caused by temperature - hot and cold - for the 2020s, 2050s, and 2080s.

They based their calculations on the projected daily average temperatures for 2000-09, 2020-29, 2050-59 and 2080-89, derived from the British Atmospheric Data Centre (BADC), and population growth estimates from the Office of National Statistics. The calculations indicated a significantly increased risk of deaths associated with temperature across all regions of the UK, with the elderly most at risk.

The number of hot weather days is projected to rise steeply, tripling in frequency by the mid 2080s, while the number of cold days is expected to fall, but at a less dramatic pace.

At the national level, the death rate increases by just over 2% for every 1°C rise in temperature above the heat threshold, with a corresponding 2% increase in the death rate for every 1°C fall in temperature below the cold threshold.

In the absence of any adaptive measures, excess deaths related to heat would be expected to rise by 257% by the 2050s, from an annual baseline of 2000, while those related to the cold would be expected to fall by 2% as a result of milder winters, from a current toll of around 41,000, but will still remain significant.

Those aged 85 and over will be most at risk, partly as a result of population growth - projected to reach 89 million by the mid 2080s - and the increasing proportion of elderly in the population, say the authors.

Regional variations are likely to persist: London and the Midlands are the regions most vulnerable to the impact of heat, while Wales, the North West, Eastern England and the South are most vulnerable to the impact of cold.

Rising fuel costs may make it harder to adapt to extremes of temperature, while increased reliance on active cooling systems could simply end up driving up energy consumption and worsening the impact of climate change, say the authors. Better and more sustainable options might instead include shading, thermal insulation, choice of construction materials implemented at the design stage of urban developments, suggest the authors.

While the death toll from cold weather temperatures will remain higher than that caused by hot temperatures, the authors warn that health protection from hot weather will become increasingly necessary - and vital for the very old.

"As the contribution of population growth and ageing on future temperature related health burdens will be large, the health protection of the elderly will be important," warn the authors, recalling the social changes that have led to many elderly living on their own - a contributory factor to the high death toll in France in the 2003 heatwave.

Climate change effects on human health: projections of temperature related mortality for the UK during the 2020s, 2050s, and 2080s Online First doi 10.1136-2013-202449

http://www.eurekalert.org/pub_releases/2014-02/egu-gfg013114.php

Greenland's fastest glacier reaches record speeds

Jakobshavn Isbræ (Jakobshavn Glacier) is moving ice from the Greenland ice sheet into the ocean at a speed that appears to be the fastest ever recorded.

Researchers from the University of Washington and the German Space Agency (DLR) measured the dramatic speeds of the fast-flowing glacier in 2012 and 2013. The results are published today in [The Cryosphere](#), an open access journal of the European Geosciences Union (EGU).

"We are now seeing summer speeds more than 4 times what they were in the 1990s on a glacier which at that time was believed to be one of the fastest, if not the fastest, glacier in Greenland," says Ian Joughin, a researcher at the Polar Science Center, University of Washington and lead-author of the study.

In the summer of 2012 the glacier reached a record speed of more than 17 kilometres per year, or over 46 metres per day. These flow rates are unprecedented: they appear to be the fastest ever recorded for any glacier or ice stream in Greenland or Antarctica, the researchers say. They note that summer speeds are temporary, with the glacier flowing more slowly over the winter months. But they add that even the annually averaged speedup over the past couple of years is nearly 3 times what it was in the 1990s.

This speedup of Jakobshavn Isbræ means that the glacier is adding more and more ice to the ocean, contributing to sea-level rise. "We know that from 2000 to 2010 this glacier alone increased sea level by about 1 mm. With the additional speed it likely will contribute a bit more than this over the next decade," explains Joughin. Jakobshavn Isbræ, which is widely believed to be the glacier that produced the large iceberg that sank the Titanic in 1912, drains the Greenland ice sheet into a deep ocean fjord on the coast of the island. At its calving front, where the glacier effectively ends as it breaks off into icebergs, some of the ice melts while the rest is pushed out, floating into the ocean. Both of these processes contribute about the same amount to sea-level rise from Greenland.

As the Arctic region warms, Greenland glaciers such as Jakobshavn Isbræ have been thinning and calving icebergs further and further inland. This means that, even though the glacier is flowing towards the coast and carrying more ice into the ocean, its calving front is actually retreating. In 2012 and 2013, the front retreated more than a kilometre further inland than in previous summers, the scientists write in the new *The Cryosphere* study.

In the case of Jakobshavn Isbræ, the thinning and retreat coincides with an increase in speed. The calving front of the glacier is now located in a deeper area of the fjord, where the underlying rock bed is about 1300 metres below sea level, which the scientists say explains the record speeds it has achieved. "As the glacier's calving front retreats into deeper regions, it loses ice – the ice in front that is holding back the flow – causing it to speed up," Joughin clarifies.

The team used satellite data to measure the speed of the glacier as part of US National Science Foundation (NSF) and NASA studies. "We used computers to compare pairs of images acquired by the German Space Agency's (DLR) TerraSAR-X satellites. As the glacier moves we can track changes between images to produce maps of the ice flow velocity," says Joughin.

The researchers believe Jakobshavn Isbræ is in an unstable state, meaning it will continue to retreat further inland in the future. By the end of this century, its calving front could retreat as far back as the head of the fjord through which the glacier flows, about 50 km upstream from where it is today.

http://www.eurekalert.org/pub_releases/2014-02/cfb-wyl013114.php

Whether you lose or gain weight depends on weekdays

Weight rhythms: Weight increases during weekends and decreases during weekdays

There are sleep cycles and there are also weight loss cycles. Almost everyone loses weight on weekdays and gains weight on weekends. What separates the slim from the heavy isn't how much more they gain on weekends. It's how much they lose during the weekdays. In this study, Dr. Brian Wansink from Cornell University, in collaboration with researchers from the VTT Technical Research Centre of Finland and Tampere University of Technology, looks into the impact that the seven-days-a-week human cycle has on weight.

Eighty adults participated in the study, ranging in age from 25 to 62 years old. These individuals were categorized according to relative weight changes: weight losers (-3% weight loss), weight gainers (+1% weight gain), and weight maintainers (-3% to 1% weight change). These individuals were asked to weigh themselves after waking up before breakfast. Only weight measurements that were taken over at least seven consecutive days were included in the analysis. The minimum follow-up time was 15 days and maximum 330 days. The main objective of the study was to observe whether weight fluctuation is dependent on the days of the week. Weekly weight patterns were analyzed across the three groups: weight losers, weight gainers and weight maintainers.

The results revealed a clear pattern in weekly weight fluctuation with higher weight after weekends (Sunday and Monday) and decreasing weight during the weekdays reaching the lowest point on Friday. Unexpectedly the researchers found a difference between weight losers and weight gainers in these fluctuation patterns.

Weight losers had stronger compensation pattern (i.e. after weekend the decrease started immediately and continued downward until Friday) whereas weight gainers had more variability between days and no clear decrease during weekdays. Weight losers reached week's maximum weight in 59% of cases on Sunday and Monday and week's minimum weight in 60% of cases on Friday or Saturday. Among weight gainers no such a pattern was seen. Minimum and maximum weights did not systematically appear on certain days but they were evenly distributed all over the week.

Based on these results, weight variations between weekdays and weekends should be considered normal instead of weight gain. On the weekends people have more time to go out and eat. Some indulging during weekends makes no harm but for successful weight loss it is important to notice these rhythms and take steps to reverse the upward trends after the weekend, even if it has to wait until Monday. Successful weight control is more likely to happen and for the long run if one is not too strict with one's diet but allows for short-term splurges.

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Your brain is fine-tuning its wiring throughout your life

The white matter microstructure, the communication pathways of the brain, continues to develop/mature as one ages.

Philadelphia, PA– Studies link age-related differences in white matter microstructure to specific cognitive abilities in childhood and adulthood.

Most prior studies, however, did not include individuals from the entire life span or evaluated a limited section of white matter tracts. This knowledge gap prompted a new study published this week in Biological Psychiatry. Dr. Bart Peters, of the Zucker Hillside Hospital, and his colleagues investigated the relationship of age and neurocognitive performance to nine white matter tracts from childhood to late adulthood.

To accomplish this, they recruited 296 healthy volunteers who ranged from 8 to 68 years of age. The participants completed a comprehensive battery of tests designed to measure their cognitive functioning, including speed, attention, memory, and learning. They also underwent a non-invasive diffusion tensor imaging scan, a technology that allowed the researchers to create maps of the 9 major white matter tracts under investigation.

The combination of this data allowed them to identify the neurocognitive correlates of each white matter tract in relation to its unique aging pattern.

They found that, from childhood into early adulthood, differences in fractional anisotropy – a measure of connectivity – of the cingulum were associated with executive functioning, whereas fractional anisotropy of the inferior fronto-occipital fasciculus was associated with visual learning and global cognitive performance via speed of processing.

"Our study identified key brain circuits that develop during adolescence and young adulthood that are associated with the growth of learning, memory and planning abilities. These findings suggest that young people may not have full capacity of these functions until these connections have completed their normal trajectory of maturation beyond adolescence," explained Peters.

"Our brain is changing throughout our lives. These changes underlie the capacities that emerge and are refined through adulthood," commented Dr. John Krystal, Editor of Biological Psychiatry. "There are clues that the steps that we take to preserve our medical health and stimulate our minds also serve to further refine and maintain these connections. For good reasons, attending to brain health is increasingly a focus of healthy aging."

In addition, many individuals diagnosed with psychiatric disorders suffer with neurocognitive dysfunction as part of their illness, which is particularly difficult to alleviate with currently available treatments. Studies such as this may help to identify specific brain circuits/pathways that could serve as potential targets for treatment interventions.

The article is "Age-Related Differences in White Matter Tract Microstructure Are Associated with Cognitive Performance from Childhood to Adulthood" by Bart D. Peters, Toshikazu Ikuta, Pamela DeRosse, Majnu John, Katherine E. Burdick, Patricia Gruner, Daniel M. Prendergast, Philip R. Szeszko, and Anil K. Malhotra (doi: 10.1016/j.biopsych.2013.05.020). The article appears in Biological Psychiatry, Volume 75, Issue 3 (February 1, 2014), published by Elsevier.

http://www.eurekalert.org/pub_releases/2014-02/dci-hls020314.php

High long-term survival of most common pediatric brain tumor, less when radiation was used

Largest-ever study of 20-year survival among pediatric low-grade glioma patients highlights radiation's association with higher mortality

BOSTON - The first comprehensive, large-scale cohort study of the long-term survival of children treated for low-grade gliomas, the most common pediatric brain tumor, finds that almost 90 percent are alive 20 years later and that few die from the tumor as adults. However, children who received radiation as part of their treatment had significantly lower long-term survival rates than children who were not radiated, researchers from Dana-Farber/Boston Children's Cancer and Blood Disorders Center report. These findings stand regardless of whether surgeons could successfully remove a child's entire tumor or only part of it, suggesting that the radiation itself may explain the difference.

The findings were published online by the journal Pediatric Blood and Cancer.

Delivery of radiation to children's developing brains has been linked to a number of adverse long-term effects, including cognitive development and endocrine function. While a number of major hospitals, including Dana-Farber/Boston Children's, have almost eliminated radiation in treating low-grade gliomas, the extent to which other institutions employ radiation varies, according to the study's senior author, Peter Manley, MD, of the Brain Tumor Center at Dana-Farber/Boston Children's.

"We found for the first time that once you survive your childhood with a low-grade glioma, you are not likely to die of that tumor as an adult," Manley said. "This is incredibly encouraging for patients and families. However, we also found some things that we are currently doing to treat low-grade gliomas, such as radiation, are increasing the rate of death later, so that as an adult you won't die of the tumor, but you may die from the treatment."

The data did not allow researchers to determine the precise mechanism driving the association between radiation treatment and reduced long-term survival (e.g., second cancers, other radiation-induced toxicities). However, given the excellent overall long-term survival findings among the patients studied, the team believes that doctors treating children for a pediatric low-grade glioma should make reducing long-term toxicity risk one of their primary concerns.

"We strongly recommend treatments that are less likely to cause long-term effects and second cancers," Manley said. "According to our analysis, radiation was the most common factor linked to differences in mortality among long-term survivors," he added. "There are multiple options available today for treating children with these tumors. We should exhaust all those before considering the use of radiation."

Low-grade gliomas—a family of non-malignant, usually non-aggressive tumors that includes pilocytic astrocytomas, diffuse astrocytomas and mixed gliomas—account for about 30 percent of all childhood brain tumors. Treatment typically consists of surgery and chemotherapy. Radiation, once a key component of therapy for these gliomas, has been falling out of favor since the mid-1990s, as it has for other childhood cancers such as Hodgkin's lymphoma and germ cell tumors.

To better understand survival factors among this population, Manley, lead author Pratiti Bandopadhyay, MBBS, PhD, of Dana-Farber/Boston Children's, and their collaborators analyzed Surveillance, Epidemiology and End Results (SEER) data from the National Cancer Institute on more than 4,000 patients diagnosed with pediatric low-grade gliomas between 1973 and 2008. Eighteen percent of the patients in the cohort received radiation as part of their treatment.

Overall the prognosis for children with low-grade gliomas is quite good, with five- and 10-year survival rates approaching 90 percent. Until now, though, the long-term survival—20 years and beyond—of adult survivors has never been comprehensively studied. Manley and his colleagues found little drop-off in survival at 20 years post-treatment, with almost 90 percent of pediatric survivors still alive.

Strikingly, though, only about 70 percent of patients treated with radiation were still alive 20 years after treatment. Other factors that affected survival included tumor location (cerebellum or not), tumor type (pilocytic or not), aggressiveness of the tumor (grade 1 vs. grade 2), year of diagnosis (before or after 1990) and age at diagnosis (<2 years old). In the team's multivariate analysis, these other factors all had less of an effect on long-term survival than radiation.

"There is an impression that children diagnosed with anything more aggressive than a grade 1 tumor do poorly in the long term," said Manley, who also directs Dana-Farber Cancer Institute's Stop & Shop Family Pediatric Neuro-Oncology Outcomes Clinic, which focuses on survivorship issues. "However, we found regardless of whether the diagnosis is grade 1 or grade 2, children with low-grade gliomas still do well."

The study was supported by Stop & Shop Pediatric Brain Tumor Program, the Andrysiak Fund for LGG, the Pediatric Low-Grade Astrocytoma Foundation, Friends of Dana-Farber Cancer Institute, the Nuovo-Soldati Foundation, Philippe Foundation, and the St. Baldrick's Foundation.

http://www.eurekalert.org/pub_releases/2014-02/bawh-blm020314.php

Blue light may fight fatigue around the clock

Researchers find blue light exposure may be a countermeasure for fatigue, during the day and night

Boston, MA-- Researchers from Brigham and Women's Hospital (BWH) have found that exposure to short wavelength, or blue light, during the biological day directly and immediately improves alertness and performance. These findings are published in the February issue of *Sleep*.

"Our previous research has shown that blue light is able to improve alertness during the night, but our new data demonstrates that these effects also extend to daytime light exposure," said Shadab Rahman, PhD, a researcher in BWH's Division of Sleep Medicine and lead author of this study. "These findings demonstrate that prolonged blue light exposure during the day has an alerting effect."

In order to determine which wavelengths of light were most effective in warding off fatigue, the BWH researchers teamed with George Brainard, PhD, a professor of neurology at Thomas Jefferson University, who developed the specialized light equipment used in the study. Researchers compared the effects of blue light with exposure to an equal amount of green light on alertness and performance in 16 study participants for 6.5 hours over a day. Participants then rated how sleepy they felt, had their reaction times measured and wore electrodes to assess changes in brain activity patterns during the light exposure.

The researchers found that participants exposed to blue light consistently rated themselves as less sleepy, had quicker reaction times and fewer lapses of attention during the performance tests compared to those who were exposed to green light. They also showed changes in brain activity patterns that indicated a more alert state. "These results contribute to our understanding of how light impacts the brain and open up a new range of possibilities for using light to improve human alertness, productivity and safety," explained Steven Lockley, PhD, neuroscientist at BWH and senior investigator of the study. "While helping to improve alertness in night workers has obvious safety benefits, day shift workers may also benefit from better quality lighting that would not only help them see better but also make them more alert."

Researchers note that the next big challenge is to figure out how to deliver better lighting. While natural light is ideal, many people do not have access to daylight in their schools, homes or work places. In addition to improvements in daylight access, the advent of new, more controllable lighting technologies may help enable researchers to develop 'smart' lighting systems designed to maximize the beneficial effects of light for human health, productivity and safety.

This research was supported by the National Space Biomedical Research Institute through NASA.

http://www.eurekalert.org/pub_releases/2014-02/cp-aol012814.php

Appearance of Lyme disease rash can help predict how bacteria spreads through body

Lyme disease is often evident by a rash on the skin, but infections do not always produce similar rashes.

This can make it difficult to detect the disease early, when antibiotic treatment is most effective. In the February 4th issue of the Biophysical Journal, published by Cell Press, researchers describe a new mathematical model that captures the interactions between disease-causing bacteria and the host immune response that affect the appearance of a rash and the spread of infection.

"Our findings are important because they connect how the rash looks with the behavior of the bacteria in our body," says co-author Dr. Charles Wolgemuth of the University of Arizona in Tucson.

Dr. Wolgemuth and graduate student Dhruv Vig developed a fairly simple mathematical model that can account for the growth and appearance of a Lyme disease rash and might be used to predict the densities of the disease-causing bacteria in relationship to the rash as a function of time during spreading.

In many cases, patients with Lyme disease develop a rash with a bull's-eye appearance. The model reveals that in these cases, the rash begins as a small and uniform rash. Activation of the immune response is strongest at the center of the rash and clears most, but not all, of the bacteria from the center within about one week; however, bacteria at the edge of the rash continue to spread outward, further activating the immune response away from the edge. Therefore, the rash grows, but the center becomes less inflamed. As time progresses, though, the bacteria resurge at the center, leading to the characteristic bull's-eye pattern.

By revealing that the bacteria and immune cell populations change as a rash progresses, the model may help guide Lyme disease treatment. "The model that we have developed can be used to predict how the bacteria move through our bodies and how they are affected by therapeutics," explains Dr. Wolgemuth. To that end, the researchers simulated the progression of different rash types over the course of antibiotic treatment. They found that for all types of Lyme disease rashes, bacteria were cleared from the skin within roughly the first week; however, the dynamics of disappearance of the rash varied depending on the type of rash with which the patient presented. For example, while bull's-eye rashes resolved within a week of treatment, uniform rashes tended to be present even after four weeks, likely due to prolonged inflammation. Such differences suggest that there may not be a one-size-fits-all treatment regimen for resolving Lyme disease and its effects on the body.

Dr. Wolgemuth also notes that there are a number of similarities between the bacterium that causes Lyme disease and the bacterium that causes syphilis, and that "therefore, it is likely that this model will also be applicable to understanding syphilis, as well as potentially other bacterial infections."

Biophysical Journal, Vig et al.: "Spatiotemporal Evolution of Erythema Migrans, the Hallmark Rash of Lyme Disease."

http://www.eurekalert.org/pub_releases/2014-02/cp-sce012914.php

Shivering could elicit some of the same benefits as exercise

It's common knowledge that shivering in the cold is part of the body's attempt to stay warm.

According to new research into the mechanisms involved, shivering releases a hormone that stimulates fat tissue to produce heat so that the body can maintain its core temperature. This hormone, irisin, is also produced by muscle during exercise. The findings, which are published in the February 4 issue of the Cell Press journal Cell Metabolism, demonstrates that the act of shivering produces calorie-burning brown fat and improves metabolism.

Through experiments conducted in healthy volunteers, Dr. Francesco S. Celi of the National Institute of Diabetes and Digestive and Kidney Diseases and his colleagues found that the irisin, produced when the body shivers, is released in proportion to shivering intensity. Furthermore, the amount of irisin secreted as a result of

shivering is of similar magnitude to that of exercise-stimulated secretion. The team also found that when human fat cells in the laboratory were treated with FNDC5, a precursor of irisin, the cells burned more energy and released more heat.

The results suggest that exercise-induced production of irisin could have evolved from a similar mechanism that occurs following shivering-related muscle contractions in order to burn calories and generate heat. "This research may reveal why exercise increases secretion of a hormone that makes the body maintain its internal temperature," said Dr. Celi, who is currently at Virginia Commonwealth University. This may help explain why exercise increases secretion of a hormone that, paradoxically, makes the body feel hotter.

The findings also suggest that exploiting the muscle-fat crosstalk that is mediated by irisin may represent a new strategy to treat or prevent obesity. The results may even help people embrace feeling cold. "Perhaps lowering the thermostat during the winter months could help both the budget and metabolism," said Dr. Celi.

Cell Metabolism, Lee et al.: "Irisin and FGF21 are cold-induced endocrine activators of brown fat function in humans."

<http://phys.org/news/2014-02-german-charlemagne.html>

German researchers near certain remains are those of Charlemagne

German researchers announced that bones they have been studying are almost certainly those of Charlemagne

Phys.org - A team of German researchers has announced to the press that the bones they have been studying for almost 26 years are almost certainly those of Charlemagne, the first ruler of the Holy Roman Empire.

Charlemagne is an historic figure as many consider him to be the father of modern Europe—he managed to forge the first empire in Europe (it included most of Western Europe) after the demise of the Roman Empire. Adding to his stature is that he reportedly personally led most of the 53 campaigns that led to his empire being built. Today, the monarchies in both Germany and France consider their realms to be direct descendants of the empire Charlemagne built.

Charlemagne based his empire out of what is now a western part of Germany—he died in his early seventies (in 847 reportedly from high fever or pneumonia) in the town of Aachen, which is where it's believed he was buried. His sarcophagus has been sitting in Aachen Cathedral for 1200 years—it was only in 1988 that a team of researchers secretly opened its lid to reveal 94 bones that are believed to have belonged to the famous leader. The researchers also discovered bones in a golden bust that were believed to belong to him as well. Both collections have been the subject of intense scrutiny ever since.

After careful analysis, the researchers report that the bones belonged to a man very nearly the same height as Charlemagne was reported to be—slightly over six feet tall—which was extremely unusual for that time (also unusual was that his father was known as Pepin the Short because he was only about five feet tall). The bones also came from a very thin man, which Charlemagne was also reported to be. Also, writings from the time suggest that the leader walked with a limp in his later years—the researchers report scarring on knee and ankle bones which likely caused their owner to limp.

The researchers obviously can't prove without a shadow of a doubt that the bones they've been studying are indeed those of Charlemagne, but insist that there is a "great likelihood" that they are, based on their research efforts.

http://www.eurekalert.org/pub_releases/2014-02/uoia-oml020414.php

Off-the-shelf materials lead to self-healing polymers

Removable paint and self-healing plastics soon could be household products

CHAMPAIGN, Ill. — Look out, super glue and paint thinner. Thanks to new dynamic materials developed at the University of Illinois, removable paint and self-healing plastics soon could be household products.

U. of I. materials science and engineering professor Jianjun Cheng, graduate student Hanze Ying and postdoctoral researcher Yanfeng Zhang published their work in the journal *Nature Communications*.

"The key advantage of using this material is that it's catalyst-free and low-temperature, and can be healed multiple times," Cheng said. "These are very nice materials for internal cracks. This can heal the crack before it causes major problems by propagating."

Other self-healing material systems have focused on solid, strong materials. However, the new study uses softer elastic materials made of polyurea, one of the most widely used classes of polymers in consumer goods such as paints, coatings, elastics and plastics.

After the polymer is cut or torn, the researchers press the two pieces back together and let the sample sit for about a day to heal – no extra chemicals or catalysts required. The materials can heal at room temperature, but the process can be sped up by curing at slightly higher temperatures (37 degrees Celsius, or about body temperature). The polymer bonds back together on the molecular level nearly as strongly as before it was cut. In

fact, tests found that some healed samples, stretched to their limits, tore in a new place rather than the healed spot, evidence that the samples had healed completely.

See a video demonstrating the preparation and self-healing properties at <https://www.youtube.com/watch?v=1i3yoK0C9Ag>.

The researchers use commercially available ingredients to create their polymer. By slightly tweaking the structure of the molecules that join up to make the polymer, they can make the bonds between the molecules longer so that they can more easily pull apart and stick back together – the key for healing. This molecular-level re-bonding is called dynamic chemistry.

Dynamic chemistry has been explored in some other polymers, but those materials tend to be for specialized applications or laboratory settings, rather than the conventional polymers used commercially. By focusing on consumer materials and using readily available ingredients, the researchers hope that manufacturers could easily integrate dynamic materials.

"We just buy commercial materials and mix them together, no fancy controls or special apparatus," said Cheng. "It's a very simple, low-cost, inexpensive process. Anybody can do this on any scale."

Now that they've established the chemistry required, the researchers are exploring how dynamic polyurea could bolster different applications. For example, they could fine-tune the mixture so that a polyurethane coating or paint could be removable.

"In some areas, when it's not necessary for the coating to be permanent and you want it to be removable, this chemistry may be applied to existing coating materials to make it reversible," Cheng said. "In general, polyurea and polyurethane are widely used. This chemistry could modify existing materials to make them more dynamic, healable."

The National Science Foundation and the National Institutes of Health supported this research. Cheng also is affiliated with the departments of chemistry and of bioengineering, the Beckman Institute for Advanced Science and Technology, the Institute for Genomic Biology, the Frederick Seitz Materials Research Laboratory and the Micro and Nano Technology Laboratory at the U. of I.

Editor's note: To contact Jianjun Cheng, call 217-244-3924; email jianjunc@illinois.edu. The paper, "Dynamic Urea Bond for the Design of Reversible and Self-healing Polymers," is available online.

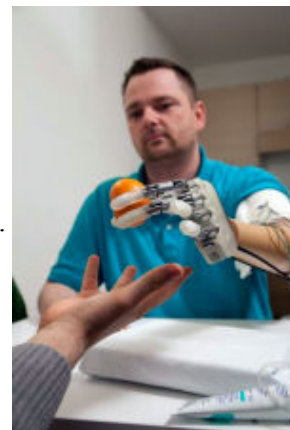
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Amputee feels in real-time with bionic hand

First amputee in the world to feel sensory rich information -- in real-time -- with a prosthetic hand wired to nerves in his upper arm

Dennis Aabo Sorensen is the first amputee in the world to feel sensory rich information -- in real-time -- with a prosthetic hand wired to nerves in his upper arm; Sorensen could grasp objects intuitively and identify what he was touching while blindfold

Nine years after an accident caused the loss of his left hand, Dennis Aabo Sørensen from Denmark became the first amputee in the world to feel – in real-time – with a sensory-enhanced prosthetic hand that was surgically wired to nerves in his upper arm. Silvestro Micera and his team at EPFL (Switzerland) and SSSA (Italy) developed the revolutionary sensory feedback that allowed Sørensen to feel again while handling objects. A prototype of this bionic technology was tested in February 2013 during a clinical trial in Rome under the supervision of Paolo Maria Rossini at Gemelli Hospital (Italy). The study is published in the February 5, 2014 edition of Science Translational Medicine, and represents a collaboration called Lifehand 2 between several European universities and hospitals.



This is amputee Dennis Aabo Sørensen wearing sensory feedback enabled prosthetic in Rome. Lifehand 2 / Patrizia Tucci

"The sensory feedback was incredible," reports the 36 year-old amputee from Denmark. "I could feel things that I hadn't been able to feel in over nine years." In a laboratory setting wearing a blindfold and earplugs, Sørensen was able to detect how strongly he was grasping, as well as the shape and consistency of different objects he picked up with his prosthetic. "When I held an object, I could feel if it was soft or hard, round or square."

From Electrical Signal to Nerve Impulse

Micera and his team enhanced the artificial hand with sensors that detect information about touch. This was done by measuring the tension in artificial tendons that control finger movement and turning this measurement into an electrical current. But this electrical signal is too coarse to be understood by the nervous system. Using

computer algorithms, the scientists transformed the electrical signal into an impulse that sensory nerves can interpret. The sense of touch was achieved by sending the digitally refined signal through wires into four electrodes that were surgically implanted into what remains of Sørensen's upper arm nerves.

"This is the first time in neuroprosthetics that sensory feedback has been restored and used by an amputee in real-time to control an artificial limb," says Micera.

"We were worried about reduced sensitivity in Dennis' nerves since they hadn't been used in over nine years," says Stanisa Raspopovic, first author and scientist at EPFL and SSSA. These concerns faded away as the scientists successfully reactivated Sørensen's sense of touch.

[VIDEO: Dennis Aabo Sørensen is the first amputee in the world to feel sensory rich information](#)

Connecting Electrodes to Nerves

On January 26, 2013, Sørensen underwent surgery in Rome at Gemelli Hospital. A specialized group of surgeons and neurologists, led by Paolo Maria Rossini, implanted so-called transneural electrodes into the ulnar and median nerves of Sørensen's left arm. After 19 days of preliminary tests, Micera and his team connected their prosthetic to the electrodes – and to Sørensen – every day for an entire week. The ultra-thin, ultra-precise electrodes, developed by Thomas Stieglitz's research group at Freiburg University (Germany), made it possible to relay extremely weak electrical signals directly into the nervous system. A tremendous amount of preliminary research was done to ensure that the electrodes would continue to work even after the formation of post-surgery scar tissue. It is also the first time that such electrodes have been transversally implanted into the peripheral nervous system of an amputee.

The First Sensory-Enhanced Artificial Limb

The clinical study provides the first step towards a bionic hand, although a sensory-enhanced prosthetic is years away from being commercially available and the bionic hand of science fiction movies is even further away.

The next step involves miniaturizing the sensory feedback electronics for a portable prosthetic. In addition, the scientists will fine-tune the sensory technology for better touch resolution and increased awareness about the angular movement of fingers. The electrodes were removed from Sørensen's arm after one month due to safety restrictions imposed on clinical trials, although the scientists are optimistic that they could remain implanted and functional without damage to the nervous system for many years.

Psychological Strength an Asset

Sørensen's psychological strength was an asset for the clinical study. He says, "I was more than happy to volunteer for the clinical trial, not only for myself, but to help other amputees as well." Now he faces the challenge of having experienced touch again for only a short period of time.

Sørensen lost his left hand while handling fireworks during a family holiday. He was rushed to the hospital where his hand was immediately amputated. Since then, he has been wearing a commercial prosthetic that detects muscle movement in his stump, allowing him to open and close his hand, and hold onto objects.

"It works like a brake on a motorbike," explains Sørensen about the conventional prosthetic he usually wears. "When you squeeze the brake, the hand closes. When you relax, the hand opens."

Without sensory information being fed back into the nervous system, though, Sørensen cannot feel what he's trying to grasp and must constantly watch his prosthetic to avoid crushing the object. Just after the amputation, Sørensen recounts what the doctor told him. "There are two ways you can view this. You can sit in the corner and feel sorry for yourself. Or, you can get up and feel grateful for what you have. I believe you'll adopt the second view."

"He was right," says Sørensen.

http://www.eurekalert.org/pub_releases/2014-02/uoo-tri020414.php

Tree roots in the mountains 'acted like a thermostat' for millions of years

For the first time, scientists have discovered how tree roots in the mountains may play an important role in controlling long-term global temperatures.

Researchers from Oxford and Sheffield Universities have found that temperatures affect the thickness of the leaf litter and organic soil layers, as well as the rate at which the tree roots grow. In a warmer world, this means that tree roots are more likely to grow into the mineral layer of the soil, breaking down rock into component parts which will eventually combine with carbon dioxide. This process, called weathering, draws carbon dioxide out of the atmosphere and cools the planet. The researchers say this theory suggests that mountainous ecosystems have acted like the Earth's thermostat, addressing the risk of 'catastrophic' overheating or cooling over millions of years.

In their research paper published online in *Geophysical Research Letters*, the researchers carried out studies in tropical rain forests in Peru, measuring tree roots across different sites of varying altitude – from the warm Amazonian Lowlands to the cooler mountain ranges of the Andes. They measured the growth of the tree roots

to 30 cm beneath the surface, every three months over several years. At each of the sites, they also measured the thickness of the organic layer above the soil. This information was then combined with existing data of monthly temperature, humidity, rainfall, and soil moisture in order to calculate the likely breakdown process of the basalt and granite rocks found in the mountain ranges of Peru.

Using this model, based on field data in Peru, the scientists were able to scale up in order to calculate the likely contribution of mountain forests worldwide to global weathering rates. The researchers then calculated the likely amount of carbon to be pulled out of the atmosphere through weathering when the Earth became very hot. They looked at the volcanic eruptions in India 65 million years ago (known as the Deccan traps). The model also allowed them to calculate the weathering process and carbon feedback after the Earth's cooling 45 million years ago, when great mountain ranges like the Andes and the Himalayas were first formed.

The paper suggests that mountainous regions may play a particularly important role in drawing carbon out of the atmosphere because they have abundant volcanic rock which is highly reactive to weathering when it disintegrates.

Lead researcher Chris Doughty, from the School of Geography and the Environment at the University of Oxford, said: 'This is a simple process driven by tree root growth and the decomposition of organic material. Yet it may contribute to Earth's long-term climate stability. It seems to act like a thermostat, drawing more carbon dioxide out of the atmosphere when it is warm and less when it is cooler.'

'A series of climatic events over the last 65 million years ago have resulted in global temperatures rising and falling. However, the weathering process that regulates carbon dioxide in the atmosphere may be buffered by forests that grow in mountainous parts of the world. In the past, this natural process may have prevented the planet from reaching temperatures that are catastrophic for life.'

The paper 'Montane forest root growth and soil organic layer depth as potential factors stabilizing Cenozoic global change' is published online in Geophysical Research Letters on 6 February 2014. (The uncorrected version is currently online but final version will appear on 6 February.)

http://www.eurekalert.org/pub_releases/2014-02/d-ssy020414.php

Study shows yogurt consumption reduces the risk of type 2 diabetes

Higher consumption of yoghurt, compared with no consumption, can reduce the risk of new-onset type 2 diabetes by 28%

New research published in *Diabetologia* (the journal of the European Association for the Study of Diabetes) shows that higher consumption of yoghurt, compared with no consumption, can reduce the risk of new-onset type 2 diabetes by 28%. Scientists at the University of Cambridge found that in fact higher consumption of low-fat fermented dairy products, which include all yoghurt varieties and some low-fat cheeses, also reduced the relative risk of diabetes by 24% overall.

Lead scientist Dr Nita Forouhi, from the Medical Research Council (MRC) Epidemiology Unit at the University of Cambridge, commented "this research highlights that specific foods may have an important role in the prevention of type 2 diabetes and are relevant for public health messages".

Dairy products are an important source of high quality protein, vitamins and minerals. However, they are also a source of saturated fat, which dietary guidelines currently advise people not to consume in high quantities, instead recommending they replace these with lower fat options.

Previous studies on links between dairy product consumption (high fat or low fat) and diabetes had inconclusive findings. Thus, the nature of the association between dairy product intake and type 2 diabetes remains unclear, prompting the authors to carry out this new investigation, using much more detailed assessment of dairy product consumption than was done in past research.

The research was based on the large EPIC-Norfolk study which includes more than 25,000 men and women living in Norfolk, UK. It compared a detailed daily record of all the food and drink consumed over a week at the time of study entry among 753 people who developed new-onset type 2 diabetes over 11 years of follow-up with 3,502 randomly selected study participants. This allowed the researchers to examine the risk of diabetes in relation to the consumption of total dairy products and also types of individual dairy products.

The consumption of total dairy, total high-fat dairy or total low-fat dairy was not associated with new-onset diabetes once important factors like healthier lifestyles, education, obesity levels, other eating habits and total calorie intake were taken into account. Total milk and cheese intakes were also not associated with diabetes risk. In contrast, those with the highest consumption of low-fat fermented dairy products (such as yoghurt, fromage frais and low-fat cottage cheese) were 24% less likely to develop type 2 diabetes over the 11 years, compared with non-consumers.

When examined separately from the other low-fat fermented dairy products, yoghurt, which makes up more than 85% of these products, was associated with a 28% reduced risk of developing diabetes. This risk reduction

was observed among individuals who consumed an average of four and a half standard 125g pots of yoghurt per week. The same applies to other low-fat fermented dairy products such as low-fat unripened cheeses including fromage frais and low-fat cottage cheese. A further finding was that consuming yoghurt in place of a portion of other snacks such as crisps also reduced the risk of developing type 2 diabetes.

While this type of study cannot prove that eating dairy products causes the reduced diabetes risk, dairy products do contain beneficial constituents such as vitamin D, calcium and magnesium. In addition, fermented dairy products may exert beneficial effects against diabetes through probiotic bacteria and a special form of vitamin K (part of the menaquinone family) associated with fermentation.

The authors acknowledge the limitations of dietary research which relies on asking people what they eat and not accounting for change in diets over time, but their study was large with long follow-up, and had detailed assessment of people's diets that was collected in real-time as people consumed the foods, rather than relying on past memory. The authors conclude that their study therefore helps to provide robust evidence that consumption of low-fat fermented dairy products, largely driven by yoghurt intake, is associated with a decreased risk of developing future type 2 diabetes.

Dr Forouhi stated that "at a time when we have a lot of other evidence that consuming high amounts of certain foods, such as added sugars and sugary drinks, is bad for our health, it is very reassuring to have messages about other foods like yoghurt and low-fat fermented dairy products, that could be good for our health".

1. Type 2 diabetes is common and the number of people with this serious medical condition is increasing in every country, with the International Diabetes Federation global estimates of 382 million people with diabetes in 2013, rising to 592 million in 2035. The potential for its prevention by factors such as the foods we eat is therefore of great interest.

2. In this study, total dairy intake in grams per day was estimated and categorised into high-fat and low-fat dairy and by subtype into yoghurt, cheese, and milk. Combined fermented dairy product intake (yoghurt, cheese, sour-cream) was estimated and also categorised into high- and low-fat.

3. In this study, the fat content of whole milk in the UK (3.9% fat) was used as the cut-off for defining high- and low-fat dairy products.

http://www.eurekalert.org/pub_releases/2014-02/ysof-few020514.php

Forest emissions, wildfires explain why ancient Earth was so hot

The release of volatile organic compounds from forests and smoke from wildfires 3 million years ago had a far greater impact on global warming than ancient atmospheric levels of carbon dioxide

The release of volatile organic compounds from Earth's forests and smoke from wildfires 3 million years ago had a far greater impact on global warming than ancient atmospheric levels of carbon dioxide, a new Yale study finds.

The research provides evidence that dynamic atmospheric chemistry played an important role in past warm climates, underscoring the complexity of climate change and the relevance of natural components, according to the authors. They do not address or dispute the significant role in climate change of human-generated CO₂ emissions.

Using sophisticated Earth system modeling, a team led by Nadine Unger of the Yale School of Forestry & Environmental Studies (F&ES) calculated that concentrations of tropospheric ozone, aerosol particles, and methane during the mid-Pliocene epoch were twice the levels observed in the pre-industrial era — largely because so much more of the planet was covered in forest. Those reactive compounds altered Earth's radiation balance, contributing a net global warming as much as two to three times greater than the effect of carbon dioxide, according to the study, published in the journal *Geophysical Research Letters*.

These findings help explain why the Pliocene was two to three degrees C warmer than the pre-industrial era despite atmospheric levels of carbon dioxide that were approximately the same as today, Unger said.

"The discovery is important for better understanding climate change throughout Earth's history, and has enormous implications for the impacts of deforestation and the role of forests in climate protection strategies," said Unger, an assistant professor of atmospheric chemistry at F&ES. "The traditional view," she said, "is that forests affect climate through carbon storage and by altering the color of the planet's surface, thus influencing the albedo effect. But as we are learning, there are other ways that forest ecosystems can impact the climate." The albedo effect refers to the amount of radiation reflected by the surface of the planet. Light-colored snowy surfaces, for instance, reflect more light and heat back into space than darker forests.

Climate scientists have suggested that the Pliocene epoch might provide a glimpse of the planet's future if humankind is unable to curb carbon dioxide emissions. During the Pliocene, the two main factors believed to influence the climate — atmospheric CO₂ concentrations and the geographic position of the continents — were nearly identical to modern times. But scientists have long wondered why the Pliocene's global surface air temperatures were so much warmer than Earth's pre-industrial climate.

The answer might be found in highly reactive compounds that existed long before humans lived on the planet, Unger says. Terrestrial vegetation naturally emits vast quantities of volatile organic compounds, for instance. These are critical precursors for organic aerosols and ozone, a potent greenhouse gas. Wildfires, meanwhile, are a major source of black carbon and primary organic carbon.

Forest cover was vastly greater during the Pliocene, a period marked not just by warmer temperatures but also by greater precipitation. At the time, most of the arid and semi-arid regions of Africa, Australia, and the Arabian peninsula were covered with savanna and grassland. Even the Arctic had extensive forests. Notably, Unger says, there were no humans to cut the forests down.

Using the NASA Goddard Institute for Space Studies Model-E2 global Earth system model, the researchers were able to simulate the terrestrial ecosystem emissions and atmospheric chemical composition of the Pliocene and the pre-industrial era. According to their findings, the increase in global vegetation was the dominant driver of emissions during the Pliocene — and the subsequent effects on climate.

Previous studies have dismissed such feedbacks, suggesting that these compounds would have had limited impact since they would have been washed from the atmosphere by frequent rainfall in the warmer climate. The new study argues otherwise, saying that the particles lingered about the same length of time — one to two weeks — in the Pliocene atmosphere compared to the pre-industrial.

Unger says her findings imply a higher climate sensitivity than if the system was simply affected by CO₂ levels and the albedo effect. "We might do a lot of work to reduce air pollution from road vehicle and industrial emissions, but in a warmer future world the natural ecosystems are just going to bring the ozone and aerosol particles right back," she said. "Reducing and preventing the accumulation of fossil-fuel CO₂ is the only way to ensure a safe climate future now."

The modeling calculations were performed on Yale University's omega supercomputer, a 704-node cluster capable of processing more than 52 trillion calculations per second.

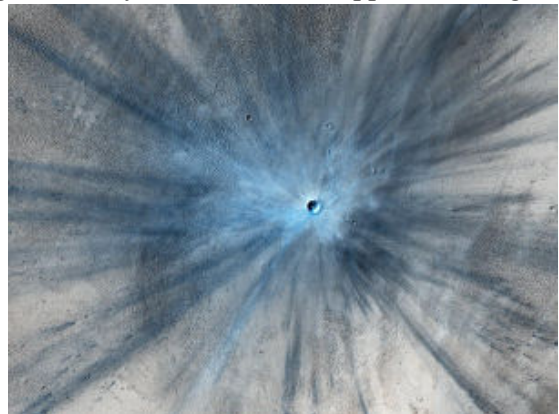
<http://phys.org/news/2014-02-nasa-mars-orbiter-crater.html>

NASA Mars orbiter examines dramatic new crater

HiRISE image from Mars Reconnaissance Orbiter shows a 30 m crater at the center of a radial burst

Phys.org - The image from the High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter shows a crater about 100 feet (30 meters) in diameter at the center of a radial burst painting the surface with a pattern of bright and dark tones. The scar appeared at some time between imaging of this location by the orbiter's Context Camera in July 2010 and again in May 2012. Based on apparent changes between those before-and-after images at lower resolution, researchers used HiRISE to acquire this new image on Nov. 19, 2013. The impact that excavated this crater threw some material as far as 9.3 miles (15 kilometers).

The Mars Reconnaissance Orbiter Project is managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif., for NASA's Science Mission Directorate, Washington. JPL is a division of the California Institute of Technology in Pasadena. HiRISE is operated by the University of Arizona, Tucson. The instrument was built by Ball Aerospace & Technologies Corp., Boulder, Colo. Malin Space Science Systems, San Diego, built and operates the Context Camera.



Space rocks hitting Mars excavate fresh craters at a pace of more than 200 per year, but few new Mars scars pack as much visual punch as one seen in a NASA image released today.

A dramatic, fresh impact crater dominates this image taken by the High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter on Nov. 19, 2013. Researchers used HiRISE to examine this site because the orbiter's Context Camera had revealed a change in appearance here between observations in July 2010 and May 2012, bracketing the formation of the crater between those observations. The crater spans approximately 100 feet (30 meters) in diameter and is surrounded by a large, rayed blast zone. Because the terrain where the crater formed is dusty, the fresh crater appears blue in the enhanced color of the image, due to removal of the reddish dust in that area. Debris tossed outward during the formation of the crater is called ejecta. In examining ejecta's distribution, scientists can learn more about the impact event. The explosion that excavated this crater threw ejecta as far as 9.3 miles (15 kilometers). The crater is at 3.7 degrees north latitude, 53.4 degrees east longitude on Mars. Before-and-after imaging that brackets appearance dates of fresh craters on Mars has indicated that impacts producing craters at least 12.8 feet (3.9 meters) in diameter occur at a rate exceeding 200 per year globally. Few of the scars are as dramatic in appearance as this one. NASA/JPL-Caltech/Univ. of Arizona

http://www.eurekalert.org/pub_releases/2014-02/asfg-aig020514.php

ASGE issues guidelines for safety in the gastrointestinal endoscopy unit
The American Society for Gastrointestinal Endoscopy (ASGE) has issued "Guidelines for safety in the gastrointestinal endoscopy unit."

DOWNERS GROVE, Ill. - The purpose of this new guideline is to present recommendations for endoscopy units in implementing and prioritizing safety efforts and to provide an endoscopy-specific guideline by which to evaluate endoscopy units. The guideline is published on the website of GIE: Gastrointestinal Endoscopy, the monthly peer-reviewed scientific journal of ASGE, at <http://www.giejournal.org>.

Historically, safety in the gastrointestinal (GI) endoscopy unit has focused on infection control, particularly around the reprocessing of endoscopes. Although ASGE has previously published guidelines on staffing, sedation, infection control, and endoscope reprocessing for endoscopic procedures, rare reports of outbreaks in which the transmission of infectious agents were related to GI endoscopy have highlighted the need to address potential areas in the endoscopy care continuum that could impact patient safety.

Changes to the Centers for Medicare and Medicaid Services (CMS) Ambulatory Surgical Center Conditions for Coverage that went into effect in 2009 eliminated the distinction between a sterile surgical room and a non-sterile procedure room, providing further impetus for this guideline. As a result of these conditions, non-sterile procedure environments, including endoscopy units, are now held to the same standards as sterile operating rooms even though requirements for facilities, infection control, staffing, and sedation applicable to the sterile operating room may not be relevant or necessary for endoscopy units. To date, the Association of Perioperative Registered Nurses and other organizations have set standards for sterile operating environments. ASGE's new guideline is endorsed by organizations with specific expertise in the safe delivery of care in the non-sterile, GI endoscopy environment, which recognize the important distinction between the endoscopy and sterile operating room settings.

"Over the past two years, surveyors have called into question accepted practices at many accredited endoscopy units seeking reaccreditation. Many of these issues relate to the Ambulatory Surgical Center Conditions for Coverage set forth by CMS and the lack of distinction between the sterile operating room and the endoscopy setting," said Audrey H. Calderwood, MD, co-chair, ASGE Ensuring Safety in the Gastrointestinal Endoscopy Unit Task Force. "ASGE recognized a need to develop nationally-recognized guidelines for endoscopy units that provide recommendations for the implementation and prioritization of safety efforts within GI endoscopy. These endoscopy-specific guidelines will also serve as an important resource for surveyors tasked with evaluating endoscopy units."

"Guidelines for safety in the gastrointestinal endoscopy unit" contains a summary of issues that have been faced by endoscopy units throughout the country along with the ASGE position and accompanying rationale.

Summary of the key strategies to maintain safety in the GI endoscopy unit:

Each unit should have a designated flow for the safe physical movement of dirty endoscopes and other equipment.

Procedure rooms vary in size, with more complex procedures requiring greater space for more specialized equipment and, in some cases, additional staff.

Before starting an endoscopic procedure, the patient, staff, and performing physician should verify the correct patient and procedure to be performed.

A specific infection prevention plan must be implemented and directed by a qualified person.

Gloves and an impervious gown should be worn by staff engaged in direct patient care during the procedure.

The unit should have a terminal cleansing plan that includes methods and chemical agents for cleansing and disinfecting the procedural space at the end of the day.

For patients undergoing routine endoscopy under moderate sedation, a single nurse is required in the room in addition to the performing physician.

Complex procedures may require additional staff for efficiency but not necessarily for safety.

At a minimum, patient monitoring should be performed before the procedure, after administration of sedatives, at regular intervals during the procedure, during initial recovery, and before discharge.

For cases in which moderate sedation is the target, the individual responsible for patient monitoring may perform brief interruptible tasks.

For cases in which moderate sedation is the target, there are currently inadequate data to support the routine use of capnography.

To read all of the guideline recommendations, see GIE: Gastrointestinal Endoscopy online at <http://www.giejournal.org>.

The guideline was developed by the ASGE Ensuring Safety in the Gastrointestinal Endoscopy Unit Task Force, co-chaired by Audrey H. Calderwood, MD, and Frank J. Chapman, MBA, and was reviewed and approved by the ASGE Governing Board. The guideline was reviewed and endorsed by the American Association for the

Study of Liver Diseases, American College of Gastroenterology, American Gastroenterological Association Institute, Ambulatory Surgery Center Association, American Society of Colon and Rectal Surgeons, and Society of American Gastrointestinal and Endoscopic Surgeons.

<http://www.medscape.com/viewarticle/820249?src=rss>

Doctors, Not Just Patients, Use Wikipedia, Too: IMS Report

Wikipedia isn't just a popular source of health information for patients, but apparently for physicians and other healthcare professionals (HCPs) too, according to a new report from the IMS Institute for Healthcare Informatics.

Miriam E. Tucker

"Wikipedia is the leading single source of healthcare information for patients and healthcare professionals...[and] nearly 50% of U.S. physicians who go online for professional purposes use Wikipedia for information, especially on specific conditions," the researchers write. That was among the data points from the January 2014 report, *Engaging Patients Through Social Media*. The report also correlates medication use with Wikipedia views, finding that this relationship differs by age among information seekers.

Research by the IMS Institute, which collects data and collaborates with the public and private sector, also shows that Wikipedia health pages are updated substantially and often, suggesting a need for better curation. The report looked at what are called "social media channels," including Wikipedia, Twitter, Facebook, and YouTube because they "have not been examined in detail," the researchers write. In common among the channels are that they "allow the creation and exchange of user-generated content."

The researchers based their findings on search engine rankings and page view statistics, writing Wikipedia "is a prominent source of online health information compared to the other health information providers studied [in the past]," they write.

The IMS also examines the ways in which regulators, pharmaceutical companies, and healthcare professionals (HCPs) use social media, and issues a "call to action" for each stakeholder group based on the findings.

"Patient trust in clinicians and the broad reach of social media puts healthcare professionals in a prime position to drive healthcare topics on the Web," the IMS notes. However, "Much like the pharmaceutical industry, healthcare professionals are usually perceived as laggard adopters of new technologies."

Among the report's recommendations to HCPs, "Effective engagement by HCPs with patients occurs where they feel most comfortable, including in social media forums. The approach taken by HCPs to social media must therefore be developed in order for HCPs to fulfil their professional mission."

That's essentially what the American College of Physicians (ACP) did in a policy statement issued in April 2013 in conjunction with the Federation of State Medical Boards (FSMB), offering detailed guidelines for physicians on appropriate use of social media, ACP president-elect David A. Fleming, MD, told *Medscape Medical News*.

"To me, [the IMS recommendation] is sort of a soft mandate, where professional organizations and groups are expected to approach social media in a professional way to meet their professional mission.... It really is up to us to police ourselves and to inform ourselves about what appropriate behavior is," Dr. Fleming said.

Whereas the ACP/FSMB guidelines addressed the specific scenarios of digital interactions between physicians and patients, physician blogging and posting on social media sites, and interprofessional relationships, the IMS report delivers a snapshot of current social media engagement. Among the metrics:

Overall use of social networking sites grew from 8% of all adults online in 2005 to 67% in late 2012 and up to 72% of U.S. adults online in May 2013.

In making clinical decisions, physicians spend twice as much time using online resources compared to print.

Physicians spend an average of 3 hours a week watching online videos for professional purposes, citing their top 3 as Medscape and YouTube, followed by videos on pharmaceutical company websites.

Wikipedia's Reach

In an analysis of page visits of 5236 English-language Wikipedia pages over the last 2 years, IMS Health found that rarer diseases tended to attract more clicks than did more common ones. In the last 12 months, the top 5 were tuberculosis (4.2 million visits), Crohn's disease (4.1 million), pneumonia (3.9 million), multiple sclerosis (3.8 million), and diabetes (3.4 million).

"Rarer diseases often have fewer available information sources and are often less well understood by the average patient and clinician than common conditions, hence the greater need for external sources of communication," the IMS report notes.

Dr. Fleming told *Medscape Medical News* that he does use Wikipedia, but not as a primary source of medical information. He checks it for historical or social information, and also sometimes uses references from medical entries.

He also uses Google and Google Scholar, as well as physician-targeted sources such as UpToDate, Epocrates, and ACP Smart Medicine. "You get multiple sources when you do a search. I don't think that's necessarily a bad thing. Any information we get, whether Wikipedia or any healthcare sites or blogs, have to be put in the context of a balanced view."

Dr. Fleming added, "Before we share any information with our patients, we need to feel comfortable that the source is accurate and the information is evidence-based, regardless of where it comes from."

But patients do seem to be relying on Wikipedia to a great extent. By looking at seasonal conditions such as pneumonia and insomnia (more common in winter months), the IMS report correlates spikes in illness with Wikipedia page views, noting that the lag times differ by age: Younger patients tend to research a treatment before starting it, whereas those aged 50 years and older typically start treatment first, then search for information about it.

An analysis of pages for Wikipedia articles on 5 health conditions — diabetes, multiple sclerosis, rheumatoid arthritis, breast cancer, and prostate cancer — showed that the content or meaning of the information in the articles had been changed an average of 16 to 46 times per month since they had been created. The last 100 changes for the 5 articles — most of them major changes — had occurred in the last 5 to 12 months.

Indeed, another of the report's recommendations was: "HCPs have a strong vested interest in supporting the updating and maintenance of medical information utilized by patients online, including Wikipedia."

Dr. Fleming agrees. "I think physicians have always had a responsibility to society to ensure accuracy and cogency of information that goes out to the public. That includes Wikipedia, but that's just one part. We need to be participatory."

Internet-empowered Patients

Dr. Fleming takes issue with the wording of a third IMS call to action for HCPs: "The rise of the empowered patient may threaten the previous stature of the physician as the sole decision maker, but empowered patients make the decisions which they feel are right for them. This has important implications for how HCPs view such patients and engage with them."

He said, "I think it's quite the opposite. The good physician is going to attempt to empower their patients by giving them information. That's what informed consent is all about. That's what patient-centered, shared decision-making is about."

For sure, the Internet and social media have made discussions with patients more "complex and challenging because so much of the information is wrong or confusing and is taken out of context...and we have to correct the mistakes. But on the other hand, it's encouraging discussion with the patient and families."

The notion of furthering discussion is included in the IMS report's fourth recommendation for HCPs regarding social media: "HCPs can learn from patients engaging in social media about their conditions and the realities of living with them. They can also pass on their findings to other patients and encourage them to seek out online support communities. Groups of providers can utilize social media to improve the quality of their customer service, gain feedback on new initiatives, and crowd-source ideas for improvements. A growing segment of patients are likely to appreciate this and may demonstrate increased loyalty."

That's the direction medicine has been going, according to Dr. Fleming, "Over the last 40-50 years, the rise of autonomy has put the patient more central to the kinds of communication that occurs. It's not a one-sided discussion...It's a discussion of what options we need to consider... All of the professional organizations are embracing the notion of communicating effectively."

Dr. Fleming has disclosed no relevant financial relationships.

http://www.eurekalert.org/pub_releases/2014-02/ind-abh020414.php

Autism: Birth hormone may control the expression of the syndrome in animals

Chloride levels are elevated in the neurons of mice used in an animal model of autism

The scientific community agrees that autism has its origins in early life—foetal and/or postnatal. The team led by Yehezkel Ben-Ari, Inserm Emeritus Research Director at the Mediterranean Institute of Neurobiology (INMED), has made a breakthrough in the understanding of the disorder. In an article published in *Science*, the researchers demonstrate that chloride levels are elevated in the neurons of mice used in an animal model of autism, and remain at abnormal levels from birth. These results corroborate the success obtained with the diuretic treatment tested on autistic children by the researchers and clinicians in 2012, and suggest that administration of diuretics to mice before birth corrects the deficits in the offspring. They also show that oxytocin, the birth hormone, brings about a decrease in chloride level during birth, which controls the expression of the autistic syndrome. This work is due to appear in the 7 February 2014 issue of *Science*. Neurons contain high levels of chloride throughout the entire embryonic phase. As a result, GABA, the main chemical messenger of the brain, excites the neurons during this phase instead of inhibiting them, in order to

facilitate construction of the brain. Subsequently, a natural reduction in chloride levels allows GABA to exercise its inhibitory role and regulate the activity of the adolescent/adult brain. In many brain disorders (childhood epilepsy, cranial trauma, etc.), studies have shown abnormally high chloride levels. Having made various observations, Dr Lemonnier's team (Brest), and Yehezkel Ben-Ari's team at Inserm carried out a clinical trial in 2012, based on the hypothesis of high chloride levels in the neurons of patients with autism. The researchers showed that administration of a diuretic to children with autism (which reduces neuronal chloride levels) has beneficial effects. The results of the trial supported this hypothesis, but because high neuronal chloride levels could not be demonstrated in children with autism, it was not possible to prove the mechanism proposed or justify the treatment.

In the present study, the researchers therefore used two animal models of autism, a genetic model, Fragile X syndrome, which is the genetic mutation most frequently associated with autism, and another, generated by injecting the pregnant mice with sodium valproate, a product known to generate abnormalities in children, including autistic spectrum disorder.

A high level of chloride in the brain

For the first time, the researchers recorded the activity of neurons at the embryonic stage and immediately after birth in order to observe modifications in chloride levels. These observations showed that neuronal chloride levels are abnormally high in both young and adult animals used in the autism model. GABA strongly excites neurons, and the researchers recorded aberrant electrical activities in the brain, which persist in adult animals. The fall in chloride level, a particularly impressive phenomenon seen at birth in control animals, is absent in both of these animal models, and the neurons have the same chloride level before and after birth. These high levels are due to reduced activity of a chloride transporter, thus preventing transport of chloride out of the neuron. As a result, a major feature of neurons during birth is abolished in animal models of autism.

"Chloride levels during delivery are determinants of the occurrence of autism spectrum disorder," explains Yehezkel Ben-Ari, an Emeritus Research Director at Inserm.

Beneficial effects of the diuretic on brain activity

The researchers administered a diuretic treatment to the mother (in both animal models) for 24 hours shortly before delivery to see if this would restore brain inhibition in the offspring. They showed that the drop in chloride level was re-established in the neurons several weeks after a single treatment during birth. According to the research team, antenatal treatment restored brain activity to approximately normal levels, and corrected the "autistic" behaviour in the animals once they became adults. "These results thus validate the working hypothesis that led us to the treatment we developed in 2012," states the principal author of the study.

Oxytocin, the birth hormone, naturally reduces chloride levels

The role of oxytocin in reducing neuronal chloride was also studied. The researchers had previously shown in 2006 that this hormone, which triggers labour, also has many beneficial actions on the brains of newborns, including protective effects in the event of complications during delivery, and even analgesic properties.

Oxytocin acts like the diuretic, reducing the intracellular chloride levels.

In the present study, the team tested the long-term effects of blocking the actions of the hormone before birth. A drug that blocks the signals generated by oxytocin was injected into pregnant mice. The researchers evaluated the effects of this blockage on the offspring, and showed that it reproduced the entire autism-like syndrome in them, both with respect to the electrical and behavioural aspects (identical to the two animal models of autism). As a result, the hormone's natural actions, just like those of the diuretic, are crucial to this delicate phase, and may control the pathogenesis of autism via the cellular chloride levels.

"These data validate our treatment strategy, and suggest that oxytocin, by acting on the chloride levels during delivery modulates/controls the expression of autism spectrum disorder," states Yehezkel Ben-Ari.

Taken together, these observations suggest that earliest possible treatment is essential for maximum possible prevention of the disorder.

This work raises the importance of carrying out early epidemiological studies in order to better understand the pathogenesis of the disorder, especially through analysing data on deliveries where a drop in chloride has occurred. Indeed, complicated deliveries with episodes of prolonged lack of oxygen, for example, or complications during pregnancy, such as viral infections, are often suggested as risk factors.

Finally, given the role of oxytocin in triggering labour, "although it is true that epidemiological data suggesting that scheduled caesarean deliveries may have increased the incidence of autism are controversial, it nonetheless remains that these studies should be followed up and extended in order to confirm or refute this relationship, which is still possible," insists Yehezkel Ben-Ari, who concludes, "To treat this type of disorder, it is necessary to understand how the brain develops and how genetic mutations and environmental insults modulate brain activity in utero."

http://www.eurekalert.org/pub_releases/2014-02/aha-ngf012914.php

New guidelines for reducing stroke risks unique to women

American Heart Association/American Stroke Association scientific statement

For the first time, guidelines have been developed for preventing stroke in women.

"If you are a woman, you share many of the same risk factors for stroke with men, but your risk is also influenced by hormones, reproductive health, pregnancy, childbirth and other sex-related factors," said Cheryl Bushnell, M.D., M.H.S., author of the new scientific statement published in the American Heart Association journal *Stroke*.

The guidelines outline stroke risks unique to women and provide scientifically-based recommendations on how best to treat them, including:

Women with a history of high blood pressure before pregnancy should be considered for low-dose aspirin and/or calcium supplement therapy to lower preeclampsia risks.

Women who have preeclampsia have twice the risk of stroke and a four-fold risk of high blood pressure later in life. Therefore, preeclampsia should be recognized as a risk factor well after pregnancy, and other risk factors such as smoking, high cholesterol, and obesity in these women should be treated early.

Pregnant women with moderately high blood pressure (150-159 mmHg/100-109 mmHg) may be considered for blood pressure medication, whereas expectant mothers with severe high blood pressure (160/110 mmHg or above) should be treated.

Women should be screened for high blood pressure before taking birth control pills because the combination raises stroke risks.

Women who have migraine headaches with aura should stop smoking to avoid higher stroke risks.

Women over age 75 should be screened for atrial fibrillation risks due to its link to higher stroke risk.

Preeclampsia and eclampsia are blood pressure disorders during pregnancy that cause major complications, including stroke during or after delivery, premature birth, and risk for stroke well after child-bearing.

Preeclampsia is characterized by high blood pressure and high protein levels in the urine, and when seizure also occurs, this is called eclampsia.

High blood pressure, migraine with aura, atrial fibrillation, diabetes, depression and emotional stress are stroke risk factors that tend to be stronger or more common in women than in men. More studies need to be done to develop a female-specific score to identify women at risk for stroke, said Bushnell, associate professor of neurology and director of the Stroke Center at Wake Forest Baptist Medical Center in Winston-Salem, N.C.

The guidelines are geared to primary care providers, including OBGYNs.

Co-authors are Louise McCullough, M.D., Ph.D.; Issam Awad, M.D., M.Sc.; Monique Chireau, M.D., M.P.H.; Wende Fedder, D.N.P., R.N.; Karen Furie, M.D., M.P.H.; Virginia Howard, Ph.D., M.S.P.H.; Judith Lichtman, Ph.D., M.P.H.; Lynda D. Lisabeth, Ph.D., M.P.H.; Ileana Piña, M.D., M.P.H.; Mathew Reeves, Ph.D., D.V.M.; Kathryn M. Rexrode, M.D., M.P.H.; Gustavo Saposnik, M.D., M.Sc.; Vineeta Singh, M.D.; Amytis Towfighi, M.D.; Viola Vaccarino, M.D., Ph.D.; and Matthew Walters, M.D., M.B.Ch.B., M.Sc.

http://www.eurekalert.org/pub_releases/2014-02/asfm-soc020614.php

Source of chlamydia reinfections may be GI tract

The current standard of care treatment for chlamydia sometimes fails to eradicate the disease, according to a review published ahead of print in *Infection and Immunity*, and the culprit may be in the gut.

Chlamydia trachomatis not only infects the reproductive tract, but abides persistently—though benignly—in the gastrointestinal tract. There it remains even after eradication from the genitals by the antibiotic, azithromycin, says first author Roger Rank, of the Arkansas Children's Research Institute, Little Rock. And that reservoir is likely a source of the all-too-common reinfections that follow treatment.

The source of the reinfections has long been a conundrum. Some are blamed on continued intercourse with an infected partner. This is not surprising since chlamydia is usually asymptomatic in men.

Chlamydiae have long been assumed often to persist within the genital tract in a non-replicating form, but Rank says there is no evidence for this. "While all agree that chlamydiae may persist in a patient for long periods of time, and that recurrent infections do develop, there has been no agreement on how and where and in what form chlamydiae persist," says Rank.

In a recent study, coauthor and Arkansas colleague Laxmi Yeruva showed in mice that azithromycin eradicated the genital infection, but not the GI infection.

Rank showed further—also in mice—that chlamydial infection of the GI does not elicit an inflammatory response, and never resolves, unlike in the genital tract.

"However, we found that GI infection does produce a strong immune response that can actually be effective against a genital infection, but that is unable to cure the GI infection," says Rank.

While chlamydial persistence in the GI tract has largely escaped notice of late, it was documented in the veterinary literature in numerous animals as early as the 1950s, says Rank. His reading of that early literature was a major factor motivating his and Yeruva's studies, and this review, Rank says.

Chlamydia trachomatis is the most common cause of sexually transmitted disease in the world. In the US, approximately 1.4 million cases occur annually, according to the Centers for Disease Control and Prevention. Adolescents are most affected, and 6.8 percent of sexually active females ages 14-19 become infected annually. *A copy of the manuscript can be found online at <http://bit.ly/asmtip0214b>. The final version of the article is scheduled for the April 2014 issue of Infection and Immunity.*

<http://phys.org/news/2014-02-dna-reveals-clues-mammoths-die.html>

DNA reveals new clues: Why did mammoths die out?

Why did mammoths and other large mammals of the tundra suddenly become extinct some 10,000 years ago?

It's a question that has divided scientists over the years. Now researchers from Lund University in Sweden (and 30 other research teams from 12 countries), have used new DNA technology to show that a drastic change in the dominant vegetation - from protein-rich herbs to less nutritious grass – could be behind their demise.

The extensive study has investigated what plants were dominant during the last 50,000 years in the Arctic land areas of northern Russia, Canada and Alaska. Although large areas were covered in ice 18,000 to 25,000 years ago, there were also ice-free areas in this Arctic region hosting the so-called mammoth steppe. On the cold, dry tundra, there were plenty of mammoth, woolly rhinoceros, steppe bison, horse and musk ox.

Most of these large mammal species, however, died out or disappeared from here about 10,000 years ago. Was it due to climate change, changes in the food base, some kind of disease, or had humans become such efficient hunters that they simply killed them off? The questions are many. In a quest for answers, a large number of researchers from a range of countries conducted a joint survey of vegetation composition, which is what mammoths and other large animals ate. One of the scientists involved is Lund University geology professor Per Möller.

"My role has been to oversee the collection of a large number of soil samples which are then analysed by biologists in laboratories", says Per Möller.

He recovered soil samples of different age during seven expeditions to Arctic Siberia, mainly the Taimyr Peninsula, spanning 16 years. The researchers then examined plant DNA residue in these samples and were able to get an overview of the various plant species that dominated the mammoth steppe.

The researchers also analysed the stomach contents of eight large mammal carcasses found preserved in the frozen ground. This showed in more detail what plants the animals preferred.

The conclusion is that the mammoth steppe was much more dominated by herbs than grass during the last ice age. This may have had an impact on large mammals. A herb-dominated diet is far more nutritious than a grass-dominated one. The study also shows that when the last ice age ended and the much more humid interglacial period began, the plant composition on the Arctic tundra changed.

"The herbs then became less dominant, and grass took over", says Per Möller.

The researchers believe the less nutritious food may have led to fewer animals surviving in the area. According to Per Möller it is conceivable that this process has been a major contributing factor to why many of the large mammals became extinct about 10,000 years ago.

So far, the scientific community has believed that the mammoth steppe was completely grass-dominated, an idea that was based on analyses of pollen in soil samples. However, the vegetation composition as shown by preserved DNA in the frozen soil gives quite a different picture; the new ability to analyse the plants' DNA residue is thus highly interesting to researchers, including Per Möller.

"We will have to re-evaluate a lot of old truths", he says of the new technology.

More information: www.nature.com/nature/journal/v506/n7486/full/nature12921.html

<http://www.bbc.co.uk/news/health-26075567>

Measles global deaths decline by 78%, WHO estimates

Global deaths from measles dropped 78% between 2000 and 2012, the World Health Organization estimates.

New figures from the WHO suggest that around 13.8 million deaths were prevented during this time and reported cases declined by 77%.

Good routine immunisation levels and campaigns to vaccinate children are thought to be behind the figures. But the WHO says measles is still a global threat and some populations remain unprotected. The mortality estimates from the WHO show that annual measles deaths decreased from more than 562,000 in 2000 to 122,000 in 2012. Reported cases of measles worldwide declined from 853,480 to 226,722 over the same time.

Currently, 84% of the world's infants receive the first dose of measles vaccine before their first birthday, according to the WHO. It says that 145 countries have also introduced a routine second dose of measles vaccine to ensure immunity and prevent outbreaks. Mass campaigns against measles in 2012 resulted in a further 145 million children being vaccinated against the disease, taking the total number of vaccinated children to more than one billion since 2000.

Threat continues

However, there are still concerns that despite this good news, measles remains a worldwide threat.

The regions of Africa, south-east Asia and Europe all experienced large outbreaks in 2012, and the Americas region had to deal with many imported measles cases. The Democratic Republic of Congo saw the largest measles outbreak of 2012, with 72,029 reported cases. There were around 18,000 cases in India and 12,000 in Ukraine, while the UK experienced just over 2,000 measles cases.

The WHO says the Africa, Eastern Mediterranean and European regions are not likely to meet their measles elimination targets on time. Without improved immunisation coverage, outbreaks will continue to occur, it says. Karen Mah, a spokeswoman for The Measles and Rubella Initiative, a global partnership led by the WHO and UNICEF among others, said there were still too many children dying.

"While estimated measles deaths have dropped significantly since 2000, there is much more work to be done as more than 330 deaths (mainly among children) still occur daily from measles.

"We need to move beyond an 84% global routine immunisation coverage. It's also vital that parents are fully aware of the benefits of immunisation and the risks associated with not vaccinating children," she added.

The Measles and Rubella Initiative wants to reduce measles deaths by 95% by 2015 and get rid of measles and rubella in at least five regions of the world by 2020.

<http://nyti.ms/1bfKj0D>

A Catalog of Cancer Genes That's Done, or Just a Start

Cancer is a disease of genes gone wrong. When certain genes mutate, they make cells behave in odd ways.

Carl Zimmer

The cells divide swiftly, they hide from the immune system that could kill them and they gain the nourishment they need to develop into tumors.

Scientists started identifying these cancer genes in the 1970s and their list slowly grew over the years. By studying them, scientists came to understand how different types of cancer develop and in some cases they were even able to develop gene-targeting drugs. Last May, for example, the Food and Drug Administration approved a drug known as Tarceva as a first-line treatment for lung cancer in which a gene called EGFR has mutated. The National Institutes of Health, hoping to speed up the identification of cancer genes, started an ambitious project in 2005 called the Cancer Genome Atlas. They analyzed 500 samples from each of over 20 types of cancer and found a wealth of new genes. The data have helped scientists discover more of the tricks cancer cells use to thrive at our expense.

"The Cancer Genome Atlas has been a spectacular success, there's no doubt about that," said Bruce Stillman, the president of Cold Spring Harbor Laboratory.

But now, as the Atlas project is coming to an end, researchers at the Broad Institute of M.I.T. and Harvard have published a study in the journal Nature that has scientists debating where cancer research should go next. They estimated that scientists would need to examine about 100,000 cancer samples — 10 times as many as the \$375 million Cancer Genome Atlas has gathered — to find most of the genes involved in 50 cancer types.

"We now know what it would take to get a complete catalog," said Eric S. Lander, the founding director of the Broad Institute and a co-author of the new study. "And we now know we're not close to done. We have a lot left to learn."

Traditionally, scientists have identified cancer genes by comparing healthy cells with cancerous ones. If they find a statistically unusually high number of cells with mutations in a particular gene, they can then examine it to see if it really does help drive cancer — or if it is just carrying a harmless mutation.

Dr. Lander and his colleagues suspected this method could miss some genes. While some cancer genes affect most cells of a given type of cancer, other genes are only involved in a fraction of them. (EGFR, the gene treated with Tarceva, is mutated in only about 10 percent of cases of nonsmall cell lung cancer.) Small samples of cancer cells might not contain the less common mutations.

The Broad researchers suspected that they could catch some of these missing genes by looking at several cancer types at once, because some genes are not limited to a single type of cancer.

For their new study, the scientists examined cancer samples from the Cancer Genome Atlas, as well as cancer samples from the Broad's own collection. All told, they analyzed 4,742 samples from 21 types of cancer.

The new study detected many of the genes that other scientists have previously linked to those 21 types of cancer. But they also found new genes that had been overlooked before. All told, they identified 33 genes that they consider strong candidates for playing a role in cancer — a potential increase of the catalog of cancer genes of 25 percent. “This was eye-opening to me,” said Dr. Lander.

Dr. Lander and his colleagues began to wonder how many genes could be found if scientists looked at more cancer samples. Was the cancer catalog almost finished, or only just begun?

“We were able to ask for the first time, ‘Are we there yet?’” said Dr. Lander.

They extrapolated from their own results to gauge how many more samples scientists would need to look at to find most cancer genes involved in at least 2 percent of cancers of a given type. To find most cancer genes involved in the 50 most common types of cancer, the researchers estimated that they would have to analyze 100,000 samples. In other words, the atlas has gotten us a tenth of the way to the finish line.

Dr. Harold Varmus, the director of the National Cancer Institute, said the study has raised valuable questions. “The paper provides some models about what we might think about doing next,” he said. He said the agency is now considering testing Dr. Lander’s hypothesis on a few types of cancer by gathering more samples.

Dr. Lander and his colleagues argue for finishing off the cancer gene catalog. “Completing the genomic analysis of this disease should be a biomedical imperative,” they wrote in their new paper.

In an interview, Dr. Lander said knowing most genes involved in cancer would be a powerful weapon against the disease. “How could we think of beating cancer in the long term without having the whole catalog?” he said. “It would be crazy not to have the information.”

But Dr. Stillman of Cold Spring Harbor Laboratory said completing the atlas has to be weighed against other needs. “Whether we need to know every cancer gene, I’d like to see an argument for how that’s going to help the advancement of new therapy,” he said.

For many researchers, the question comes down to whether extending the atlas project would be the best use of existing research funds. “There’s no question that it would be valuable. The question is whether it’s worth it,” said Dr. Bert Vogelstein, a Howard Hughes Medical Institute Investigator at Johns Hopkins University.

Some scientists say it might make more sense to study common cancer genes that have already been identified, instead of searching for relatively rare genes that might not turn out to be helpful in fighting cancer.

Also in question is who would pay for advancing the cancer catalog project. “We still don’t know how much money we’re going to have this year,” said Dr. Varmus of the National Cancer Institute’s budget. “We’re not going to set off tomorrow and do 100,000 complete genomes.”

Dr. Lander argued that the project could be done for a reasonable cost, and might also be supported by philanthropic organizations or international partners. In any case, he said, he welcomed a debate about when science will finish the cancer gene catalog. “If people say, ‘I would rather not know that for five years, or 10 years,’ that’s a reasonable argument,” said Dr. Lander. “But I would rather know that sooner.”

<http://www.newscientist.com/article/dn24857-nasas-revived-exoplanethunter-sees-its-first-world.html>

NASA's revived exoplanet-hunter sees its first world

It's alive! After suffering a critical injury last year, NASA's Kepler space telescope has just observed an exoplanet for the first time in months.

23:00 06 February 2014 by Lisa Grossman

The Jupiter-sized world is not a new discovery – it was found by another telescope – but spotting it again with Kepler is solid evidence that, following a few modifications, the famed planet-hunter is ready to get back to work.

Launched in 2009, Kepler was designed to see planetary transits – the tiny dips in starlight when a planet passes in front of its star, from Earth's perspective. Over four years the mission collected almost 250 confirmed planets and thousands more candidates, boosting our confidence that the galaxy is brimming with alien worlds.

But observations ground to a halt last year, when mechanical failures killed Kepler's precision steering system and ruined its ability to hold steady enough to see transits. At least, until now. At a meeting in November last year, the Kepler team announced the K2 mission, which would use the radiation pressure from sunlight to hold the craft steady for up to 75 days at a time.

During a test run in January, the K2 team nabbed their first planet: a previously identified gas giant called WASP-28b. Seeing a clear signal is verification that the Kepler's new mission concept will work as planned. "It's a lovely planet transit. If you were in this field you'd look at this and right away say, 'Oh, of course it's a planet!'" says project scientist Steve Howell. "It's very exciting."

Younger quarry

WASP-28b is about the size of Jupiter and is in a very tight orbit around its star, with a year that lasts just 3.4 Earth days. Unfortunately, K2 will not be able to carry on with Kepler's original quest to find habitable Earth-

sized planets around sun-like stars. To confirm that a planet is real, Kepler needed to see it transit three times, meaning true Earth twins would take about three years to confirm. The modified space telescope won't be able to maintain its lock on a star for that long.

But the K2 mission will be able to collect data on very young stars and search for planets or planet-forming discs around them. "This will be a window into both star formation and planet formation," says Howell. For now K2 is operating on funding reserves from the main Kepler mission, and the team is waiting on approval for NASA funding for another two years. That decision is expected by the end of May. In the meantime, the team is ploughing ahead. The first official science campaign will start on 1 March – and the team has already received requests to observe 110,000 target stars. "For us that's great news, not because we can do all of that, but because it's a sign of the interest of the community," says Howell.

<http://nyti.ms/1likX2Z>

As Seen on TV, a Medical Mystery Involving Hip Implants Is Solved

By a strange coincidence, two leading medical journals on Thursday published case studies of the same arcane medical mystery.

By GINA KOLATA FEB. 6, 2014

In one, doctors solved the riddle only after the patient, a middle-aged woman, got so sick she had to have a heart transplant. But in the other, a physician who teaches at the University of Marburg in Germany found the clues in Season 7, Episode 11, of the Fox television show "House."

It turned out that Dr. Gregory House, the cantankerous, fictional diagnostician modeled on Sherlock Holmes, had used his powers of deduction to diagnose the very same ailment in a woman played by the actress Candice Bergen on an episode that first aired in 2011.

In this case of life imitating art — or at least television — a paper in The Lancet, a London-based medical publication, described how an ailing man in Germany had gone from doctor to doctor, seeking a diagnosis as his condition worsened.

His problems began about three years ago. He had low thyroid hormone levels, inflammation of his esophagus and fever of unknown origin. His loss of vision was so profound he was almost blind, and his loss of hearing so severe he was almost deaf. Most perilous of all, his heart had weakened so much it could not pump hard enough to supply blood to his body. Heart failure usually follows coronary artery disease, but this man's arteries were fine. Doctor after doctor was stumped.

Finally, in May 2012, the man, then 55, arrived at a University of Marburg clinic run by Dr. Juergen R. Schaefer, who specializes in puzzling cases and happens to be a major fan of "House." In fact, Dr. Schaefer uses "House" in teaching medicine, and he realized his patient's symptoms were eerily similar to those of Ms. Bergen's character on the show. In that episode, she, too, had heart failure. Dr. House's diagnosis: cobalt poisoning from her artificial metal hip.

Dr. Schaefer's patient had had an artificial ceramic hip that failed, and it was replaced with a metal one in November 2010, shortly before his symptoms began. So Dr. Schaefer tested the man's cobalt level and discovered it was a thousand times the level considered normal.

A scan showed the metal in his hip was eroded. The reason, Dr. Schaefer speculated, was that when the man's doctor removed the broken ceramic hip, he inadvertently left behind tiny particles of ceramic. Those particles, Dr. Schaefer said, acted like sandpaper: "You destroy the metal part with each movement."

The man had his metal hip replaced with another ceramic one, after which his cobalt level plunged. His heart function improved, but he still needed a defibrillator implanted. His fever and esophagus problems went away. But his hearing and eyesight barely got any better.

Needless to say, the doctors in the other case, published in The New England Journal of Medicine, had not seen that episode of "House."

The patient, a woman in Denver who asked not to be named to protect her privacy, said she began feeling ill on a vacation in Hawaii a few years ago. "I was tired all the time," she said. When she returned from her travels, she discovered she had gained 10 pounds on her 4-foot-10, 95-pound frame, for no apparent reason. Her abdomen was swollen, as were her arms and legs.

Her doctor ordered a CT scan, which showed fluid accumulating around her heart. He drained the fluid, but she still felt ill. Normally, someone with such a condition, cardiomyopathy, has an enlarged heart, but hers was a normal size. "It was kind of a puzzle to my first cardiologist," she said.

By 2011, her heart was failing. She went to the Anschutz Medical Campus of the University of Colorado, Denver, where her doctor, Larry A. Allen, a heart failure and transplant specialist, confessed he was baffled. "We did a work-up looking at possible causes and even rare causes," he said. "Nothing showed up."

On Sept. 10, 2011, she underwent a heart transplant.

Sometime later, the orthopedist who had replaced her hips with metal implants took some routine blood tests and found something curious. Her cobalt level was more than 300 times normal. Cobalt poisoning can seriously damage organs, particularly the heart. The cause of her problems was suddenly clear.

About a year after her heart transplant, she had both artificial hips replaced with ones that had a polyethylene liner. Her postoperative course was rocky, but her cobalt level declined.

“I have much of my old energy back,” she said in an interview.

In their article describing the case, Dr. Allen and his colleagues wrote that cobalt poisoning was first described in the 1960s in people who had been drinking beer that had foam stabilizers that contained cobalt.

But its link to metal-on-metal hip implants leaves questions, they said. Their patient had nothing obviously wrong with her prosthetic hips. And, Dr. Allen said, “literally tens of thousands of people had these hips without her problems.”

But Dr. Allen said the patient’s case was a good reminder. However rare cobalt poisoning might be, it is something to consider when people with metal-on-metal hip implants have symptoms suggestive of it.

And, yes, he said, maybe if he had just seen Dr. House in action he would have considered it.

“Unfortunately,” he said, “I have seen about two half-episodes of ‘House.’ ”

<http://nyti.ms/1IPAbjG>

Uterine Surgical Technique Is Linked to Abnormal Growths and Cancer Spread

Concerns are increasing among doctors about the safety of a procedure performed on tens of thousands of women a year in the United States who undergo surgery to remove fibroid tumors from the uterus, or to remove the entire uterus.

By DENISE GRADY FEB. 6, 2014

The procedure, morcellation, cuts tissue into pieces that can be pulled out through tiny incisions. The technique is part of minimally invasive surgery, which avoids big incisions, shortens recovery time and reduces the risks of blood loss, infection and other complications.

Surgeons can perform morcellation by hand with a knife, or with an electrical device that has a rapidly spinning blade. But problems have emerged with the procedure, most likely from the power device, according to two articles published on Thursday in The Journal of the American Medical Association. The technique can spray bits of uterine tissue or fibroids around inside the abdomen like seeds. Even benign tissue (fibroids are benign) can take hold and grow on organs where it does not belong, causing pain, infection or bowel obstruction.

In a few cases, a rare and hard-to-diagnose uterine tumor called a sarcoma was hidden in the uterus or mistaken for a fibroid, and morcellation apparently spread cancer cells through the patient’s abdomen. Advanced cancer followed. The blades on power morcellators have also injured abdominal organs and blood vessels.

According to the American College of Obstetricians and Gynecologists, about 498,000 women in the United States had hysterectomies to remove the uterus in 2010, and about 11 percent of those operations involved morcellation.

Dr. Kimberly Kho, an author of one of the journal articles and an assistant professor of obstetrics and gynecology at the University of Texas Southwestern Medical Center, said that she and a colleague became concerned several years ago when they began seeing patients with abdominal problems following morcellation of fibroids or the uterus by other surgeons. The women needed additional surgery to remove lumps of uterine tissue or fibroids that were growing on the liver, appendix or bladder. Some had multiple growths sprouting inside the abdomen. The true incidence of these problems after morcellation is not known, but a case in Boston, reported in December by The Wall Street Journal, has drawn considerable attention to the cancer risk.

In that case, a patient who had morcellation to remove fibroids was later found to have advanced cancer, apparently from a hidden sarcoma that might have been spread by the procedure. These uterine sarcomas are rare and are often not diagnosed until after the surgery is done and the tissue is analyzed by a pathologist.

The patient and her husband are both doctors, and have been trying to persuade surgeons to stop using morcellation. But Dr. Kho said she did not think the technique should be banned, because minimally invasive surgery has so many benefits for patients.

“I do think, however, that we could be more prudent and conservative with whom we use these instruments on and more systematic about preoperative evaluation to prevent morcellating detectable cancers,” she said.

One approach that she and other doctors favor involves enclosing the tissue that is to be removed in a bag and then morcellating it inside the bag, to keep the tissue from being dispersed. That technique, known as closed morcellation, is already used by other types of surgeons, said Dr. Robert Barbieri, the chairman of obstetrics and gynecology at Brigham and Women’s Hospital in Boston. But he said few gynecologists know how to perform it, and it takes months to learn.

In the meantime, Dr. Barbieri said, doctors at his hospital are discussing the procedure's risks with patients. They estimate that in one in 1,000 cases, a woman with fibroids will have a hidden sarcoma, but say the risk could be as high as 1 in 400. Some women, he said, have already heard about the issue and say, "Hey, that morcellation thing, I don't want that." And they prefer open surgery in which the tissue is removed intact. But other women think the risk estimate is not so bad, dread the larger incision and want to get back to work quickly. "I don't think this is the end of the story," Dr. Barbieri said. "I think we'll develop technology that will use closed morcellation."

<http://phys.org/news/2014-02-storm-periodicity-southern-oceans.html>

Researchers find storm periodicity in southern oceans

Storms in the Southern Hemisphere tend to occur on a 20 to 30 day periodic basis

Phys.org - A pair of researchers with the Department of Atmospheric Science at Colorado State University has found that storms in the Southern Hemisphere tend to occur on a 20 to 30 day periodic basis. In their paper published in the journal *Science*, David Thompson and Elizabeth Barnes describe how they analyzed thirty years of atmospheric data and used it to create a weather model that revealed the periodic behavior of weather patterns in the Southern Hemisphere.

Future weather conditions are hard to predict due in part to their seemingly random nature, but one part of the world may not be as random as has thought. In this new effort, the research duo pulled out atmospheric data (from balloons, surface temperature readings and satellite observations) relevant to southern hemispheric oceans, covering the past thirty years. In so doing, they focused primarily on circulation of large atmospheric events in the middle latitudes over the southern oceans. That led them to the discovery of a near rhythmic flow of heat as it was carried from the tropical regions into the colder mid-latitudes. That flow, they noted, tended to cause an imbalance in atmospheric conditions that led to the development of storms. It happens, they report, over and over, with storms occurring roughly every 20 to 30 days.

Atmospheric scientists have long known about tropic based circulation patterns—so well-known are they that some of them have names, such as the Quasi-Biennial or Madden-Julian Oscillation. What's surprising is that such circulation patterns are apparently indirectly impacting weather patterns in the mid-latitudes in the south—so much so that the weather there has become periodic as a result. At least as startling, perhaps, is that no one until now has noticed this weather system—at least not in the scientific community—*anecdotal evidence suggests sailors have known about it for years.*

The team used what they had learned to build a computer model to simulate the conditions that were evident in the data record and found the same result, which they suggest means that storms really do follow a periodic pattern in the oceanic part of the Southern Hemisphere—a finding that could prove invaluable for weather forecasters in South America, Africa, Australia or even Antarctica.

More information: Periodic Variability in the Large-Scale Southern Hemisphere Atmospheric Circulation, Science 7 February 2014: Vol. 343 no. 6171 pp. 641-645. DOI: 10.1126/science.1247660

Abstract

Periodic behavior in the climate system has important implications not only for weather prediction but also for understanding and interpreting the physical processes that drive climate variability. Here we demonstrate that the large-scale Southern Hemisphere atmospheric circulation exhibits marked periodicity on time scales of approximately 20 to 30 days. The periodicity is tied to the Southern Hemisphere baroclinic annular mode and emerges in hemispheric-scale averages of the eddy fluxes of heat, the eddy kinetic energy, and precipitation. Observational and theoretical analyses suggest that the oscillation results from feedbacks between the extratropical baroclinicity, the wave fluxes of heat, and radiative damping. The oscillation plays a potentially profound role in driving large-scale climate variability throughout much of the mid-latitude Southern Hemisphere.

http://www.eurekalert.org/pub_releases/2014-02/asu-afv020614.php

Avian flu variant stalks Egypt

Since its first identification in Asia, highly pathogenic avian influenza-H5N1-has caused significant alarm in the scientific community.

Richard Harth - The Biodesign Institute

While the virus' primary target is birds—tens of millions have already died from it—it is capable of infecting mammals, including humans, causing serious illness and a frightening rate of mortality.

In a new study, Matthew Scotch, a researcher at Arizona State University's Biodesign Institute, tracks the spread of an H5N1 variant in Egypt—a country recently identified as a major epicenter for the virus. In results recently appearing in the journal *BMC Genomics*, Scotch tracks the spread of H5N1 cases using a technique known as phylogeography.

The authors hope that studies of this kind will significantly enhance efforts by public health officials to identify viral outbreaks, limit their spread, coordinate vaccination efforts, reduce mortality and better inform the public of risks.

"Egypt represents an epicenter for H5N1 and there are new variants that have emerged since it was first discovered there in 2006," Scotch says. "We used phylogeography and influenza genome sequences to model diffusion and evolution of the virus."

Phylogeography was born out of the fields of biogeography and phylogenetics or molecular evolution. By combining viral sequence data and geographical information over time, as well as evaluating features associated with viral carriers, researchers can better understand how viruses spread across a landscape through animal and human populations.

Phylogeography has already been established as a powerful technique for investigating viral dispersal for human diseases, including dengue fever, rabies, influenza and HIV. Recent application of phylogeographic methods to the study of avian influenza promises to significantly improve fine-grained mapping of viral origin and spread.

Avian flu H5N1 is a form of influenza A—an RNA virus—first identified in Hong Kong in 1997. The initial cases of H5N1 were apparently not transmitted efficiently among birds. In 2002 however, new isolates of H5N1 appeared, causing acute disease in ducks, resulting in neurological dysfunction and death.

Infected birds transmit H5N1 to one another through nasal secretions, saliva, feces and blood. Other animals, including humans, may become infected with the virus through direct contact with avian bodily fluids or through contaminated surfaces.

Human cases of H5N1 often result from contact with infected poultry, particularly in live bird markets and farms, which are believed to be major reservoirs for the virus. Avian H5N1 however, is also carried by migratory species of birds, which further spread H5N1 to other parts of the world.

In 2004, researchers discovered that H5N1 is a more potent pathogen than originally assumed, attacking waterfowl, chickens, crows, pigeons and ducks, as well as mammals, yielding a high mortality rate. Avian flu is now considered a significant global health threat, with the very real prospect of an international pandemic, causing widespread fatality.

Indeed, the mortality rate in humans contracting H5N1 has been estimated to be around 60 percent, making it more lethal for infected individuals than Spanish influenza—a genetically similar strain that killed 50-100 million people worldwide during the pandemic of 1918.

Currently, H5N1 is not highly transmissible to humans from birds and has a very low rate of human-to-human transmission, (though around a half dozen cases have been reported). Should a small number of mutations render H5N1 more easily transmissible among humans, the conditions for a deadly pandemic will have been met.

In addition to mutations, mixed forms of influenza virus—known as reassortant strains—can occur when a single individual is infected with two versions of a given virus and they exchange genes. An H5N1 reassortant could render avian influenza readily transmissible between human hosts.

In the new study, a particular variant of H5N1, labeled 2.2.1.1, was observed in Egypt. There, avian flu has already killed thousands of birds and caused 173 human cases, of which 63 have been fatal as of December 10th, 2013, according to the World Health Organization. These are the highest case numbers for H5N1 outside of Asia. As in the case of Asian H5N1, experts associate most human infections in Egypt with exposure to diseased poultry, particularly at live bird markets.

In their attempts to identify the origin and spread of the virus in Egypt, researchers made use of a new software platform created by Professor Scotch. Known as ZooPhy, the program enables the phylogeographic analysis of H5N1 spread. (Maps of viral spread made with ZooPhy may be seen in the accompanying video below.)

The avian influenza virus H5N1 takes its name from two kinds of spikes adorning the viral surface, hemagglutinin (HA) and neuraminidase (NA). Influenza viruses of Type A or Type B use hemagglutinin to attach to cell surface receptors, allowing viral infection of the cell. Neuraminidase later acts to remove these receptors from infected cells, allowing newly synthesized viruses particles to escape and infect other cells. (There are 17 different types of hemagglutinin, from H1 to H17 and nine different types of neuraminidase, from N1 to N9 among influenza A viruses. Each virus has one type of H (such as H5) and one type of N (such as N1).)

Through the analysis of 226 HA and 92 NA sequences, Scotch and his colleagues used a phylogeographic approach to trace the preponderance and transmission routes of H5N1 in Egypt. Phylogeography is a particularly fruitful approach for animal-to-human (or zoonotic) RNA viruses, due to short genomic sequences and rapid rates of evolution.

The group's findings revealed a geographic spread of the 2.2.1.1 viral form of H5N1 across Egypt's four primary areas: Cairo, Nile Delta, Canal and Upper Egypt. Statistical analysis suggests the northern governorate of Ash Sharqiyah as the point of origin for the spread of H5N1, however, the mathematical association is too weak to claim certainty. Analysis also implied that the strongest transmission routes for H5N1 were from Ash Sharqiyah to Al Gharbiyah and Al Fayyum to Al Qalyubiyah.

Most of the identified routes of transmission appeared in the densely populated Delta region of Egypt. The Al Qalyubiyah governorate in particular appears to be a popular area for viral transition, though dispersion to and from this region remains uncertain, requiring further research. The study also noted considerable viral diversity over a limited time frame—perhaps an evasive response to a country-wide poultry vaccination program.

"This has significant public health implications for the rest of the world," Scotch says. "It is important to focus on variant clades in order to better understand how this virus has evolved and which governorates are propagating its spread."

The authors are further developing the ZooPhy software's graphical interface. The tool requires no specialized knowledge of phylogeography or bioinformatics, making it convenient for field use by public health officials. By zeroing in on trade routes, migration patterns and highways of viral transmission, health authorities can conserve limited resources, applying them where they can be most effective.

http://www.eurekalert.org/pub_releases/2014-02/vt-sip020614.php

Substance in photosynthesis was at work in ancient, methane-producing microbes

Discovery may shed light on climate change, agriculture, human health

An international team of researchers led by scientists at Virginia Tech and the University of California, Berkeley has discovered that a process that turns on photosynthesis in plants likely developed on Earth in ancient microbes 2.5 billion years ago, long before oxygen became available.

The research offers new perspective on evolutionary biology, microbiology, and the production of natural gas, and may shed light on climate change, agriculture, and human health.

"By looking at this one mechanism that was not previously studied, we will be able to develop new basic information that potentially has broad impact on contemporary issues ranging from climate change to obesity," said Biswarup Mukhopadhyay, an associate professor of biochemistry at the Virginia Tech College of Agriculture and Life Sciences, and the senior author of the study. He is also a faculty member at the Virginia Bioinformatics Institute. Plant and microbial biology professor emeritus Bob B. Buchanan co-led the research and co-authored the paper. The findings were described this week in an early online edition of the Proceedings of the National Academy of Sciences.

This research concerns methane-forming archaea, a group of microbes known as methanogens, which live in areas where oxygen is absent. Methane is the main component of natural gas and a potent greenhouse gas.

"This innovative work demonstrates the importance of a new global regulatory system in methanogens," said William Whitman, a professor of microbiology at the University of Georgia who is familiar with the study, but not connected to it. "Understanding this system will provide the tools to use these economically important microorganisms better."

Methanogens play a key role in carbon cycling. When plants die, some of their biomass is trapped in areas that are devoid of oxygen, such as the bottom of lakes. Methanogens help convert the residual biological material to methane, which other organisms convert to carbon dioxide — a product that can be used by plants.

This natural process for producing methane forms the basis for treating municipal and industrial wastes, helps reduce pollution, and provides methane for fuel. The same process allows natural gas production from agricultural residues, a renewable resource.

Methanogens also play an important role in agriculture and human health. They live in the digestive systems of cattle and sheep where they facilitate the digestion of feed consumed in the diet. Efforts to control methanogens in specific ways may improve feed utilization and enhance the production of meat and milk, researchers say.

Methanogens are additionally a factor in human nutrition. The organisms live in the large intestine, where they enhance the breakdown of food. Some have proposed that restricting this activity of methanogens could help alleviate obesity.

The team investigated an ancient type of methanogen, *Methanocaldococcus jannaschii*, which lives in deep-sea hydrothermal vents or volcanoes where environmental conditions mimic those that existed on the early Earth.

They found that the protein thioredoxin, which plays a major role in contemporary photosynthesis, could repair many of the organism's proteins damaged by oxygen. Since methanogens developed before oxygen appeared on earth, the evidence raises the possibility that thioredoxin-based metabolic regulation could have come into play for managing anaerobic life long before the advent of oxygen.

"It is rewarding to see that our decades of research on thioredoxin and photosynthesis are contributing to understanding the ancient process of methane formation," Buchanan said. "It is an excellent illustration of how a process that proved successful early in evolution has been retained in the development of highly complex forms of life."

Dwi Susanti, the lead author, recently received her doctoral degree in genetics, bioinformatics and computational biology from the Virginia Bioinformatics Institute, and is currently a postdoctoral scholar in the Department of Biochemistry at Virginia Tech.

Usha Loganathan, a graduate student in the Department of Biological Sciences in the College of Science at Virginia Tech, also participated in the study. William H. Vensel of the Western Regional Research Center in Albany, Calif., provided proteomics expertise as did Joshua Wong of University of California, Berkeley. Rebecca De Santis and Ruth Schmitz-Streit of University of Kiel in Germany, and Monica Balsera of the Institute of Natural Resources and Agrobiolology of Salamanca in Spain also worked on the project

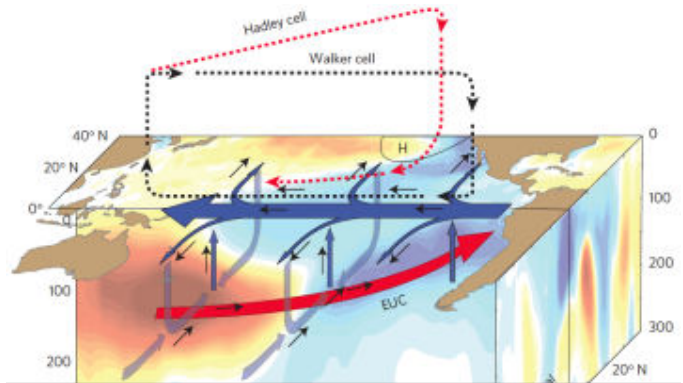
<http://phys.org/news/2014-02-pacific-stall-global-surface-warmingfor.html>

Pacific trade winds stall global surface warming—for now

Heat stored in the western Pacific Ocean caused by an unprecedented strengthening of the equatorial trade winds appears to be largely responsible for the hiatus in surface warming observed over the past 13 years.

New research published today in the journal *Nature Climate Change* indicates that the dramatic acceleration in winds has invigorated the circulation of the Pacific Ocean, causing more heat to be taken out of the atmosphere and transferred into the subsurface ocean, while bringing cooler waters to the surface.

"Scientists have long suspected that extra ocean heat uptake has slowed the rise of global average temperatures, but the mechanism behind the hiatus remained unclear" said Professor Matthew England, lead author of the study and a Chief Investigator at the ARC Centre of Excellence for Climate System Science.



This is a schematic of the trends in temperature and ocean-atmosphere circulation in the Pacific over the past two decades. Color shading shows observed temperature trends (C per decade) during 1992-2011 at the sea surface (Northern Hemisphere only), zonally averaged in the latitude-depth sense (as per Supplementary Fig. 6) and along the equatorial Pacific in the longitude-depth plane (averaged between 5°N S). Peak warming in the western Pacific thermocline is 2.0 C per decade in the reanalysis data and 2.2 C per decade in the model. The mean and anomalous circulation in the Pacific Ocean is shown by bold and thin arrows, respectively, indicating an overall acceleration of the Pacific Ocean shallow overturning cells, the equatorial surface currents and the Equatorial Undercurrent (EUC). The accelerated atmospheric circulation in the Pacific is indicated by the dashed arrows; including the Walker cell (black dashed) and the Hadley cell (red dashed; Northern Hemisphere only). Anomalous high SLP in the North Pacific is indicated by the symbol "H." An equivalent accelerated Hadley cell in the Southern Hemisphere is omitted for clarity. Credit: Nature Climate Change

"But the heat uptake is by no means permanent: when the trade wind strength returns to normal - as it inevitably will - our research suggests heat will quickly accumulate in the atmosphere. So global temperatures look set to rise rapidly out of the hiatus, returning to the levels projected within as little as a decade."

The strengthening of the Pacific trade winds began during the 1990s and continues today. Previously, no climate models have incorporated a trade wind strengthening of the magnitude observed, and these models failed to capture the hiatus in warming. Once the trade winds were added by the researchers, the global average temperatures very closely resembled the observations during the hiatus.

"The winds lead to extra ocean heat uptake, which stalled warming of the atmosphere. Accounting for this wind intensification in model projections produces a hiatus in global warming that is in striking agreement with observations," Prof England said. "Unfortunately, however, when the hiatus ends, global warming looks set to be rapid." The impact of the trade winds on global average temperatures is caused by the winds forcing heat to accumulate below surface of the Western Pacific Ocean.

"This pumping of heat into the ocean is not very deep, however, and once the winds abate, heat is returned rapidly to the atmosphere" England explains. "Climate scientists have long understood that global average temperatures don't rise in a continual upward trajectory, instead warming in a series of abrupt steps in between periods with more-or-less steady temperatures. Our work helps explain how this occurs," said Prof England. "We should be very clear: the current hiatus offers no comfort - we are just seeing another pause in warming before the next inevitable rise in global temperatures." *More information: Paper: [dx.doi.org/10.1038/nclimate2106](https://doi.org/10.1038/nclimate2106)*