http://www.pasthorizonspr.com/index.php/archives/07/2011/the-origins-of-archery-in-africa

The origins of archery in Africa

Arrows were dated to at least 64,000 years old, and were discovered not in Europe, but in South Africa.

It is well understood that projectile weapons allow lethal killing power at a safe distance and their use is near universal among human groups. Before the firearm began it's rise to prominence over the last 500 years the most popular projectile weapons systems were the atlatl (spearthrower/dart) and the bow and arrow.

Most researchers consider these as ''true'' projectile technologies, distinguishing them from thrown spears, throwing sticks and other hurled weapons. There is considerable archaeological consensus that projectile weapons were in use by the Late Palaeolithic at least 30,000 years ago. However, last year, anthropologist Marlize Lombard of South Africa's University of Johannesburg and her colleagues, reported in the journal Antiquity, that arrows were dated to at least 64,000 years old, and were discovered not in Europe, but in South Africa. This was based on a single bloodstained quartz arrowhead recovered from the the Sibudu Cave site.

In the new Journal of Archaeological Science study, Lombard reports more arrowheads and more evidence to push back the age of the bow and arrow. This adds more weight to a bone point, that could have been an arrow tip that was also excavated from the same site and published in 2008 by Lucinda Backwell and colleagues from the University of the Witwatersrand.

The real importance of these finds is what it represents in terms of cognitive archaeology. The concepts of complex thought that are required and the methodology of thought may provide further clues into the minds of our distant ancestors and what prepared them for their spread across the globe. "Although the existence of bow and arrow technology (more than 60,000 years ago) may have far-reaching consequences for hypotheses about human behavioural evolution and adaptation, it is by no means easy to establish," Lombard says at the beginning of her study which looks in microscopic detail at 16 quartz blades.

Howieson's Poort stone tools with sharp cutting edges and blunted back edges (left panel) which were fixed (hafted) to make hunting weapons (right panel). Photo credit: M.Lombard

Her study concludes that some of these hafted points might have been launched from bows. While "most attributes such as micro-residue distribution patterns and micro-wear will develop similarly on points used to tip spears, darts or arrows" and "explicit tests for distinctions between thrown spears and projected arrows have not yet been conducted" the researchers find "contextual support" for the use of these points on arrows: a broad range of animals were hunted, with an emphasis on taxa that prefer closed forested niches, including fast moving, terrestrial and arboreal animals which would be difficult to hunt with anything other than an bow and arrow.

Expanding further, this is also an argument for the use of traps, including snares with the associated comprehension for the use of cords and knots which would also have been adequate for the production of bows. The employment of snares would also demonstrate a practical understanding of the latent energy stored in bent branches, the main principle of bow construction.

Despite a body of literature focusing on the functionality of modern and stylistically distinct projectile points, comparatively little attention has been paid to quantifying the functionality of the early stages of projectile use. Previous work identified a simple ballistics measure, the Tip Cross-Sectional Area, as a way of determining if a given class of stone points could have served as effective projectile.

The new study adds an alternate measure, the Tip Cross-Sectional Perimeter, a more accurate proxy of the force needed to penetrate a target to a lethal depth. The current study discusses this measure and uses it to analyse a collection of measurements from African Middle Stone Age pointed stone artefacts. Several point types that were rejected in previous studies are statistically indistinguishable from ethnographic projectile points using this new measure.

The researchers wrote in their paper: "Hunting with a bow and arrow requires intricate multi-staged planning, material collection and tool preparation and implies a range of innovative social and communication skills."

Dr Lombard explained that her ultimate aim was to answer the “big question”: When did we start to think in the same way that we do now?

http://www.newscientist.com/blogs/shortsharpscience/2011/07/why-global-temperatures-held-s.html

Why global temperatures held steady for 10 years

Michael Marshall, environment reporter

Global warming temporarily ground to a halt over the last 10 years, thanks to increased pollution from China, the El Niño system in the Pacific, and a slight drop in the energy Earth gets from the sun.

"Global warming stopped in 1998" is one of the most common reasons people offer for not believing in climate change. It certainly looks like a problem for anyone claiming that humanity's greenhouse gas emissions are warming the planet: after all, we kept on pumping out carbon dioxide faster than ever, yet nothing happened to the temperature.

But according to the new analysis, various short-term factors can account for the slowdown. Most of those variables are going to change direction soon. So the halt in warming may be only temporary.

To find out if the slowdown could be explained, Robert Kaufmann of Boston University in Massachusetts and colleagues used a statistical model of the climate. They took data collected between 1998 and 2008 on several factors that can affect the climate, including greenhouse gas emissions, incoming radiation from the sun, and sulphur pollution from burning coal and other industrial activities. Then they plugged the information into their model, ran it for the 1998-2008 period, and asked: does it replicate what global temperatures actually did?

The short answer is yes. In the model, global temperatures held steady, showing no significant rise over the study period. A major reason for this is the rise in coal use in China. This produces a lot of sulphur particles, which cool the global climate. This more-or-less cancelled out the warming effect of the greenhouse gas emissions. That shouldn't come as a surprise. It's well-established that aerosol particles can have a major impact on the climate. In south-east Asia, particularly China and India, there is often a "brown haze" of pollution that has an overall cooling effect on the planet.

With the two human-produced effects cancelling each other out, natural variation in the climate took hold. As it happened, two of the natural trends were towards cooling. The first was the El Niño Southern Oscillation (ENSO), a cyclic change in the behaviour of the Pacific Ocean. 1998 saw the system in an extreme state, so the Pacific dumped a lot of heat into the atmosphere and surface temperatures spiked as a result. Since then ENSO has gone in the other direction, so the Pacific has taken heat from the atmosphere.

And the second shift came from the sun, which goes through a regular 11-year cycle of changing activity. From a peak in 2000, solar activity fell steadily to a low in 2007, so it sent less radiation our way.

It's possible - though by no means certain - that the sun will stay quiet for the next few decades. Unfortunately any cooling effect is likely to be small, and would stop as soon as the sun perked up again.

But while the sun might keep putting the brakes on global warming - slightly - the other variables won't be so obliging. ENSO will swing back in the other direction and warm the surface again. And China is planning to cut the pollution from its coal power plants, because it is so harmful to human health. So there are two key messages we can take from the research. The first is that the brief halt in global warming doesn't necessarily mean there's a problem with climate science: known factors can account for it. And the second is that the reprieve may be only temporary.

http://www.eurekalert.org/pub_releases/2011-07/uom-ave070511.php

Australian volcano eruptions overdue, new study confirms

Latest research into the age of volcanos in Western Victoria and South Australia has confirmed that the regions are overdue for an eruption, potentially affecting thousands of local residents.

Using the latest dating techniques, scientists from the University of Melbourne's School of Earth Sciences and the Melbourne School of Engineering have calculated the ages of the small volcanoes in the regions and established the recurrence rate for eruptions as 2,000 years. With the last volcano eruption at Mt Gambier in South Australia occurring over 5,000 years ago, scientists say the areas are overdue.

The research was presented today by Professor Bernie Joyce of the University of Melbourne's School of Earth Sciences at the XXV International Congress of Geodesy and Geophysics, in Melbourne.

"Although the volcanoes in the region don't erupt on a regular sequence, the likelihood of an eruption is high given the average gap in the past has been 2,000 years," Professor Joyce said. "These are small eruptions and very localised but depending on the type of eruption, they could cause devastation to thousands of people," he said.

The regions of Western Victoria and adjacent south-eastern South Australia demonstrate a history of activity by young monogenetic (single short-lived activity) volcanoes. Similar young monogenetic provinces are found in northeast Queensland.

Professor Joyce and his colleagues from the University's School of Earth Sciences have spent years cataloguing the hundreds of small volcanic cones, lava flows and craters in the regions. The distribution of activity including lava flows and ash deposits has been mapped in detail. The latest findings are due to more recent studies using a range of state of the art dating techniques, which have provided more information on the ages of the individual volcanoes, providing information about the occurrence rates.

Professor Joyce said there are several kinds of eruptions which can cause damage and harm to local communities. "Among the hazards which may need to be prepared for in this closely-settled region are the localised effects of cone building leading to lava flows which run downhill towards the coast.'

"The long lasting and often extensive lava flows can travel for tens of kilometres, and so would be hazardous to modern infrastructure such as bridges, roads and railways, powerlines and pipelines, as well as being a major fire hazard on the dry grassland plains of summer in Western Victoria. In some cases rising magma can meet ground water and cause steam explosions. This can form wide craters and produce a lot of ash."

"Depending on where the eruption occurs, ash can cause huge damage to people who are down wind, clogging up streams, road and rail transport and perhaps affecting local air travel," he said.

The cause of the volcanic activity may be the movement of the Australian tectonic plate, which is moving north. "The plate is hitting up against PNG, lifting the southern margin upwards. This allows magma to move upwards towards the surface," Professor Joyce said.

Professor Joyce said communities need to have some knowledge of what to do after an eruption.

"So far we have no action plans in place if eruptions occur. If they happen close to Melbourne or Geelong it could be hugely devastating. It is more likely however, that eruptions would occur further west, closer to areas such as Colac, Port Fairy, Portland and Mt Gambier." "We need to note the concerns of other cities such as Auckland in New Zealand which sits on a similar young volcanic region, with a local government which has plans in place to respond if eruptions occur," he said.

http://www.eurekalert.org/pub_releases/2011-07/uow-rbg070111.php

Rose-colored beer goggles: Social benefits of heavy drinking outweigh harms

A study by University of Washington psychologists shows some people continue to drink heavily because of perceived positive effects, despite experiencing negative effects such as hangovers, fights and regrettable sexual situations.

According to participants in the study, boosts of courage, chattiness and other social benefits of drinking outweigh its harms, which they generally did not consider as strong deterrents. The findings offer a new direction for programs targeting binge drinking, which tend to limit their focus to avoiding alcohol's ill effects rather than considering its rewards.

"This study suggest why some people can experience a lot of bad consequences of drinking but not change their behavior," said Kevin King, co-author and UW assistant professor of psychology. "People think, 'It's not going to happen to me' or 'I'll never drink that much again.' They do not seem to associate their own heavy drinking with negative consequences," he said. The paper was published online May 30 in Psychology of Addictive Behaviors.

Nearly 500 college students completed an online survey measuring their drinking habits during the previous year. The survey assessed how often the participants had experienced 35 different negative consequences of drinking, such as blackouts, fights, hangovers, missed classes and work, and lost or stolen belongings, as well as 14 positive effects of drinking, including better conversational and joke-telling abilities, improved sexual encounters and more energy to stay up late partying and dancing. The researchers also measured the participants' beliefs about how likely all of these drinking consequences would happen again and how positive or negative they were.

Participants rated the upsides to drinking as more positive and likely to happen in the future, a finding the researchers call "rose-colored beer goggles. It's as though they think that the good effects of drinking keep getting better and more likely to happen again," said Diane Logan, lead author and a UW clinical psychology graduate student.

Respondents' perceptions of drinking's negative consequences differed according to how many bad experiences they had had. Those who experienced a small to moderate number of ill effects of drinking did not

consider the experiences to be not so bad and did not think that they were any more likely to experience them again compared with students who hadn't experienced them.

The researchers call this cognitive-dissonance reasoning. It leads to people, on the morning after a night of heavy partying, telling themselves "I'll never drink that much again" or "I threw up that one time, but that's not me; I won't do it again." Or, it may be that once a bad consequence of drinking happens, people think that it wasn't really as bad as they initially thought, the researchers speculated.

But the participants reporting the most bad experiences rated the episodes as more negative and more likely to happen again. "Until high levels of negative consequences are experienced, participants aren't deterred by the ill effects of drinking," Logan said.

The findings have implications for alcohol intervention programs for college students, which tend to focus on how to avoid the negative consequences of drinking. "We should take into account how people don't think of negative consequences as all that bad or likely to happen again," Logan said, adding that factoring in how people view alcohol's positive effects "might have a bigger impact" on drinking habits.

She suggests a risk reduction approach by helping people reduce their drinking such that they still get some of the positive effects while avoiding many of the negative and recommends training exercises to increase social skills in the absence of alcohol.

The National Institute on Alcohol Abuse and Alcoholism funded the study. Co-authors are Teague Henry, a UW psychology undergraduate student; Matthew Vaughn, a former UW psychology undergraduate student; and Jeremy Luk, a UW psychology graduate student.

http://www.nytimes.com/2011/07/05/world/asia/05india.html?_r=1&hpw

Beneath a Temple in Southern India, a Treasure Trove of Staggering Riches

By VIKAS BAJAJ

MUMBAI, India — *A court-ordered search of vaults beneath a south Indian temple has unearthed gold, jewels and statues worth an estimated $22 billion, government officials said Monday.*

The treasure trove, at the 16th century Sri Padmanabhaswamy temple, is widely believed to be the largest find of its kind in India, catching officials in the state of Kerala by surprise and forcing the government to send two dozen police officers to the previously unguarded shrine for round-the-clock security.

The discovery has also revived questions about who should manage the wealth, much of which is believed to have been deposited at the temple by the royal family of the princely state of Travancore, which acceded to India when the country became independent in 1947. Some of the vaults under the temple have not been opened for nearly 150 years, temple officials have said.

Temples in India often have rich endowments, mainly from donations of gold and cash by pilgrims and wealthy patrons, but the wealth discovered at Padmanabhaswamy dwarfs the known assets of every other Indian temple. Such assets are typically meant to be used by administrators to operate temples and provide services to the poor, but they have often become the subject of heated disputes and controversies.

India’s Supreme Court ordered the opening of the vaults at Padmanabhaswamy to assess the wealth of the temple after a local activist, T. P. Sundararajan, filed a case accusing administrators of mismanaging and poorly guarding the temple. Descendants of the royal family still control the trust that manages the temple, which is devoted to the Hindu god Vishnu.

Searchers have found bags of gold coins, diamonds and other jewels and solid-gold statues of gods and goddesses. On Monday, searchers started to unseal “Section B” of the vaults, a large space that was expected to reveal another sizable collection, said P. T. Chacko, the spokesman for the chief minister of Kerala, Oommen Chandy.

Mr. Chacko said Kerala would not seek control of the temple or its treasure, a step that some activists have recommended. “The treasure is donated to the temple from disciples and believers; it’s the property of the temple,” he said. “It has nothing to do with the state.”

India’s Supreme Court will decide what happens to the treasure and the rest of the temple, which sits in the heart of Kerala’s capital, Thiruvananthapuram, once it has established the total value of the holdings, which could take months to finish. Early estimates of the treasure have been raised several times as searchers have opened more of the vaults in recent days.

The economy of Kerala, a relatively prosperous Indian state, relies heavily on remittances from migrant workers in the Middle East and elsewhere. For many decades, it led the country in improving development indicators like literacy and infant mortality.

http://www.eurekalert.org/pub_releases/2011-07/esoh-te070211.php

'Vanishing twin' explains increased risk of birth defects

The "vanishing twin" phenomenon, in which only one child is born from a pregnancy that originally starts as a multiple pregnancy, is linked to an increased risk in any congenital malformation and multiple malformations.

Professor Michael Davies will tell the annual meeting of the European Society of Human Reproduction and Embryology today (Wednesday) that the "vanishing twin" phenomenon, in which only one child is born from a pregnancy that originally starts as a multiple pregnancy, is linked to a nearly two-fold increased risk in any congenital malformation and to a nearly three-fold risk of multiple malformations.

Prof Davies, who is an Associate Professor and co-director of the Research Centre for the Early Origins of Health and Disease at the University of Adelaide, Australia, will say: "Our findings show that a 'vanishing twin' is a significant risk factor for congenital malformations in the surviving baby. This discovery means that we can now investigate what factors are occurring earlier in the process that could be influencing embryo development and loss. This has significant potential for advancing our understanding of the origins of congenital malformation, not just after infertility treatment, but also in spontaneously conceived pregnancies."

It is difficult to study what factors in early pregnancy might be causing congenital malformations such as heart and skeletal defects and cerebral palsy. This is because, in the general population, the majority of pregnancy losses, including vanishing twins, occur in the early days and weeks of pregnancy, often before the woman even knows that she is pregnant. The first ultrasound scans are usually carried out at around six to eight weeks. However, in women undergoing fertility treatment, early pregnancy is much easier to study because doctors know exactly when eggs were fertilised and transferred to the woman's womb, and this is followed by close monitoring with pregnancy tests and ultrasounds from the very beginning.

Prof Davies and his team studied data from all assisted reproductive technology (ART) cycles that took place in South Australia between January 1986 and December 2002, and linked them to registry data on birth defects and cerebral palsy. They identified cases in which a foetus had been lost by comparing routine six-week ultrasound data, which would show the presence of an empty foetal sac, and the number of babies actually delivered. These results were compared with pregnancies that had started off as single pregnancies and which had continued without loss of the foetus.

During this period 7,462 babies were delivered. In pregnancies where ultrasound had detected an empty foetal sac at six weeks, 14.6% of babies born had subsequent congenital malformations. The presence of an empty sac nearly doubled the risk of any malformation, and nearly trebled the risk of multiple malformations. Multiple pregnancies without any foetal loss were not associated with an increase in malformations when compared with single pregnancies without loss in the infertility group.

Prof Davies also looked at pregnancy loss after the first six weeks and he found that this was associated with birth defects in the surviving twin as well.

He will tell the conference: "To our knowledge, this appears to be the first report of the association of very early loss of a co-twin and a range of congenital malformations. This result is important for several reasons. Firstly, it appears that the developmental competency, or 'quality' of embryos in twins is related. Where one fails to develop, it appears to be an important indicator of the health of the survivor. This is certainly a sensible interpretation within ART, where the embryos result from the same stimulation cycle and embryo culture conditions, and are returned together.

"However, it may be possible to generalise these results to birth defects seen in fraternal twins – twins created from two separate eggs – from spontaneous pregnancies in the general population. This is important from the point of reproductive biology. One interpretation is that twinning reflects a failure in the regulation of egg recruitment and early embryo selection to ensure that only a single best egg and embryo implant. From a clinical perspective, it also emphasises the importance of embryo quality – not just for pregnancy rates but also for the competency of the foetus to develop normally." Now he and his team will be trying to discover what mechanism is involved and whether it could be used to predict and improve embryo quality.

Prof Davies believes that the same mechanism may also be operating when babies with birth defects are born after spontaneously conceived single pregnancies, and that this could explain why a family history of miscarriage or a previous miscarriage is a risk factor for birth defects in a singleton pregnancy. "This interpretation may help us understand why both twinning and birth defects increase with maternal age, as there may be a common mechanism."

The results of the research to be presented today may have important implications for fertility treatment, for instance when implementing a policy of single embryo transfer. "It may reinforce the importance of maximising embryo quality and factors that contribute to it," he will say. "Furthermore, creating and using

multiple embryos of lower quality may increase the risk of a developmentally compromised embryo both being selected for transfer and surviving to birth. However, it also appears that there may be predictable circumstances under which twin pregnancies do not carry a significant additional overall risk for birth defects, although twinning would continue to be a high-risk pregnancy for mother and baby for numerous other reasons."

He will conclude: "It is particularly exciting to consider that in the near future we should be able to understand and influence the factors related to embryo quality in such a way as to drastically reduce the risk of congenital malformations in ART babies. Further, it appears plausible that these same factors will operate in the general population, and may, in principle, be modifiable."

http://www.nytimes.com/2011/07/05/health/05gene.html?partner=rss&emc=rss

Roots of Disease Found to Vary by Continent

By NICHOLAS WADE

A new survey of the human genome shows that common diseases are likely to have a different set of genetic roots in Africans, East Asians and Europeans.

The finding may represent yet another serious complication in the post-genome quest for the roots of common disease, since it implies that each disease may need to be investigated separately in different populations.

After the human genome was decoded in 2003, biologists completed a follow-up project called the HapMap that cataloged the genome's common variations, meaning the sites on the DNA where one unit often differs from the standard sequence. They then scanned the genomes of patients with common diseases to look for statistical links between having a disease and having a particular variation.

These expensive scans, called genomewide association studies, required recruiting hundreds of patients. Many such scans have now been done for most of the common diseases, but the results have been disappointing. With a few exceptions, common variations account for little of the genetic risk of common disease. The basic premise of the HapMap — that common diseases were caused by common variations — turned out to be largely incorrect.

Back at the drawing board, biologists decided that if the genetic roots of common disease did not lie in the common variants, they should lie in the rarer variants. With partners in England and China, the National Institutes of Health in 2008 undertook a follow-up to the HapMap, the 1,000 Genomes Project, to catalog rare variants in the human population.

The project is not yet complete, but a team led by Simon Gravel and Carlos D. Bustamante of Stanford University has analyzed the data so far available and predicts the rare variants will be found to be almost entirely different in the Chinese, European and African populations. This means that almost all of the rare variants developed after the three populations had split apart.

"Genomewide association studies aiming to correlate common disease susceptibility with rare variants may need extraordinarily large sample sizes," the scientists concluded in the journal PNAS.

David B. Goldstein, a geneticist at Duke University, said that it had long been known that rare variants tend to be specific to particular populations, but that it was too early to tell how hard it will be to find those that cause disease. Some rare variants can greatly increase the risk of disease and should be easier to detect than others.

But the jury is still out on the catalog of rarer variants being developed by the 1,000 Genomes Project and how useful it will be, Dr. Goldstein said. It may be more effective to decode the entire genomes of patients with a particular disease. "We are more interested in the variants we see in patients than in a generic catalog," he said. These variants are so rare that even 1,000 Genomes is unlikely to pick up many of them, he said.

The Stanford study also sheds light on major aspects of human population history, like the time at which the first modern humans emigrated from Africa. Archaeologists believe it was about 50,000 years ago, since no modern human remains older than this have yet been found outside of Africa, but geneticists have long favored much earlier dates. Dr. Gravel and Dr. Bustamante now calculate that 51,000 years ago, give or take several thousand years, is the date best supported by genetic data, bringing the geneticists' date into alignment with the archaeologists' favored time for the exit from Africa.

The common variations in the human genome were mostly present in the ancestral human population in Africa and have been inherited by all the descendant populations around the world. The rare variants occurred more recently.

"Most of the common variants hark back to pre-Out of Africa," Dr. Bustamante said. "Most of the rare variants come after the Neolithic revolution." This is the event that marked the beginning of agriculture about 10,000 years ago and led to significant increases in the size of human populations.

http://www.eurekalert.org/pub_releases/2011-07/uoo-rha070511.php

Ruminant headgear: A mystery awaiting unraveling

Researchers seek to inspire interest in the medical potential of antlers, horns, ossicones and pronghorns

EUGENE, Ore. -- Emerging from the heads of most cud-chewing mammals, headgear inspire an almost mystical and certainly majestic aura. But, scientists say, we know shockingly little about them.

In a paper appearing online ahead of regular publication in the Proceedings of the Royal Society B, a London-based international journal dedicated to biology, a three-member scientific team spells out what is known -- and not known -- about antlers, horns, pronghorns and ossicones.

For antlers, think deer, moose and elk. Horns are worn by cattle, sheep and goats; ossicones by giraffes and okapi. Pronghorns are found on pronghorn antelope, a strictly North American mammal. The represent the cervid, bovid, giraffids and antilocaprid families, respectively.

In addition to their perplexing evolutionary origins, major questions surround how a better biological understanding of these animals' headgear might lead to innovations in medical treatments for such conditions as skin damage from burns, bone cancer and osteoporosis, says lead author Edward Byrd Davis, a paleontologist in the department of geological sciences at the University of Oregon.

"Antlers, for example, are the fastest growing bones of any living vertebrate today," said Davis, who also is fossil collection manager at the UO Museum of Natural and Cultural History and affiliate of the Robert D. Clark Honors College. "They are shed at the end of each season and replaced by new racks every year.

"This is one of those things where you'd think we'd know more, but we don't," said Davis, who became interested in pronghorn antelopes while a doctoral student at the University of California, Berkeley. "Scientists get a lot of press coverage for dark matter or the Higgs boson because they are among deep mysteries that we are still unlocking. A lot of people assume that most of biology is understood, yet something as fundamental as the age-old question 'how did the cow get its horns?' is still not well understood."

Among assumptions only recently overturned was the idea that pronghorn antelope were related to antler-wearing deer or horned cattle, goats and sheep. In fact, a mitochondrial DNA study co-authored by Spain's Manuel Hernandez Fernandez and Yale University's Elisabeth S. Vrba, published in Biological Reviews in 2005, determined that pronghorn antelope are more closely related to giraffes.

It turns out the origin and evolution of headgear was probably messy, with a shared origin among some lineages and independent origins of form and development in others, concluded Davis and co-authors Katherine Brakora, a doctoral student at the University of California, Berkeley, and Andrew Lee, a professor at Midwestern University in Glendale, Ariz.

The hope is, Davis said, that his team's review of the literature will inspire a renewed exploration by biologists of the various headgear found in both living and fossil species.

"We need to be looking more closely at the early development of horns, antlers, ossicones and pronghorns and be making comparisons between fossils and modern animals," he said. "We hope to develop collaborations to better interpret what we find in the fossil record and to better understand the biological development of these headgear. Achieving that, we should be able to uncover a number of applications for human medicine."

http://www.nytimes.com/2011/07/05/health/05stroke.html?partner=rss&emc=rss

In the 'Stroke Belt,' Erosion of Memory Is More Likely Too

By PAM BELLUCK

People in a large area of the American South have long been known to have more strokes and to be more likely to die from them than people living elsewhere in the country.

Now, a large national study suggests the so-called stroke belt may have another troubling health distinction. Researchers have found that Southerners there also are more likely to experience a decline in cognitive ability over several years — specifically, problems with memory and orientation.

The differences to date in the continuing study are not large: Of nearly 24,000 participants, 1,090 in eight stroke-belt states showed signs of cognitive decline after four years, compared with 847 people in 40 other states. But the geographic difference persisted even after the researchers adjusted for factors - like age, sex, race and education - that might influence the result. The most recent data from the study were published in Annals of Neurology.

None of the people with cognitive decline in the study had had detectable strokes. But some experts believe their memory problems and other mental issues could be related to the same underlying risk factors, including lifestyle patterns that contribute to hypertension, high cholesterol, diabetes and obesity.

Is it the fried food beloved by Southerners? Limited access to doctors? Too little exercise? Researchers are investigating those and other possible causes. Some experts also suggest that the participants could have had small, undetectable strokes that subtly affected brain function.

"This should be a very strong alarm signal," said Dr. Gustavo C. Roman, who leads the neuroepidemiology section of the American Academy of Neurology and was not involved in the study. The finding suggests that "if you want to keep your marbles, you need to control your blood pressure, excessive weight and other risk factors for stroke."

Dr. Kenneth Langa, a professor of internal medicine at University of Michigan who was not involved in the research, said the size of the study and the geographic diversity, encompassing 1,588 of the country's 3,000 counties, made the findings powerful.

They could also be instructive because, while there is currently almost no treatment for memory problems later in life, there are effective ways of combating or preventing many causes of stroke. "Pinning down this relationship between hypertension, diabetes, physical inactivity and the effects on the brain" could help people learn to protect their mental capacities for longer, Dr. Langa said.

Experts do not know exactly why more strokes occur in a region stretching across Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee (sometimes additional Southern states are included in the stroke belt). Financed by two federal health agencies as part of a broader study of stroke and health, the new research followed non-Hispanic blacks and whites age 45 and older for about four years.

At the beginning of the study, the participants, assessed in a detailed phone interview and home visit, had experienced no strokes or cognitive problems. Each year, researchers conducted telephone interviews, asking the subjects to recall words and demonstrate knowledge of the day, week and year. Every two years, there were longer telephone assessments with more extensive word-recall tests and tasks like naming items in a category — animals, for example. As of October 2010, 8.2 percent of stroke-belt participants showed signs of cognitive decline; 8 percent of participants in other areas did. The small difference was nonetheless significant in such a large study, experts said.

"The difference is actually larger than those two numbers seem to suggest," said George Howard, the study's principal investigator and chairman of the biostatistics department at the University of Alabama at Birmingham. By chance, the particular Southerners in the study had qualities that should have made them less vulnerable to cognitive problems, not more so. They were younger and more of them were women, compared with study subjects elsewhere, and fewer were African-American, a group that is more prone to strokes. "If region didn't make any difference, the South should have been significantly less likely to be declining" in the study results, Dr. Howard said.

In both stroke-belt and non-stroke-belt groups, older age, less education, and being African-American were associated with increased chances of cognitive decline. But even when those factors were accounted for, residents of the stroke belt still were 18 percent more likely to show impairment. "These effects are so large, it overcomes these differences in the population," Dr. Howard said. Most memory and orientation problems detected in the four years were subtle, he added, although a few cases were more severe.

Virginia Wadley, the study's lead author and an associate professor of medicine at the University of Alabama at Birmingham, and her colleagues are now looking for possible causes, including genetic predisposition, nutrition, smoking, exercise, hypertension, high cholesterol, obesity, diabetes, emotional or work-related stress and environmental factors like air quality. "It's likely a mixed bag," Dr. Wadley said.

Many of these are also risk factors for stroke, and some experts say it is possible that participants could have suffered what Dr. Howard called "undiagnosed teeny-weeny strokes."

Dr. Langa said problems like high blood pressure and diabetes are likely to be "affecting blood flow to the brain, even if it's not causing a visible stroke. An undersupply of blood can also cause problems with brain cells that lead to cognitive decline."

But silent strokes probably cannot explain all participants' memory and orientation problems, the researchers said. Some subjects may have budding dementia, age-related memory loss, or a combination.

"Those behaviors that prevent stroke likely will prevent some but not all of the things that cause cognitive decline," said Dr. Joseph P. Broderick, chairman of neurology at the University of Cincinnati Neuroscience Institute, who was not involved in the study. "If you buy a car and you take great care of it, it still ain't the same 15 years later. But if you don't ever change the oil and your basic engine grinds down, in five years you can't drive it and it won't last very long."

Dr. Roman, who also directs the Nantz National Alzheimer Center at Methodist Neurological Institute in Houston, said the cycle might begin with cognitive decline and then lead to stroke, not the other way around.

“If you have lower cognitive function,” he said, “maybe you don’t care anymore about taking your blood pressure pill” to prevent stroke, which could then cause further memory impairment.

Dr. Broderick cautioned that study may be missing more severe cases of mental impairment, because “you may not get people who don’t have a phone, are homeless, very poor.”

“This is not just a problem for the stroke belt, it’s a problem for the country,” he said. “I have some issues with trying to focus attention on just one area, rather than people in the country who fit that high-risk group.”

Dr. Howard and Dr. Wadley, both Southerners, acknowledged that the new data can be misinterpreted.

“One of the things we are concerned about is, it does sort of reinforce every negative stereotype about the South, that there are these slow hicks down here,” Dr. Howard said. “The first question is, is there a problem? Unfortunately, as a Southerner, the answer is yes. If we can get to why it exists, then we can get to what to do to change it.”

http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2011/07/04/MNG01K5FK7.DTL

UCSF, Stanford autism study shows surprises

Erin Allday, Chronicle Staff Writer

San Francisco -- *Environmental factors play a more important role in causing autism than previously assumed and, surprisingly, an even larger role than genetics, according to a new study out of UCSF and Stanford that could force a dramatic swing in the focus of research into the developmental disorder.*

The study, published in Monday's issue of the Archives of General Psychiatry, looked at 192 pairs of twins in California and, using a mathematical model, found that genetics account for about 38 percent of the risk of autism, and environmental factors account for about 62 percent.

Previous twin studies had suggested that autism was highly inheritable, with genetics accounting for roughly 90 percent of all cases worldwide. As such, much recent research into autism has focused on tracking down the genes and unlocking the complex genetic codes that are associated with autism.

"We're not trying to say there isn't a genetic component - quite the opposite. But for most individuals with autism spectrum disorder, it's not simply a genetic cause," said Neil Risch, director of the UCSF Institute for Human Genetics, who designed the study.

Autism doctors and patient advocates said the study, which will probably be followed up with similar studies of twins and other siblings, could have a significant impact on research into the disorder.

Earlier beliefs

For decades in the mid-20th century, autism was linked mostly to environmental factors - specifically, poor parenting, with much of the blame falling on mothers. As rates of autism skyrocketed in the '80s and '90s - it's now thought to affect as many as 1 percent of U.S. children - scientists and patient advocates shifted away from blaming families.

Research has focused on obvious genetic factors for the past 10 or 15 years. Now, scientists said, they hope to broaden the study and look at how genetics and environmental influences work together to cause autism.

"We've known that genetics played a huge role. The surprise was that the environmental factors have been underestimated," said Clara Lajonchere, vice president of clinical programs for Autism Speaks, a patient advocacy group that participated in and helped fund the new twin study.

"Families are going to really hold researchers more accountable now," Lajonchere said. "A lot of parents view genetics as a long-term solution. They are going to want to know how we can accelerate the pace of research such that we can find answers now."

Twin studies often are used to distinguish between environmental and genetic influences on medical disorders. Identical twins share nearly 100 percent of their genes, and fraternal twins share about half of their genes. In both cases the siblings' early developmental environment - both in the womb and after birth - are very similar.

Several small twin studies in the past decade looked at how common it was for twin siblings to share an autism diagnosis, and results of those studies placed genetics as the primary cause of autism. But some scientists believe that those studies weren't large enough to note the differences in shared diagnoses rates between identical and fraternal twins.

Diverse study

The new study is the largest, and the most diverse, to look at twins. Of the 192 pairs of twins in the study, 54 were identical and 138 were fraternal. At least one sibling in each pair was autistic, and every child was interviewed by researchers to confirm that diagnosis.

If autism was entirely a genetic disease, then scientists would expect that if one identical twin had the disorder, the other twin would too. And they'd expect that among fraternal twins, if one twin had the disorder, then the other would have a slightly higher risk of developing autism than the general population. Previous

studies have indicated that if one non-twin sibling has autism, other siblings have about a 5 percent chance of developing the disorder. But in the study, researchers found that only about 60 to 70 percent of the identical twins had dual autism diagnoses - lower than expected - and 20 to 30 percent of the fraternal twins had dual diagnoses - much higher than anticipated.

Those rates, along with the expected rates scientists would find if autism was entirely genetic or entirely environmentally caused, were plugged into a mathematical equation, and researchers determined that only about 38 percent of autism risk could be tied to genetics.

"The rates for the (fraternal) twin pairs were so high, I retyped all of the results because I thought we'd mixed them up," said Dr. Joachim Hallmayer, an associate professor in psychiatry at Stanford and lead author of the study. "This draws attention to the environment, and to the possibility that shared environmental factors play a bigger role than we had previously assumed." Several scientists said they expect the new study to start shifting research toward early environmental factors, in particular prenatal conditions for developing fetuses.

Antidepressants' role?

One study along those lines, also published in Monday's Archives of General Psychiatry, looked at the possible role of maternal antidepressant use before and during pregnancy. The study of 298 autistic children in the Kaiser Permanente Northern California system found a two-fold increase in risk of the disorder when mothers took antidepressants at some point in the year before giving birth.

The study doesn't prove that the antidepressants actually caused autism, and researchers stressed that women taking such drugs should not stop if they are pregnant or about to become pregnant. But they added that studies like theirs are increasingly important, especially given the new information about environmental effects on autism.

"We're just beginning to scratch the surface," said Lisa Croen, director of the Autism Research Program at the Kaiser Division of Research in Oakland, and lead author of the antidepressant study. "We have to continue to look at genetic factors, but it's really important to look at non-genetic factors too - and (what's) critical will be looking at them together."

http://www.physorg.com/news/2011-07-hot-earth-scientists-uncovers.html

How hot did Earth get in the past? Scientists uncover new information

The question seems simple enough: What happens to the Earth's temperature when atmospheric carbon dioxide levels increase? The answer is elusive.

However, clues are hidden in the fossil record. A new study by researchers from Syracuse and Yale universities provides a much clearer picture of the Earth's temperature approximately 50 million years ago when CO2 concentrations were higher than today. The results may shed light on what to expect in the future if CO2 levels keep rising. The study, which for the first time compared multiple geochemical and temperature proxies to determine mean annual and seasonal temperatures, is published online in the journal Geology, the premier publication of the Geological Society of America, and is forthcoming in print Aug. 1.

SU Alumnus Caitlin Keating-Bitonti '09 is the corresponding author of the study. She conducted the research as an undergraduate student under the guidance of Linda Ivany, associate professor of earth sciences, and Scott Samson, professor of earth sciences, both in Syracuse University's College of Arts and Sciences. Early results led the team to bring in Hagit Affek, assistant professor of geology and geophysics at Yale University, and Yale Ph.D. candidate Peter Douglas for collaborative study. The National Science Foundation and the American Chemical Society funded the research.

"The early Eocene Epoch (50 million years ago) was about as warm as the Earth has been over the past 65 million years, since the extinction of the dinosaurs," Ivany says. "There were crocodiles above the Arctic Circle and palm trees in Alaska. The questions we are trying to answer are how much warmer was it at different latitudes and how can that information be used to project future temperatures based on what we know about CO2 levels?"

Previous studies have suggested that the polar regions (high-latitude areas) during the Eocene were very hot —greater than 30 degrees centigrade (86 degrees Fahrenheit). However, because the sun's rays are strongest at the Earth's equator, tropical and subtropical areas (lower latitude) will always be at least as warm as polar areas, if not hotter. Until now, temperature data for subtropical regions were limited.

The SU and Yale research team found that average Eocene water temperature along the subtropical U.S. Gulf Coast hovered around 27 degrees centigrade (80 degrees Fahrenheit), slightly cooler than earlier studies predicted. Modern temperatures in the study area average 75 degrees Fahrenheit. Additionally, the scientists discovered that, during the Eocene, temperatures in the study area did not change more than 3 to 5 degrees centigrade across seasons, whereas today, the area's seasonal temperatures fluctuate by 12 degrees centigrade.

The new results indicate that the polar and sub-polar regions, while still very warm, could not have been quite as hot as previously suggested.

The findings are based on a chemical analysis of the growth rings of the shells of fossilized bivalve mollusks and on the organic materials trapped in the sediment packed inside the shells, which was conducted by Keating-Bitonti and her colleagues. Ivany collected the fossils from sediment layers exposed along the Tombigbee River in Alabama. The mollusks lived in a near-shore marine environment during a time when the sea level was higher and the ocean flooded much of southern Alabama. The sediments that accumulated there contain one of the richest and best-preserved fossil records in the country.

"Our study shows that previous estimates of temperatures during the early Eocene were likely overestimated, especially at higher latitudes near the poles," Keating-Bitonti says. "The study does not mean elevated atmospheric CO2 levels did not produce a greenhouse effect—the Earth was clearly hotter during the early Eocene. Our results support predictions that increasing levels of atmospheric CO2 will result in a warmer climate with less seasonality across the globe."

To determine the average seasonal temperatures in the study area, Keating-Bitonti sampled the mollusk shells for high-resolution oxygen and strontium isotope analyses, which were done at SU. The Yale team analyzed shells and sediments for clumped-isotope and tetraether-lipid analysis. The results were consistent across all of the independent analytic methods. The scientists believe the multiple methods of analysis have yielded a more complete and accurate picture of ancient climate than previously possible.

The study also marks the first time clumped-isotope analysis has been used alongside traditional oxygen isotope and organic geochemical analyses in paleoclimate work. The research team is currently using the same analytical process to determine Eocene Epoch mean annual and seasonal temperatures in polar-regions.

"Clumped isotopes is a new way to measure past temperatures that offers a distinct advantage over other approaches because the technique requires fewer assumptions; it's based on well understood physics," Affek says. "The agreement among different methods gives us confidence in the results and enables us to use these methods in other locations, such as Antarctica."

http://www.eurekalert.org/pub_releases/2011-07/wuso-tbb070611.php

The biology behind alcohol-induced blackouts

A person who drinks too much alcohol may be able to perform complicated tasks, such as dancing, carrying on a conversation or even driving a car, but later have no memory of those escapades.

These periods of amnesia, commonly known as "blackouts," can last from a few minutes to several hours. Now, at Washington University School of Medicine in St. Louis, neuroscientists have identified the brain cells involved in blackouts and the molecular mechanism that appears to underlie them. They report July 6, 2011, in The Journal of Neuroscience, that exposure to large amounts of alcohol does not necessarily kill brain cells as once was thought. Rather, alcohol interferes with key receptors in the brain, which in turn manufacture steroids that inhibit long-term potentiation (LTP), a process that strengthens the connections between neurons and is crucial to learning and memory.

Better understanding of what occurs when memory formation is inhibited by alcohol exposure could lead to strategies to improve memory. "The mechanism involves NMDA receptors that transmit glutamate, which carries signals between neurons," says Yukitoshi Izumi, MD, PhD, research professor of psychiatry at Washington University School of Medicine in St. Louis. "An NMDA receptor is like a double-edged sword because too much activity and too little can be toxic. We've found that exposure to alcohol inhibits some receptors and later activates others, causing neurons to manufacture steroids that inhibit LTP and memory formation."

Izumi says the various receptors involved in the cascade interfere with synaptic plasticity in the brain's hippocampus, which is known to be important in cognitive function. Just as plastic bends and can be molded into different shapes, synaptic plasticity is a term scientists use to describe the changeable properties of synapses, the sites where nerve cells connect and communicate. LTP is the synaptic mechanism that underlies memory formation.

The brain cells affected by alcohol are found in the hippocampus and other brain structures involved in advanced cognitive functions. Izumi and first author Kazuhiro Tokuda, MD, research instructor of psychiatry, studied slices of the hippocampus from the rat brain. When they treated hippocampal cells with moderate amounts of alcohol, LTP was unaffected, but exposing the cells to large amounts of alcohol inhibited the memory formation mechanism.

"It takes a lot of alcohol to block LTP and memory," says senior investigator Charles F. Zorumski, MD, the Samuel B. Guze Professor and head of the Department of Psychiatry. "But the mechanism isn't straightforward. The alcohol triggers these receptors to behave in seemingly contradictory ways, and that's what actually blocks the neural signals that create memories. It also may explain why individuals who get highly intoxicated don't remember what they did the night before."

But not all NMDA receptors are blocked by alcohol. Instead, their activity is cut roughly in half.

"The exposure to alcohol blocks some NMDA receptors and activates others, which then trigger the neuron to manufacture these steroids," Zorumski says.

The scientists point out that alcohol isn't causing blackouts by killing neurons. Instead, the steroids interfere with synaptic plasticity to impair LTP and memory formation.

"Alcohol isn't damaging the cells in any way that we can detect," Zorumski says. "As a matter of fact, even at the high levels we used here, we don't see any changes in how the brain cells communicate. You still process information. You're not anesthetized. You haven't passed out. But you're not forming new memories."
Stress on the hippocampal cells also can block memory formation. So can consumption of other drugs. When combined, alcohol and certain other drugs are much more likely to cause blackouts than either substance alone.

The researchers found that if they could block the manufacture of steroids by neurons, they also could preserve LTP in the rat hippocampus. And they did that with drugs called 5-alpha-reductase inhibitors. These include finasteride and dutasteride, which are commonly prescribed to reduce a man's enlarged prostate gland. In the brain, however, those substances seem to preserve memory.

"We would expect there may be some differences in the effects of alcohol on patients taking these drugs," Izumi says. "Perhaps men taking the drugs would be less likely to experience intoxication blackouts."

The researchers plan to study 5-alpha-reductase inhibitors to see how easily they get into the brain and to determine whether those drugs, or similar substances, might someday play a role in preserving memory.

Tokuda K, Izumi Y, Zorumski CF. Ethanol enhances neurosteroidogenesis in hippocampal pyramidal neurons by paradoxical NMDA receptor activation, The Journal of Neuroscience, vol. 31(27), pp. 9905-9909. July 6, 2011.

This work was supported by grants from the National Institute of Mental Health, the National Institute of General Medical Sciences, and the National Institute on Alcohol Abuse and Alcoholism of the National Institutes of Health (NIH), and by the Bantley Foundation.

http://www.eurekalert.org/pub_releases/2011-07/ifts-tbh070611.php

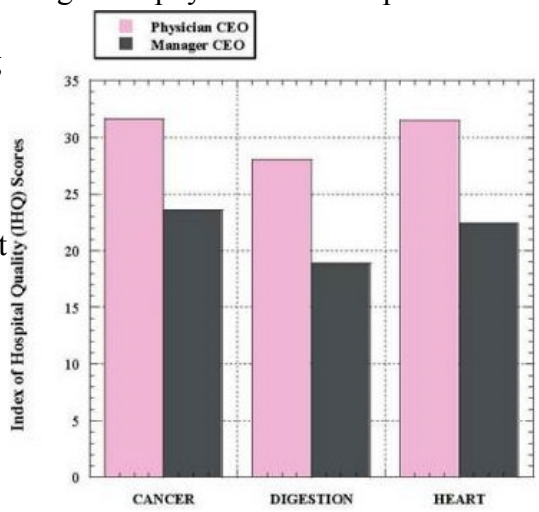
The best hospitals are run by physicians

Top-performing hospitals are typically ones headed by a medical doctor rather than a manager. That is the finding from a new study of what makes a good hospital.

The research, to be published in the elite journal Social Science and Medicine, is the first of its kind. Its conclusions run counter to a modern trend across the western world to put generally trained managers -- not those with a medical degree -- at the helm of hospitals. This trend has been questioned, particularly by the Darzi Report, which was commissioned by the U.K. National Health Service, but until now there has been no clear evidence.

Amanda Goodall PhD, the author of the study, and a senior researcher at the Institute for the Study of Labor (IZA) in Bonn, Germany, constructed a detailed database on 300 of the most prominent hospitals in the United States. She then traced the professional background and personal history of each leader. The research focused particularly on hospital performance in the fields of cancer, digestive disorders and heart surgery.

The study shows that hospital quality scores are approximately 25% higher in physician-run hospitals than in the average hospital.



Goodall said: "Over the last few decades there has been a growing tendency for hospital boards to appoint managers as CEOs. These findings raise some warning signs over that trend."

She said: "According to the latest data, outstanding hospitals tend to be those run by somebody with a medical degree. I was surprised by the strength of the pattern. It seems that age-old conventions about having doctors in charge -- currently an idea that is out of favor around the world -- may turn out to have been right all along."

Barry Silbaugh M.D., the CEO of American College of Physician Executives, commented: "We are watching Dr Goodall's research carefully because it seems to finally provide a real evidence-base for physician leadership. This is something we have long supported."

Goodall stressed that more research would be needed before cause-and-effect could be truly understood. The study, a cross-sectional one, uses data from 2009. "This is an intriguing pattern but these snap-shot results for a single point in time do not prove that doctors make the best heads of hospitals, although they are consistent with that claim. More research following a range of hospitals through time is urgently needed," she said.

The new study, "Physician-Leaders and Hospital Performance: Is There an Association?", by Amanda H. Goodall, is in press at Social Science and Medicine. It can be downloaded free of charge as from the IZA website (www.iza.org) as IZA Discussion Paper No. 5830: http://ftp.iza.org/dp5830.pdf

http://medicalxpress.com/news/2011-07-gifted-natural-vitamin-tocotrienol-brain.html

'Gifted' natural vitamin E tocotrienol protects brain against stroke in three ways

A natural form of vitamin E called alpha-tocotrienol can trigger production of a protein in the brain that clears toxins from nerve cells, preventing those cells from dying after a stroke, new research shows.

This process is one of three mechanisms identified so far that this form of vitamin E uses to protect brain cells after a stroke, meaning that this natural substance might be more potent than drugs targeting single mechanisms for preventing stroke damage, according to Ohio State University scientists who have studied the nutrient for more than a decade. These researchers previously reported that the tocotrienol form of vitamin E protects the brain after a stroke by blocking an enzyme from releasing toxic fatty acids and inhibiting activity of a gene that can lead to neuron death.

Vitamin E occurs naturally in eight different forms, and all of this work is focused on the tocotrienol form, also known as TCT. The commonly known form of vitamin E belongs to a variety called tocopherols. TCT is not abundant in the American diet but is available as a nutritional supplement. It is a common component of a typical Southeast Asian diet.

In this new study, the researchers first clarified the role of a protein called MRP1, or multidrug resistance-associated protein 1. This protein clears away a compound that can cause toxicity and cell death when it builds up in neurons as a result of the trauma of blocked blood flow associated with a stroke.

They then determined that TCT taken orally influences production of this protein by elevating the activity of genes that make MRP1. This appears to occur at the microRNA level; a microRNA is a small segment of RNA that influences a gene's protein-building function.

This is one of the first studies to provide evidence that a safe nutrient – a vitamin – can alter microRNA biology to produce a favorable disease outcome," said Chandan Sen, professor and vice chair for research in Ohio State's Department of Surgery and senior author of the study. "Here, a natural nutritional product is simultaneously acting on multiple targets to help prevent stroke-induced brain damage. That is a gifted molecule." The research appears online and is scheduled for later print publication in the journal Stroke.

Over the past decade, Sen has led numerous studies on how the TCT form of vitamin E protects the brain against stroke damage in animal and cell models, and intends to eventually pursue tests of its potential to both prevent and treat strokes in humans. Approximately 795,000 Americans suffer new or recurrent strokes each year, and stroke is the third-leading cause of death in the United States, according to the American Stroke Association.

These latest research findings in mice follow a recent Food and Drug Administration certification of TCT as "Generally Recognized as Safe." The scientists conclude in the paper that even before clinical trials can take place, "TCT may be considered as a preventive nutritional countermeasure for people at high risk for stroke."

To determine the role of MRP1 in protecting brain cells, the researchers compared the effects of an induced stroke in two groups of mice: normal mice and animals that were genetically modified to be deficient in the MRP1 protein. Both groups of mice showed comparably decreased blood flow in the area of the stroke, but the mice deficient in MRP1 had a larger volume of tissue death than did normal mice.

The mice with the protein deficiency also had a 1.6-fold higher level of a toxin that is cleared by MRP1. This toxin is called GSSG, or glutathione disulfide, and these researchers have previously shown that a failure to clear this toxin appears to trigger neuron death in the brain after stroke.

"The protein has the effect of dredging out the toxin," said Sen, who is also a deputy director of Ohio State's Davis Heart and Lung Research Institute. "A significant finding in this work is the recognition that MRP1 is a protective factor against stroke. Thanks to tocotrienol, we were able to identify that path."

The presence of GSSG is linked to an excessive amount of glutamate that is released in the brain after a stroke. Glutamate is a neurotransmitter that, in tiny amounts, has important roles in learning and memory. Too much of it triggers a sequence of reactions that lead to the death of brain cells – the most damaging effects of a stroke. This experiment showed for the first time that the loss of MRP1 function impairs the clearance of

GSSG, and that MRP1 cells were recruited to the site of the stroke in normal mice, indicating this protein has a protective role in the brain after a stroke.

The researchers searched databases containing genomic data for a microRNA that appeared to have potential to influence production of MRP1. MicroRNAs bind to messenger RNA, which contains the actual set of instructions for building proteins. When that connection is made, however, the microRNA inhibits the building of protein from messenger RNA. So an inverse relationship exists between a microRNA and a protein it controls.

The researchers saw this very relationship in the cell study in which they manipulated the candidate microRNA levels and observed the effects of changing those levels on the presence of the MRP1 protein.

Finally, the researchers compared mice that were treated with TCT supplements or corn oil as a control for 13 weeks before a stroke was induced. The amount of damaged brain tissue was smaller in the mice that received TCT supplementation than in the mice receiving corn oil. In addition, TCT supplementation was associated with a lower level of the candidate microRNA in the damaged brain tissue, as well as an increase in the abundance of MRP1 cells at the stroke site.

"Essentially what we are showing with mechanistic explanation is that tocotrienol protects neural cells. It is anti-neurodegenerative," Sen said. "This form of vitamin E helped us identify three major checkpoints in stroke-related neurodegeneration that were not known before we began testing tocotrienols against neurodegeneration"

http://www.bbc.co.uk/news/technology-14045387

New solution can help 'permanently get rid of germs'

A new anti-microbial treatment that can make clothing - including smelly socks - permanently germ-free has been developed by US scientists.

The spray-on solution can be applied to existing garments, according to the team from the University of Georgia. It is designed to offer low cost protection for healthcare facilities, such as hospitals. Chemical impregnated materials already exist, but have to be added during the manufacturing process. The new solution can be applied to natural and synthetic textiles including clothes, home carpets, shoes and even plastics.

In a paper published in the American Chemical Society journal Applied Materials and Interfaces, Dr Jason Locklin and his colleagues state that the treatment kills a wide range of dangerous pathogens, including staph, strep, E. coli, pseudomonas and acetinobacter. Many of these can cause disease, break down fabrics, create stains and produce odours. When the scientists tested the product, they found that a single application was enough to stop all further bacterial growth at up to 37 degrees Celsius. And the solution did not degrade even after multiple hot water laundry cycles.

Medical field

Although it could potentially be used in a number of fields, its primary application is expected to be in healthcare. According to the US federal agency Centers for Disease Control and Prevention, approximately one in every 20 hospitalised patients contracts a healthcare-associated infection.

Lab coats, scrub suits, uniforms, gowns, gloves and linens are all known to be breeding grounds for harmful microbes. "The spread of pathogens on textiles and plastics is a growing concern, especially in healthcare facilities and hotels, which are ideal environments for the proliferation and spread of very harmful micro-organisms," said Dr Locklin. People are also trying to get rid of dangerous microbes at home, especially when it comes to food packaging, plastic furniture and their children's bath toys.

But not all anti-bacterial products are cheap or effective. "Similar technologies are limited by cost of materials, use of noxious chemicals in the application or loss of effectiveness after a few washings," said Gennaro Gama from the University of Georgia Research Foundation (UGARF).

"Locklin's technology uses ingeniously simple, inexpensive and scalable chemistry."

http://www.eurekalert.org/pub_releases/2011-07/ki-ucr070111.php

Unexpected cell repairs the injured spinal cord

Lesions to the brain or spinal cord rarely heal fully, which leads to permanent functional impairment.

After injury to the central nervous system (CNS), neurons are lost and largely replaced by a scar often referred to as the glial scar based on its abundance of supporting glial cells. Although this process has been known to science for over a century, the function of the scar tissue has long been disputed. However, there are indications that it stabilizes the tissue and that it inhibits the re-growth of damaged nerve fibres.

In this present study, Professor Jonas Frisén and his team of researchers show that the majority of scar cells in the damaged spinal cord are not glial cells at all, but derive from pericytes, a small group of cells located along blood vessels. They reveal that these pericytes start to divide after an injury, giving rise to a mass of

connective tissue cells that migrate towards the lesion to form a large portion of the scar tissue. Their paper also shows that these cells are needed to regain the tissue integrity, and that in the absence of this reaction, holes appear in the tissue instead of scarring.

For many years, scientists have tried to modulate scar formation after CNS damage in order to facilitate functional recovery, and have concentrated on glial cells. However, these new findings indicate a critical and previously unknown mechanism for scar formation following damage to the nerve system, and give reason for further investigation into whether the modulation of pericytes after CNS injury can stimulate functional recovery.

Publication: "A pericyte origin of spinal cord scar tissue", C. Göritz, D. Dias, N. Tomilin, M. Barbacid, O. Shupliakov, J. Frisén, Science online 7 July 2011.

http://www.scientificamerican.com/article.cfm?id=microbial-mat-bears-evidence-3billion-year-old-photosynthesis

Microbial Mat Bears Direct Evidence of 3.3 Billion-Year-Old Photosynthesis

Mat of microbes contains calcium carbonate that could only have formed through photosynthesis.

By Katharine Sanderson of Nature magazine

The most direct evidence yet for ancient photosynthesis has been uncovered in a fossil of a matted carpet of microbes that lived on a beach 3.3 billion years ago. Frances Westall at the Centre for Molecular Biophysics, a laboratory of the French National Centre for Scientific Research (CNRS), in Orleans and her colleagues looked at the well-preserved Josefsdal Chert microbial mat--a thin sheet formed by layer upon layer of tiny organisms--from the Barberton Greenstone Belt in South Africa.

These layers of ancient microorganisms grew at a time when Earth's atmosphere did not contain oxygen. The mat would have lain on a beach in a place that sunlight could reach, but there would have been few carbon-rich nutrients around at that time. So early life would have relied on photosynthesis for nourishment, and working out when this process evolved is fundamental to understanding how life began.

Photosynthetic filaments

Westall and her team used electron microscopes and a synchrotron light source to look at the structure and composition of the preserved microbial mat. In the mat's surface layer they saw tiny filaments, about 0.3 micrometers long: remnants of photosynthetic microbes, Westall says. Beneath the surface they found small particles of aragonite, a calcium carbonate mineral. This could only have come to be there if the surface was photosynthesizing: taking energy from the Sun and turning it into useful nutrients for other microbes to feed on. "We've never before seen in situ calcification," Westall says. "There is no other way [besides photosynthesis] of producing this structure in this environment."

Westall says that as the mat grew, layers of dead photosynthetic microbes underneath the active top layer were consumed by non-photosynthetic organisms called heterotrophs lower down in the mat. As the heterotrophs degraded the carbon-rich layers produced by photosynthesis, she says, they excreted metabolites that caused the pH in the mat to rise. The higher pH released calcium ions taken up from the water by carbonaceous polymers that form part of the mat. The calcium mixed with carbonates from the seawater and precipitated as calcium carbonate.

Modern photosynthetic mats contain sulphur-reducing bacteria that also precipitate calcium carbonates. Westall spotted a sulphur-containing molecule, thiophene, in her sample, and was able to quantify the total amount of sulphur present--up to 1%. This, she says, suggests that the heterotrophs in the ancient mat included sulphur-reducing bacteria similar to those in modern mats.

"One of many mysteries about the early fossil record is the lack of calcified examples of microbial filaments, which are usually found in shallow marine contexts consistent with photosynthesis," says Martin Brasier, an expert on ancient biological processes at the University of Oxford, UK. Brasier is cautious about the results, saying he would like to see independent confirmation of the work.

Another view

Other ancient mats have been studied, but Westall says evidence that they photosynthesized has been indirect--either being assumed from their carbon-isotope composition, which Westall argues can also come from non-photosynthetic microbes, or by looking closely at the mat's structure and seeing microbe-like structures.

One such study, by Michael Tice, now at Texas A&M University in College Station, suggested that a 3.4-billion-year-old mat was photosynthetic. In an e-mail to Nature, Tice says that his arguments in that work were more compelling than Westall suggests. "A key component to our arguments for photosynthesis was the observation that these mats were formed in shallow sunlit environments but not in deep-water environments recorded in the same geologic unit," he says. When combined with what they concluded about the fluids the

mats grew in and their bulk isotopic compositions, Tice and his colleagues decided that "they could only have been produced by anoxygenic photosynthetic micro organisms".

Tice says that the calcification is important new evidence, but he doesn't think it is definitive. "They add to a body of indirect evidence suggesting that photosynthesis had evolved by the end of the Palaeoarchean, but we are still not in possession of a smoking gun," Tice says.

Westall presented her group's findings at the Origins2011 conference in Montpellier, France.

http://www.nytimes.com/2011/07/05/science/05angier.html?partner=rss&emc=rss

Thirst for Fairness May Have Helped Us Survive

By NATALIE ANGIER

Among the Ache hunter-gatherers in eastern Paraguay, healthy adults with no dependent offspring are expected to donate as much as 70 to 90 percent of the food they forage to the needier members of the group.

And as those strapping suppliers themselves fall ill, give birth or grow old, they know they can count on the tribe to provide.

Among the !Kung bushmen of the Kalahari in Africa, a successful hunter who may be inclined to swagger is kept in check by his compatriots through a ritualized game called “insulting the meat.” You asked us out here to help you carry that pitiful carcass? What is it, some kind of rabbit?

Among the Hadza foragers of northern Tanzania, people confronted by a stingy food sharer do not simply accept what’s offered. They hold out their hand, according to Frank Marlowe, an anthropologist at Durham University in England, “encouraging the giver to keep giving until the giver finally draws the line.”

Among America’s top executives today, according to a study commissioned by The New York Times, the average annual salary is about $10 million and rising some 12 percent a year. At the same time, the rest of the tribe of the United States of America struggles with miserably high unemployment, stagnant wages and the worst economic crisis since the Great Depression. Now, maybe the wealth gap is a temporary problem, and shiny new quarters will soon rain down on us all. But if you’re feeling tetchy and surly about the lavished haves when you have not a job, if you’re tempted to go out and insult a piece of corporate meat, researchers who study the nature and evolution of human social organization say they are hardly surprised.

Darwinian-minded analysts argue that Homo sapiens have an innate distaste for hierarchical extremes, the legacy of our long nomadic prehistory as tightly knit bands living by veldt-ready team-building rules: the belief in fairness and reciprocity, a capacity for empathy and impulse control, and a willingness to work cooperatively in ways that even our smartest primate kin cannot match. As Michael Tomasello of the Max Planck Institute for Evolutionary Anthropology has pointed out, you will never see two chimpanzees carrying a log together. The advent of agriculture and settled life may have thrown a few feudal monkeys and monarchs into the mix, but evolutionary theorists say our basic egalitarian leanings remain.

Studies have found that the thirst for fairness runs deep. As Ernst Fehr of the University of Zurich and his colleagues reported in the journal Nature, by the age of 6 or 7, children are zealously devoted to the equitable partitioning of goods, and they will choose to punish those who try to grab more than their arithmetically proper share of Smarties and jelly beans even when that means the punishers must sacrifice their own portion of treats.

In follow-up research with older children and adolescents that has yet to be published, Dr. Fehr and his colleagues have found a more nuanced understanding of fairness, an acknowledgment that some degree of inequality can make sense: The kid who studies every night deserves a better grade than the slacker. Nevertheless, said Dr. Fehr, there are limits to teenage tolerance. “ ‘One for me, two for you’ may not be too bad,” Dr. Fehr said. “But ‘one for me, five for you’ would not be accepted.”

A sense of fairness is both cerebral and visceral, cortical and limbic. In the journal PLoS Biology, Katarina Gospic of the Karolinska Institute’s Osher Center in Stockholm and her colleagues analyzed brain scans of 35 subjects as they played the famed Ultimatum game, in which participants bargain over how to divide up a fixed sum of money. Immediately upon hearing an opponent propose a split of 80 percent me, 20 percent you, scanned subjects showed a burst of activity in the amygdala, the ancient seat of outrage and aggression, followed by the arousal of higher cortical domains associated with introspection, conflict resolution and upholding rules; and 40 percent of the time they angrily rejected the deal as unfair.

That first swift limbic kick proved key. When given a mild anti-anxiety drug that suppressed the amygdala response, subjects still said they viewed an 80-20 split as unjust, but their willingness to reject it outright dropped in half. “This indicates that the act of treating people fairly and implementing justice in society has evolutionary roots,” Dr. Gospic said. “It increases our survival.”

David Sloan Wilson, an evolutionary theorist at the State University of New York at Binghamton, sees the onset of humanity’s cooperative, fair-and-square spirit as one of the major transitions in the history of life on

earth, moments when individual organisms or selection units band together and stake their future fitness on each other. A larger bacterial cell engulfs a smaller bacterial cell to form the first complex eukaryotic cell. Single cells merge into multicellular organisms of specialized parts. Ants and bees become hive-minded superorganisms and push all other insects aside.

"A major transition occurs when you have mechanisms for suppressing fitness differences and establishing equality within groups, so that it is no longer possible to succeed at the expense of your group," Dr. Wilson said. "It's a rare event, and it's hard to get started, but when it does you can quickly dominate the earth." Human evolution, he said, "clearly falls into this paradigm."

Our rise to global dominance began, paradoxically enough, when we set rigid dominance hierarchies aside. "In a typical primate group, the toughest individuals can have their way and dominate everybody else in the group," said Dr. Wilson. "Chimps are very smart, but their intelligence is predicated on distrust."

Our ancestors had to learn to trust their neighbors, and the seeds of our mutuality can be seen in our simplest gestures, like the willingness to point out a hidden object to another, as even toddlers will do. Early humans also needed ways to control would-be bullies, and our exceptional pitching skills — which researchers speculate originally arose to help us ward off predators — probably helped. "We can throw much better than any other primate," Dr. Wilson said, "and once we could throw things at a distance, all of a sudden the alpha male is vulnerable to being dispatched with stones. Stoning might have been one of our first adaptations."

Low hierarchy does not mean no hierarchy. Through ethnographic and cross-cultural studies, researchers have concluded that the basic template for human social groups is moderately but not unerringly egalitarian. They have found gradients of wealth and power among even the most nomadic groups, but such gradients tend to be mild. In a recent analysis of five hunter-gatherer populations, Eric Aiden Smith of the University of Washington and his colleagues found the average degree of income inequality to be roughly half that seen in the United States, and close to the wealth distribution of Denmark.

Interestingly, another recent study found that when Americans were given the chance to construct their version of the optimal wealth gradient for America, both Republicans and Democrats came up with a chart that looked like Sweden's. There's no need to insult the meat in the land of lutefisk.

http://www.scientificamerican.com/article.cfm?id=review-adds-salt-to-a-familiar

New Study Finds No Connection between Salt and Heart Disease

Link between salt consumption and heart disease challenged.

By Ewen Callaway of Nature magazine

A controversial new study is questioning the oft-repeated connection between the consumption of too much salt and the development of cardiovascular disease. The meta-analysis, published online today in the American Journal of Hypertension, examined the results of seven clinical studies and found no solid proof that reducing salt consumption prevents heart conditions.

The World Health Organization recommends that no more than 5 grams of salt per day should be consumed, whereas people in many Western countries typically eat twice as much. Public-health authorities are already looking at ways of cutting the salt content of foods. For instance, Britain's Food Standards Agency is working with food manufacturers to reduce sodium, and the New York City health department is spearheading a national initiative to cut Americans' salt consumption by 20% over 5 years. Nature examines the new study and its implications for such policies.

How might salt cause heart disease?

Consuming sodium causes the body to retain water, thereby increasing blood pressure, and hypertension is a risk factor for heart attack, stroke and other cardiovascular diseases. A number of clinical trials and meta-analyses have suggested that cutting one's salt intake reduces blood pressure, says Rod Taylor, a statistician at the University of Exeter, UK, who led the new study. But his team says that it is unclear whether restricting salt intake reduces blood pressure sufficiently to protect against heart disease. A previous meta-analysis found that eating less salt reduced people's blood pressure -- but on average only slightly.

On the other hand, many studies comparing how much salt people consume with their incidence of cardiovascular disease have come up with clearer links. A 2009 meta-analysis3 of 13 such studies, incorporating 177,000 patients, found that a high-salt diet increased the risk of stroke by 23%.

Why has it been so difficult to prove whether or not cutting salt prevents cardiovascular disease?

Observational studies, which look at the correlation between salt intake and the incidence of disease, can't directly pin reductions in cardiovascular disease on eating less salt, Taylor says. "People are choosing to reduce their salt, but it may be associated with a whole host of other healthy behaviors. They may be more active and eating less saturated fat" -- factors that also protect against cardiovascular disease.

"To inform policy and whether we should be advising people to reduce their salt, observational studies do fall short," Taylor adds. Controlled experimental trials, in which patients are placed on a low- or high-salt diet and followed over time, should offer a clearer answer, he says.

How was the new study conducted?

Taylor's team trawled through 2,600 published journal articles on the link between salt and cardiovascular disease, and came up with seven controlled studies that included a total of 6,250 patients who were tracked for 6 months or longer. Taylor's team grouped the patients into three categories-those with normal blood pressure, those with high blood pressure and those diagnosed with heart failure--and analyzed how their salt intake was associated with blood pressure, incidence of cardiovascular disease and incidence of death.

What did they find?

People on low-salt diets saw their blood pressure drop. But Taylor's team found no statistically significant difference in the subjects' rates of heart disease compared with rates in people who didn't reduce their salt intake. Furthermore, a low-salt diet was not linked to reduced death rates in people with normal blood pressure or high blood pressure. "In one trial in heart-failure patients, we rather worryingly found that reductions in salt increased risk of death," Taylor adds.

Why is this result different from those of other observational studies?

Taylor isn't sure why his team's review came to a different conclusion from previous observational studies. It could be that there is no link between cutting salt and preventing cardiovascular disease, Taylor says. But he questions that interpretation because his team noticed reductions in blood pressure.

Perhaps the study did not have look at enough patients to uncover a statistically significant effect. This possibility is raised by Francesco Cappuccio, who heads the World Health Organization Collaborating Centre for Nutrition at the University of Warwick, UK. "The only problem here is that they're not statistically significant and the reason for that is the meta-analysis is too small," Cappuccio says. He notes that low-salt diets did show a trend towards protecting against cardiovascular disease.

Taylor thinks the best explanation is that patients cut their salt intake early on in the studies but eventually allowed their intake to creep up, masking any benefit. "They're intensively followed up for a couple years, and 8 or 10 years later these people's behavior has probably reverted to what it was," he says. Could a larger, closely supervised clinical trial get to the bottom of the link between salt and cardiovascular disease?

Taylor thinks that studies that rely on dietary advice directed at individuals, like those his team analyzed, do not do enough to cut people's salt consumption. Rather, scientists should look to studies that investigate the effects of public-health efforts, such as clearer labeling of a food's salt content, to see if these can prevent cardiovascular disease and death. "We need to design studies that are population-level interventions," he says, "essentially where we take a community of individuals and we target them in various ways to change their behavior and help them sustain that behavior, rather than just give them a pamphlet and have them sit down with a counselor for an hour."

However, Cappuccio says that such studies are costly, impractical and unnecessary. "They hold public health to ransom by asking for something that's impossible," he explains. "Salt, like many other nutritional factors, falls into the category where action has to be taken in the face of overwhelming evidence, even in the absence of a controlled clinical trial."

What are the policy implications of the new study?

The answer depends on whom you ask. Michael Alderman, an emeritus epidemiologist at the Albert Einstein College of Medicine in New York City, believes the study adds to growing evidence that cutting salt does not help people who consume modest amounts of the stuff. Public policies aimed at forcing salt reductions are misguided and potentially dangerous, he says. Eating less salt may reduce blood pressure, which is beneficial for the heart, but it could also increase insulin resistance, triglyceride levels and sympathetic-nerve activity -- all risk factors for cardiovascular disease.

Taylor, too, worries that policies directed at compelling people to eat less salt could have unintended health and economic consequences, and he calls for more research into the health effects of salt reduction. "Whilst intuitively reducing salt across the board appears to be a good thing, I would say we still need the evidence to prove it," he says.

Cappuccio is concerned that the new study will be used as a smokescreen, making it more difficult for public-health authorities to convince or even compel food manufacturers to reduce salt in processed and prepared foods, as these account for most of the salt in our diets. "It's creating a sense of controversy where policy is pushing forward," he explains.

http://www.newscientist.com/article/dn20666-polar-bears-can-claim-irish-ancestry.html

Polar bears can claim Irish ancestry

*** 17:00 07 July 2011 by Cian O'Luanaigh**

First it was JFK. Then Barack O'Bama. Now it seems even polar bears can celebrate their Irish roots.

A team led by Ceiridwen Edwards – now at the University of Oxford but at Trinity College Dublin in Ireland during the study – has found that modern polar bears are descended from extinct brown bears that loped over the present-day islands of Britain and Ireland between 43000 and 3000 years ago. At times during this period the two islands were connected by an ice sheet.

Edwards's team analysed short chunks of mitochondrial DNA – each 100 to 176 base pairs in length – from the teeth and bones of 17 ancient bears from caves across Ireland, and then compared them with a global dataset of DNA sequences from polar bears and brown bears, extinct and modern.

Mitochondria have their own DNA, which is passed from mother to offspring through the egg. "The main reason for looking at mitochondrial DNA is that there is a very high number of copies in archaeological samples" says Edwards. This makes it more likely that enough mtDNA survives for analysis. "The mtDNA is passed down the matrilineal line effectively unchanged."

Ten of the Irish bears were from the maternal lineage that gave rise to all modern polar bears, but curiously not from the lineage that gave rise to modern brown bears. Among polar bears, though, the Irish line has beaten all comers. "The maternal lineage that was present in the ancient polar bear population has been completely replaced by the Irish population," says Edwards.

Edwards says this hybridisation would have happened when Ireland was covered in ice, at the maximum extent of the ice sheet 22,000 years ago. No polar bear remains have been found in Ireland from this time – isotopic analysis of the Irish fossil bears confirms that all had a terrestrial diet and not the distinctive marine diet of polar bears – but the genetics puts them there as hybridisation would have been occurring during this time, she says.

Charlotte Lindqvist of the University at Buffalo, New York, is not so sure. "It does look like the Irish bears are closely related to polar bears and other brown bears, but the exact branching order is not clear," she says.

An analysis based on entire mitochondrial genomes, or on nuclear DNA, would give more genetic markers, she says. But nuclear DNA sequences are less likely to survive in ancient bones. "I am sure there is a lot more to say about bear evolution. The problem is we have very few fossils and most of them are recent, within the last 11,000 years or so," says Lindqvist. *Journal reference: Current Biology, DOI: 10.1016/j.cub.2011.05.058*

http://www.newscientist.com/article/dn20668-found-the-mother-of-all-blood-cells.html

Found: the mother of all blood cells

*** 19:00 07 July 2011 by Andy Coghlan**

The "mother" cell that gives birth to all other blood cells has finally been pinned down after a search lasting more than 20 years.

It's not that we didn't know about these mother cells before. Otherwise known as hematopoietic stem cells (HSCs), they are found in the bone marrow and replenish the blood throughout life. For 50 years, they've been used to treat people with leukaemia, who receive bone marrow from tissue-matched donors after their own has been destroyed by chemotherapy to kill the cancer.

But isolating individual HSCs has not been easy. "No one has ever gotten a glimpse of them within the mass of cells used when someone gets a transplant," says John Dick of the University of Toronto in Ontario, Canada, and head of the team which has finally tracked down the mother cells.

"Our work has provided the first sighting, so to speak, of the cell we have known about for many years."

All types of blood cell

Dick and his colleagues have now proved that HSCs can regenerate all types of blood cell, including red blood cells, lymphocytes and macrophages.

They did this through a long and painstaking process of transplanting human bone marrow and blood extracts into mice without an immune system, so the human cells wouldn't be rejected by the animals.

Over many years, Dick and his colleagues narrowed down the search for the elusive cell by deleting each mouse's bone marrow cells, then replacing mouse marrow with human cells to see whether they would rebuild the entire blood system from scratch.

Eventually, they narrowed their search down to a single cell type, which they also discovered has the CD49f protein on its surface, which marks it out from the rest. When they transplanted bone marrow and blood samples minus the CD49f-marked cells, the blood system failed to regenerate.

The CD49f "biomarker" is vital for further research, because it will enable the genuine HSCs to be extracted from all other blood stem cells, some of which will be at more advanced stages of maturity, and so not capable of turning into all blood types.

New leukaemia treatments

Dick says doctors might be able to safely regenerate a patient's entire blood system from scratch, using just a small population of the CD49f-marked cell, offering new ways to treat people with leukaemia.

At present, such patients would receive new bone marrow from tissue-matched donors, if available – only a third of patients find a donor. But now it might be possible to reconstitute marrow from HSCs extracted before chemotherapy starts. Checks could be done to make sure the HSCs chosen for regeneration are not themselves cancerous.

Researchers can now also experiment with the HSCs to work out the different stages and steps by which they develop into all types of blood cells, potentially allowing them to make specific blood cells by design.

"This specific HSC marker, CD49f, could not only help to identify which cells are capable of long-term engraftment in patients, but also as a tool to help us generate these cells in the lab from pluripotent stem cell sources," says Robert Lanza, chief scientist at Advanced Cell Technology in Worcester, Massachusetts. In 2008, the company developed red blood cells from human embryonic stem cells, and hopes soon to begin testing them in patients. *Journal reference: Science, DOI: 10.1126/science.1206360*

http://www.scientificamerican.com/blog/post.cfm?id=brain-on-beauty-shows-same-pattern-2011-07-07

Brain on beauty shows same pattern for art and music

By Katherine Harmon | Jul 7, 2011 01:15 PM

The search for beauty has spurred great works of art and music, lengthy philosophical treatises and decades of dense cultural criticism. So, is beauty in the object? The eye of the beholder? Somewhere in between?

The time has come "for neurobiology to tackle these fundamental questions," Semir Zeki , a neurobiologist at University College London, said in a prepared statement.

Zeki and a colleague at the Wellcome Laboratory of Neurobiology decided to see if they could find common brain patterns in people from different cultures as they observed things that they described as beautiful. For the study, 10 western Europeans, four Japanese, three Chinese, two Indians and two Americans assessed 60 paintings and 60 musical compositions as being beautiful, ugly or inspiring no more than indifference. The subjects then experienced the stimuli again and were asked to make another aesthetic evaluation, during which processes researchers recorded the subjects' brain patterns via fMRI (functional magnetic resonance imaging). In each of the subjects' brains, a 16-second flash of a painting or 16-second musical clip that they had rated (as somewhat to very) beautiful corresponded to an equally strong spark of activity in a tiny 15-to 17-millimeter-wide section of the medial orbitofrontal cortex. The findings were published online July 6 in PLoS ONE.

The medial orbitofrontal cortex has previously been linked to perception of beauty—as well as to pleasure, value and judgment. But this new study uncovers a more nuanced picture of individuals' perception of beauty across different mediums. And the findings suggest that even though the definition of "art" can be anything from a decontextualized urinal to harsh soundscapes, the brain processes "beauty" independently.

"A painting by Francis Bacon , for example, may have great artistic merit but may not qualify as beautiful," Zeki said. And "to someone who finds [rock music] more rewarding and beautiful, we would expect to see greater activity in the particular brain region when listening to Van Halen than when listening to Wagner."

Beautiful music seemed to spur the brain's center more quickly than did art, and each medium also activated its respective sensory regions (auditory and visual).

But visual art seemed to have a special effect on the brain. In addition to the medial orbitofrontal cortex, beautiful paintings also triggered the caudate nucleus, which has been linked to feelings of romantic love. This biological connection provides "an interesting neural commentary on the traditional emphasis made in world literature on the relationship between love and beauty," the researchers noted in their paper.

The parallels with previous findings about the medial orbitofrontal cortex suggest that there might be "an intimate link in the cortical processing that is linked to value, desire and beauty," the researchers wrote.

Zeki and his co-author, Tomohiro Ishizu hasten to add that compositions frequently considered beautiful might indeed share common attributes (symmetry, balance, harmony, etc.). And they don't propose to have solved that centuries-old discussion: "what these characteristics are has been, and continues to be, a subject of debate," they wrote. But what about the paintings and strains of music participants found ugly? Those experiences spurred action in the somatomotor cortex and the amygdala, suggesting that the brain has very different processes for different types of evaluation (positive versus negative). And art and music that subjects were indifferent to didn't make any big splashes in the brain images.

http://www.nytimes.com/2011/07/05/us/05tree.html?hpw

Who's on the Family Tree? Now It's Complicated

By LAURA M. HOLSON

Laura Ashmore and Jennifer Williams are sisters. After that, their relationship becomes more complex.

When Ms. Ashmore and her husband, Lee, learned a few years ago that they could not conceive a child, Ms. Williams stepped in and offered to become pregnant with a donor's sperm on behalf of the couple, and give birth to the child. The baby, Mallory, was born in September 2007 and adopted by Ms. Ashmore and her husband.

Then the sisters began to ponder: where would the little girl sit on the family tree?

"For medical purposes I am her mother," Ms. Williams said. "But I am also her aunt."

Many families are grappling with similar questions as a family tree today is beginning to look more like a tangled forest. Genealogists have long defined familial relations along bloodlines or marriage. But as the composition of families changes, so too has the notion of who gets a branch on the family tree.

Some families now organize their family tree into two separate histories: genetic and emotional. Some schools, where charting family history has traditionally been a classroom project, are now skipping the exercise altogether.

Adriana Murphy, a seventh-grade social studies teacher at the Green Acres School in Rockville, Md., said she asked students to write a story about an aspect of their family history instead. At Riverdale Country School in the Bronx, KC Cohen, a counselor, said the family tree had been mostly relegated to foreign language class, where students can practice saying "brother" or "sister" in French and Spanish.

"You have to be ready to have that conversation about surrogates, sperm donors and same-sex parents if you are going to teach the family tree in the classroom," Ms. Cohen said.

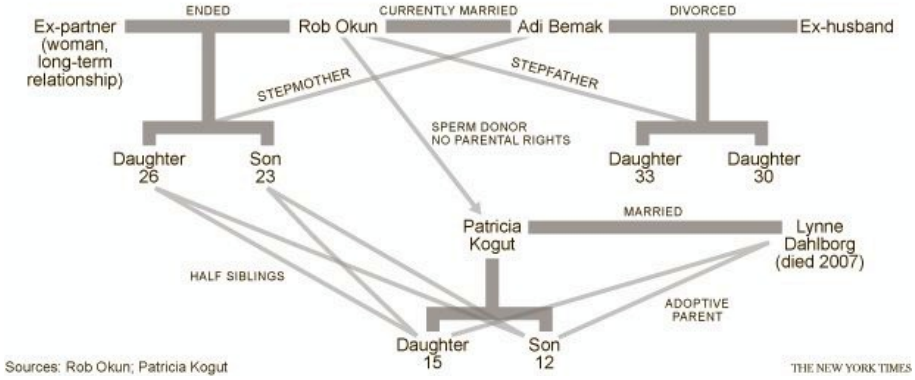
For the last six years, according to United States census data, there have been more unmarried households than married ones. And more same-sex couples are having children using surrogates or sperm donors or by adoption. The California Cryobank, one of the nation's largest sperm banks, said that about one-third of its clients in 2009 were lesbian couples, compared with 7 percent a decade earlier. Even birth certificate reporting is catching up. New questions are being phased in nationally on the standard birth certificate questionnaire about whether, and what type of, reproductive technology was used, according to the National Center for Health Statistics, part of the Centers for Disease Control and Prevention.

Tracing a family tree, though, is more than just an intellectual exercise. There are medical and legal implications, particularly when it comes to death and inheritance. Families, said Melinde Lutz Byrne, president of the American Society of Genealogists, are mostly concerned with who inherits property when a biological relative dies.

Ms. Williams and her sister, though, had other issues to resolve. Ms. Williams, who has a lesbian partner, had a biological child, Jamison, 6, who was conceived through a sperm donor, too. And the sisters wondered how to describe the relationship between Mallory and Jamison, who are not only biological half-siblings, but also cousins. And where did the sperm donors fit in?

A Tangled Family Tree

Rob Okun, a 61-year-old magazine editor from Massachusetts, has four biological children. He has a daughter, 26, and a son, 23, by a woman with whom he had a long-term relationship. He gave up parental rights to two other children, a 12-year-old boy and 15-year-old girl, both the result of sperm donated to a lesbian couple. He has two stepdaughters with his current wife, Adi Bemak.



After months of discussion, they came to a resolution: "Mallory is my daughter and Jennifer is her aunt," said Ms. Ashmore, 38, who lives close to her sister near Minneapolis. At home, Jamison sometimes refers to Mallory as his sister. But at school, said Ms. Williams, 40, "she's his cousin." The sperm donors, they agreed, had no place on the family tree.

For some children, having to explain their family tree can be alienating. "It can cause kids pain in unexpected ways," said Peggy Gillespie, a founder of Family Diversity Projects, a family education advisory group.

At Green Acres last year, Ms. Murphy said, two kindergartners were playing outside when a boy, the son of a single mother, told a classmate that he had an older sister. "You can't have an older sister; you don't have a dad," Ms. Murphy recalled the girl saying. The boy protested; he said he knew his sperm donor, who had a daughter of his own.

Sue Stuever Battel and Bob Battel of Cass City, Mich., will soon have four children. The oldest, Addy, 8, was conceived naturally; Dori, 5, was conceived via a sperm donor. They are adopting two toddler boys. “All four of our kids are 100 percent in our family tree,” Ms. Battel said. “The genetic connection has never mattered.” But the Battels understand that their children may have questions. So they have prepared two sets of baby books: one outlining life with the Battels, the other about each child’s birth parents. The children can choose which details they want to share.

Ms. Battel and her husband also debated whether to include other children born using their donor’s sperm. After all, those children would be biological half-siblings to Dori. Their verdict: “We decided they are not half-siblings, but donor siblings,” Ms. Battel said. “We honor them, but they are not part of the family.”

Jeannette Lofas, founder of Stepfamily Foundation, a family counseling service based in New York City, eschews the traditional family tree for a network of circles (females) and squares (males), with dotted and straight lines to connect married and blood relatives. A live-in lover or nanny can be included, too, though with no connecting lines. “That is how complex we have to think,” Ms. Lofas said.

Rob Okun, a 61-year-old magazine editor from Massachusetts, agreed to donate his sperm to a lesbian couple 16 years ago. Mr. Okun already had two biological children with a longtime female partner and two stepchildren with his current wife. He wanted no role in parenting the children born with his donated sperm, but did want them to know who he was. The couple, Patricia Kogut and Lynne Dahlborg, agreed, and Ms. Kogut gave birth to Lucyna and Nathaniel. Ms. Dahlborg then adopted both children.

“There is the family tree and there is the day-to-day structure of the family,” Ms. Kogut said.

She described the family as having a “triple family tree” that included her, Ms. Dahlborg and Mr. Okun.

For a long time, though, Mr. Okun was uncomfortable with the connection, largely because his mother disapproved. It wasn’t until after her death in 2004 that he considered including the children in his tree. Now, he said, “I make no distinction between my biological and stepchildren.”

For now, Ms. Williams and her sister said they were happy that Mallory and Jamison shared a special bond. But what if one day the two children want to place themselves as brother and sister on their family tree?

“I think I’m fine,” Ms. Ashmore said, tentatively.

Then she added, “But we’ll have to think about it.”

http://www.newscientist.com/article/mg21128203.400-south-koreas-pupils-to-go-paperless-by-2015.html

South Korea's pupils to go paperless by 2015

THE fusty aroma of old textbooks may take you back to your school years, but children starting school after 2015 in South Korea are more likely to recall the smell of an overheating tablet computer.

That's because the education ministry intends to transform schools into paperless digital operations by then, according to Korean news site The Chosun Ilbo.

Under its Smart Education programme, announced on 1 July, the ministry is to spend 2.2 trillion Won ($2 billion) digitising all elementary and secondary school textbooks currently in use so they can be read on a variety of devices, including computers, interactive whiteboards, iPad-like tablets and smartphones. Classes will also be video-streamed online so children who can't come in due to poor health or weather don't miss out.

Children with disabilities may also benefit: e-books could be controlled by eye-tracking or gesture recognition, for example.

http://www.eurekalert.org/pub_releases/2011-07/uom-ngc070711.php

New genetic clues for schizophrenia

De novo mutations more frequent

De novo mutations – genetic errors that are present in patients but not in their parents – are more frequent in schizophrenic patients than in normal individuals, according to an international group of scientists led by Dr. Guy A. Rouleau of the University of Montreal and CHU Sainte-Justine Hospital. The discovery, published today in Nature Genetics, may enable researchers to define how the disease results from these mutations and eventually develop new treatments for it.

"The occurrence of de novo mutations, as observed in this study, may in part explain the high worldwide incidence of schizophrenia," says Dr. Rouleau, who is also Director of the CHU Sainte-Justine Research Center and researcher at the University of Montreal Hospital Research Centre. "Because the mutations are located in many different genes, we can now start to establish genetic networks that would define how these gene mutations predispose to schizophrenia," adds Simon Girard, the student who performed the key experiments that led to this discovery. "Most of the genes identified in this study have not been previously linked to schizophrenia, thereby providing new potential therapeutic targets."

Schizophrenia is a major mental disorder characterized by a wide spectrum of symptoms, including delusions, hallucinations, disturbances in thinking, and deterioration of social behaviours. According to the World Health Organization, as many as 24 million individuals worldwide suffer from schizophrenia and over half of them are not receiving appropriate care to relieve their symptoms.

Dr. Rouleau's team used modern DNA sequencing technologies to identify genetic changes in patients with schizophrenia whose parents showed no signs of the disease. To identify genetic mutations associated with schizophrenia, Dr. Rouleau and his team analysed approximately 20,000 genes from each participant in the study. The research team was especially interested in "de novo" mutations, meaning those that are present in patients but absent in their parents.

"Our results not only open the door to a better understanding of schizophrenia," adds Dr. Rouleau. "They also give us valuable information about the molecular mechanisms involved in human brain development and function."

The identification of de novo mutations in schizophrenia supports the hypothesis proposed by Dr. Rouleau in 2006, that this type of mutation plays a role in several diseases affecting brain development such as autism, schizophrenia and mental retardation.

About the study: *"Increased exonic de novo mutation rate in probands affected with schizophrenia" was published online on July 10, 2011 in Nature Genetics. The authors are Simon L. Girard, Julie Gauthier, Anne Noreau, Lan Xiong, Sirui Zhou, Loubna Jouan, Alexandre Dionne-Laporte, Dan Spiegelman, Edouard Henrion, Ousmane Diallo, Pascale Thibodeau, Isabelle Bachand, Jessie Y.J. Bao, Amy Hin Yan Tong, Chi-Ho Lin, Bruno Millet, Nematollah Jaafari, Ridha Joober, Patrick A. Dion, Si Lok, Marie-Odile Krebs, and Guy A. Rouleau.*

This research was funded in large part by Genome Canada and Génome Québec, with contributions by the Canadian Institutes of Health Research (CIHR) and the Brain and Behavior Research Foundation (formerly NARSAD, the National Alliance for Research on Schizophrenia and Depression) and the University of Montreal. The University of Montreal is officially known as Université de Montréal.

http://www.eurekalert.org/pub_releases/2011-07/ul-sdf070711.php

Scientists discover first gonorrhea strain resistant to all available antibiotics

An international research team has discovered a strain of gonorrhea resistant to all currently available antibiotics.

This new strain is likely to transform a common and once easily treatable infection into a global threat to public health. The details of the discovery made by Dr. Magnus Unemo, Dr. Makoto Ohnishi, and colleagues will be presented at the 19th conference of the International Society for Sexually Transmitted Disease Research (ISSTDR) which runs July 10-13 in Quebec City, Canada.

The team of researchers successfully identified a heretofore unknown variant of the bacterium that causes gonorrhea, Neisseria gonorrhoeae. Analyzing this new strain, dubbed H041, allowed researchers to identify the genetic mutations responsible for the bacterium's extreme resistance to all cephalosporin-class antibiotics—the last remaining drugs still effective in treating gonorrhea.

"This is both an alarming and a predictable discovery," noted Dr. Unemo of the Swedish Reference Laboratory for Pathogenic Neisseria. "Since antibiotics became the standard treatment for gonorrhea in the 1940s, this bacterium has shown a remarkable capacity to develop resistance mechanisms to all drugs introduced to control it."

"While it is still too early to assess if this new strain has become widespread, the history of newly emergent resistance in the bacterium suggests that it may spread rapidly unless new drugs and effective treatment programs are developed," Dr. Unemo continued.

Gonorrhea is one of the most common sexually transmitted diseases in the world. In the U.S. alone, according to the Center for Disease Control and Prevention (CDC), the number of cases is estimated at 700,000 annually.

Gonorrhea is asymptomatic in about 50% of infected women and approximately 2-5% of men. When symptomatic, it is characterized by a burning sensation when urinating and pus discharge from the genitals. If left untreated, gonorrhea can lead to serious and irreversible health complications in both women and men.

In women, the infection can cause chronic pelvic pain and ectopic pregnancy. It can lead to infertility, mostly in women but also in men, and it increases the risk of HIV transmission. In 3-4% of cases, untreated infections spread to the skin, blood, joints, or even the heart and can cause potentially mortal lesions. Babies born of infected mothers are at high risk of developing serious blood and joint infections, and passage through the birth canal of an infected mother can cause blindness in the infant.

http://www.bbc.co.uk/nature/14048754

Tiny snails survive digestion by birds

By Ella Davies Reporter, BBC Nature

Snails are able to survive intact after being eaten by birds, according to scientists.

Japanese white-eyes on the island of Hahajima, Japan feast on tiny land snails. Researchers found that 15% of the snails eaten survived digestion and were found alive in the birds' droppings. This evidence suggests that bird predation could be a key factor in how snail populations spread.

It is well known that plant seeds are dispersed by birds that eat fruit. But in findings published in the Journal of Biogeography, researchers from Tohoku University, Japan investigated whether invertebrates could also spread in this way. Previous research has shown that pond snails can survive being eaten by fish but the same was not known for land snails.

Studies of the diets of birds on the island of Hahajima identified the Japanese white-eye's preference for the tiny land snail Tornatellides boeningi. In the lab scientists fed the birds with the snails to find out whether any survived the digestive process. "We were surprised that a high rate, about 15 percent, of snails were still alive after passing through the gut of [the] birds," explained researcher Shinichiro Wada.

They also studied the genetic differences of T. boeningi populations found across the island and discovered considerable variation.

Rather than only mating with nearby snails, these results suggested that different populations made contact despite their geographical isolation. "Biogeography of wingless terrestrial invertebrates, in particular snails, is often faced with mysterious long distance dispersal patterns that can only be explained by hand waving arguments involving birds' feet or guts or cyclones," said Mr Wada. "This is the first study showing that birds can indeed transport a substantial [number of] micro land snails in their gut alive."

One snail in particular identified how numerous snails could travel over distances via bird droppings. "One of the snails fed to the bird gave birth to juveniles just after passing through the gut," Mr Wada told the BBC.

The main factor allowing the snails to survive being eaten is their small size, according to the scientists. Tornatellides boeningi (c) Shinichiro Wada T. boeningi is the most common species of snail on Hahajima

At an average of 2.5mm the micro snails fared much better than larger species in previous studies whose shells were severely damaged when eaten by birds. Mr Wada and his colleagues said further study is required to find out whether the tiny snails have other adaptations that allow them to survive.

Hahajima lies 1000km south of Tokyo in the Bonin Islands archipelago, known as the Ogasawara Group in Japan. The islands were recently added to the UNESCO World Heritage List "for the wealth of their ecosystems which reflect a wide range of evolutionary processes".

http://medicalxpress.com/news/2011-07-cholera-surges-haiti-central-plateau.html

Cholera surges in Haiti's Central Plateau

(AP) -- ***An old man with sunken cheeks is so dehydrated he must be carried down the dirt lane to a clinic where the air is thick with the odor of bleach. Minutes later, a worried father enters, carrying a two-year-old girl in a frilly white dress, her eyes sunken and unfocused.***

Such scenes are once again common in Haiti where a deadly cholera epidemic that swept the country last fall has returned, fueled by weeks of heavy rains that have helped spread the waterborne bacteria that flourishes in the country's rivers and rice fields.

The treatment center in Mirebalais, a dusty crossroads town a one-hour drive north from the capital, Port-au-Prince, is again seeing dozens of new patients a day, many arriving at the edge of death from dehydration.

The center saw a fivefold jump from April to May and it hasn't let up since, said Louise Ivers, senior health and policy adviser to the U.S.-based Partners in Health, which runs the clinic in association with the Health Ministry.

"When people come here, they're in critical condition, ready to die," said Francole Adonis, who registers the new arrivals at the center. "They're collapsing in the yard. The situation is horrible."

The number of new cases each day spiked to 1,700 day in mid-June, three times as many as sought treatment in March, according to the Health Ministry. The daily average dropped back down to about 1,000 a day by the end of June but could surge again as the rainy season develops.

The epidemic began in rural Haiti last fall, likely brought by U.N. peacekeepers from Nepal. It swept through the countryside of an impoverished nation already overwhelmed by a January 2010 earthquake that left hundreds of thousands homeless and by political instability following disputed elections.

Cholera has sickened at least 370,000 people and killed more than 5,500 since the outbreak started in October, according to the Health Ministry. The precise total is unknowable since many Haitians live in remote areas with no access to health care. The disease is relatively easy to treat if people can get help in time.

When the outbreak began, foreign volunteers descended on Haiti to staff rural clinics and help provide access to clean drinking water. Many feared it would devastate Port-au-Prince, where hundreds of thousands of people were living in densely packed refugee camps. But people in the capital had access to latrines and potable water, thanks to the huge international aid effort, and it was spared the worst of the disease.

The disease faded in winter and spring, when rain is less frequent, and many aid workers moved on. U.N. troops in Haiti turned their attention to the country's many other pressing problems.

Now there is a fear among aid workers who remain that there won't be enough resources if the latest surge gets much worse.

"If the cases continue on the same path we could see a lot of health-worker fatigue," said Cate Oswald, a Partners in Health coordinator. "The health care force is already stretched thin."

Oswald recalled how volunteers were everywhere during the first response to the outbreak, providing supplies such as bleach, which is sprayed on shoes and throughout the centers to prevent the spread of cholera.

"At one point we were worrying about too much duplication of efforts," Oswald said.

"Then the rains started coming." Oswald paused. "And cholera was still here."

The rains have deluged the Caribbean, including Haiti, in recent weeks. The rivers of the Artibonite, where rural Haitians drink, bathe and wash their clothes, are flowing through a valley ringed by chocolate-brown mountains, and cholera is again raging in the region.

"Sometimes, it's 50 patients a day. Sometimes it's 200 patients a day," Pierre-Marie Cherenfant, a Mirebalais doctor who oversees the clinic, said of the flow of cases coming to the facility.

Smaller treatment centers throughout Haiti's Central Plateau are also reporting sharp increases in recent weeks, though the most recent breakdown for Mirebalais is not yet available, Ivers said.

There are signs of a growing problem in Carrefour, a large and crowded city on the right at the western edge of the capital. Treatment centers there were reporting more than 300 new cases a day in early June, more than twice what they were seeing back in November, according to the aid group Oxfam.

An emergency latrine built in Carrefour collapsed as heavy rains fell and the waste spilled into a camp, according to a June report by the U.N.'s shelter cluster.

UNICEF's Mark Henderson, head of the U.N.'s water and sanitation response, said many non-governmental organizations tapped into earthquake-related funds in the fall in a desperate effort for treatment and prevention. That money is no longer available.

"The initial funding that everybody received has come to an end," Henderson said.

Though the number of new cases is again rising, Health Ministry statistics show the number of deaths is far less than what it was during the initial surge. On a single day in mid-December, about 110 people died, compared to almost 20 in a single day in mid-June, according to the Health Ministry. The mortality rate is now under 2 percent, half what it was when the outbreak started.

The reason for the lower percentage of deaths is that people aren't waiting to get better, as many did when the disease first emerged, and instead are rushing for help. A public health campaign has featured radio jingles and text messages to educate people about the disease.

Haiti had never had a reported cholera outbreak until October but the initial cause of the outbreak is now no longer so mysterious.

This month, an article in the U.S. Centers for Disease Control and Prevention journal said evidence "strongly suggests" that a Nepalese peacekeeping mission, based in Mirebalais, inadvertently imported the disease. The article points to "an exact correlation" in time and place between the arrival of a Nepalese battalion from an area of its South Asian homeland that was experiencing a cholera outbreak and the appearance of the first cases in a river a few days later.

The treatment center in Mirebalais started as a single one-story building. It quickly grew to include several large tents and temporary shelters, and now they are expanding again.

As Associated Press journalists toured the site recently, construction workers prepared the foundation for new buildings.

Thunder boomed in the background as health worker Rosette Jean-Philippe darted among beds and cots, adjusting IVs hooked to thin wrists and replacing bags of rehydration fluid.

"When you're here, that's what you have to do to save lives," Jean-Philippe said.