

Consumption of 'good salt' can reduce population blood pressure levels

An increased intake of 'good' potassium salts could contribute significantly to improving blood pressure at the population level. The favourable effect brought about by potassium is even estimated to be comparable with the blood pressure reduction achievable by halving the intake of 'bad' sodium salts (mostly from table salt). Those are the conclusions drawn by Linda van Mierlo and her colleagues at Wageningen University, part of Wageningen UR, and Unilever in their investigation of the consumption of potassium in 21 countries. An article describing their findings appeared in the journal Archives of Internal Medicine on 13 September.

The risk of developing cardiovascular diseases rises as blood pressure increases. In Western countries only 20-30% of the population has 'optimal' blood pressure, with the systolic (maximum) pressure being lower than 120 mm Hg* and the diastolic (minimum) pressure lower than 80 mm Hg. Blood pressure increases with age in most people. Men more often have a higher blood pressure than women.

Diet and lifestyle plays an important role in managing blood pressure. High intakes of sodium and low intakes of potassium have unfavorable effects on blood pressure. Therefore, reducing the consumption of sodium and increasing the consumption of potassium are both good ways to improve blood pressure.

The study carried out by food researchers from the Human Nutrition department at Wageningen University and from the Nutrition & Health department at Unilever demonstrates that the average potassium intake in 21 countries including the US, China, New Zealand, Germany and the Netherlands varies between 1.7 and 3.7 g a day. This is considerably lower than the 4.7 g a day, which has been recommended based on the positive health effects observed at this level of intake.

A hypothetical increase in the potassium intake to the recommended level would reduce the systolic blood pressure in the populations of these countries by between 1.7 and 3.2 mm Hg. This corresponds with the reduction that would occur if Western consumers were to take in 4 g of salt less per day. The intakes of both potassium and sodium are therefore of importance in preventing high blood pressure.

Earlier studies have shown that salt reduction of 3 g per day in food could reduce blood pressure and prevent 2500 deaths per year due to cardiovascular diseases in the Netherlands. In Western countries, salt consumption can be as high as 9-12 g a day whereas 5 g is the recommended amount according to WHO standards. Most household salt is to be found in processed foods such as bread, ready-made meals, soups, sauces and savoury snacks and pizzas. An effective way of increasing potassium intake is to follow the guidelines for healthy nutrition more closely, including a higher consumption of vegetables and fruit. In addition, the use of mineral salts in processed foods - by which sodium is partly replaced by potassium - would contribute to an improved intake of both sodium and potassium.

Lead Poisoning in Samurai Kids Linked to Mom's Makeup

By Rebecca Kessler, LiveScience Contributor

Lead poisoning isn't just a problem for post-industrial city kids - the children of samurai suffered from it too, a new study suggests. An analysis of bones of children who lived as many as 400 years ago showed sky-high lead levels, which scientists now think came from their mothers' makeup.

During the Edo period, from 1603 to 1867, Japan was ruled by a series of shoguns. Below the shogun, a few hundred feudal lords presided over the country's agricultural domains, each from within a castle-town headquarters that was protected by a cadre of samurai military nobles.

At the castle town of Kokura, in the modern city of Kitakyushu, samurai and their families were buried in large clay pots at a local Zen Buddhist temple. A team lead by Tamiji Nakashima, an anatomist at the University of Occupational and Environmental Health in Kitakyushu, studied the remains of 70 samurai men, their wives and children. The researchers sampled the lead in rib bones, and X-rayed some of the children's long arm and leg bones looking for signs of lead poisoning.

What they found surprised them: kids with enough lead in their systems to cause severe intellectual impairment. Children under age 3 were the worst off, with a median level of 1,241 micrograms of lead per gram of dry bone. That's more than 120 times the level thought to cause neurological and behavioral problems today and as much as 50 times higher than levels the team found in samurai adults. Older kids' levels were lower, but still very high.

What's more, five of the children had unusual bone enlargements, and X-rays revealed banding that only turns up in children with at least 70 micrograms of lead per deciliter of blood.

Scientists now understand that blood-lead levels of just 10 micrograms per deciliter can cause "lowered intelligence, reading and learning disabilities, impaired hearing, reduced attention span, hyperactivity, and antisocial behavior," according to an Environmental Protection Agency website. And harmful effects have been noted at even lower levels.

Poison powder

Where might the samurai children have encountered enough lead to cause such extraordinary contamination? Globally, lead contamination is known to be much higher since the industrial revolution than at any other time in history, and Edo-period environmental levels were generally low, as were levels in Kokura.

In this and previous studies, Nakashima and colleagues showed that samurai women had higher lead levels in their bones than samurai men did, and the researchers' suspicions settled on the women's cosmetics. A lead-based white face powder was fashionable among the elite during the Edo period, introduced by celebrity geisha, courtesans and Kabuki actors.

The youngest children most likely picked lead up while nursing, Nakashima and his colleagues surmise. Little did the samurai mamas know, their quest for beauty may have stunted their babes' development. Judging by the ones who didn't make it to adulthood, the authors suggest that many surviving samurai children during the Edo period probably suffered from severe intellectual impairment.

And there's reason to believe lead poisoning may have been widespread among elites: Nakashima and colleagues showed in an earlier study that samurai and merchants living in Kokura had much higher lead levels in their bones than did farmers and fishermen living nearby. They also point to individual shoguns known to have suffered from intellectual and health problems associated with lead poisoning.

"We assume that facial cosmetics were one of the main sources of lead exposure among the samurai class because they were luxuries at that time," Nakashima explained in an e-mail. "The lower class people (farmers and fishermen) did not have the luxury of using cosmetics and the laws strictly prohibited [them] from using cosmetics because they were workers."

Political effects

Nakashima and his team think a ruling class addled by lead poisoning may have contributed to political instability, and ultimately to the collapse of the seven-century-old shogun system in 1867, when power shifted cataclysmically from the shogun to the emperor, and life in Japan changed for good.

It wouldn't be the first time lead poisoning rang in the end of an era. Others have suggested that "plumbism" among the Roman elite - whose fancy food and wine was laced with lead leached from cooking equipment - contributed to the fall of the Roman Empire.

The new research will be published in a forthcoming issue of the Journal of Archaeological Science.

Brain stimulation can help partially paralyzed stroke patients regain use of their muscles

Stroke patients who were left partially paralysed found that their condition improved after they received a simple and non-invasive method of brain stimulation, according to research in the September issue of the European Journal of Neurology.

Researchers from the Ain Shams University in Cairo, Egypt, studied 60 patients with ischaemic stroke - where the blood supply is reduced to the brain - who had been left with mild to moderate muscle weakness down one side of their body.

Twenty of the randomly assigned treatment group received repetitive transcranial magnetic stimulation (rTMS) applied at 5-Hz over the brain hemisphere affected by the stroke and the other 20 received 1-Hz stimulation of the unaffected hemisphere. The remaining 20 formed the control group, receiving inactive placebo doses of the treatment. All patients received the same physical therapy.

"When we compared the results between the three groups, we found that both of the treatment groups showed significant motor function recovery" says co-author Anwar El Etribi, Professor of Neurology and Psychiatry at the University. "No improvements were seen in the control group who had received the placebo treatment and the same physical therapy protocol."

The majority of the patients (95 per cent) had suffered their stroke in the last three years, having been enrolled in the study at least one month after their stroke. However, there was no difference between the level of clinical improvement and the interval since the patients' strokes.

"We believe that people develop partial paralysis down one side after they have a stroke because the hemispheres of the brain become unbalanced" explains Professor Etribi. "The hemisphere that has not been affected can become over-active, while the damaged hemisphere can become inhibited."

"Our treatment worked on the theory that increasing the activity of the hemisphere affected by the stroke and reducing the activity of the unaffected hemisphere can reduce muscle weakness and improve overall motor function."

The 60 patients who took part in the study had similar baseline characteristics, apart from a lower incident of ischaemic heart disease in the 5-Hz rTMS group, which was unlikely to have had an effect on recovery.

Patients averaged just under 54 years of age and just over two-thirds were male.

The patients were randomly assigned to one of the three groups and magnetic stimulation was administered in three different ways:

* Patients in group one received a daily 5-Hz session for 10 days over the part of the brain affected by the stroke. This equated to 750 pulses per session and 7,500 pulses over the course of the treatment.

* Patients in group two received a daily 1-Hz session for 10 days over the part of the brain not affected by the stroke. This equated to 150 pulses per session and 1,500 pulses over the course of the treatment.

* The "treatment" in the placebo group was applied in the same way as group two, but the stimulator was angled at 90 degrees to render it ineffective.

Patients were clinically assessed at baseline and at two, four, eight and 12 weeks using a range of tools to determine motor function and cognitive status.

Further details of the scores and the treatment sessions are outlined in detail in the full paper.

"Our study shows that using rTMS can help patients who have suffered an ischaemic stroke and are experiencing partial paralysis on one side of their body to regain motor function" says Professor Etrubi. "We also found that the time interval from stroke to treatment did not have an effect on how well the patient recovered.

"It appears that inhibitory and stimulatory rTMS may well prove useful tools in long-term programmes to rehabilitate stroke patients."

More information: Repetitive transcranial magnetic stimulation at 1Hz and 5Hz produces sustained improvement in motor function and disability after ischaemic stroke. Emara et al. European Journal of Neurology. 17, pp1203-1209. (September 2010). DOI: 10.1111/j.1468-1331.2010.03000.x

Public handwashing takes a hike

Mom's advice about cleaning your hands may finally be starting to get through. In the latest observational study sponsored by the American Society for Microbiology and the American Cleaning Institute (formerly The Soap and Detergent Association), 85% of adults washed their hands in public restrooms, compared with 77% in 2007.

The 85% total was actually the highest observed since these studies began in 1996. The results were announced at the Interscience Conference on Antimicrobial Agents and Chemotherapy, an infectious disease meeting sponsored by the American Society for Microbiology.

In a separate telephone survey, 96% of adults say they always wash their hands in public restrooms, a percentage that has remained relatively constant over the years.

On behalf of ASM and ACI, Harris Interactive discreetly observed 6,028 adults in public restrooms in August 2010 to note whether or not people washed their hands. Researchers returned to six locations in four cities where two previous studies were conducted: Atlanta (Turner Field), Chicago (Museum of Science and Industry, Shedd Aquarium), New York City (Grand Central Station, Penn Station), and San Francisco (Ferry Terminal Farmers Market).

Guys Washing Better - But Don't Take Them Out to the Ballgame

Men stepped up to the sink a bit more than they have in the past when it comes to public handwashing. More than three-quarters of the guys (77%) washed their hands publicly in 2010, compared to 66% in 2007.

The men still strike out more on handwashing in sporting venues, though. Turner Field by far fielded the worst percentage for the guys - barely two-thirds (65%) - though that's still better than just 57% in 2007. Perhaps as a counter to the men's poor handwashing practices, Turner Field brought out the best in women's handwashing among all venues: 98%. Overall, the rate of women washing their hands in public restrooms improved from 88% in 2007 to 93% in 2010.

"We are really pleased to see these results, which suggest that our campaign is being effective," said ASM spokesperson Dr. Judy Daly, Director of Clinical Microbiology at Children's Primary Medical Center, Salt Lake City. "Although the venues were different, our first observational study in 1996 found only 68% overall washing up in public restrooms, and that declined to an all-time low of 67% when we repeated the study in 2000. We hope that as a result of an increased focus on handwashing in the media over these years, as well as increased public awareness of infectious disease risks, behavior really is changing."

"The message is that people are getting the message," said Nancy Bock, ACI Vice President of Consumer Education. "Between mom's common sense advice and the recent pandemic scare, people now seem to realize the importance of when and how you wash your hands."

First-Place Tie Between Windy City, City by the Bay

The best observed handwashing in 2010 was in Chicago and San Francisco, with 89% of adults lathering up in public restrooms. Atlanta was next (82%), followed by New York City (79%). The venue with the best overall handwashing regimen was Chicago's Museum of Science and Industry (93%).

More of Us Are Getting Behind Handwashing After Changing Diapers

In a 2010 telephone survey of 1,006 American adults, Harris Interactive's survey for ASM and ACI found the vast majority of us say we always wash our hands after using the bathroom at home (89%).

More Americans now report that they always wash their hands after changing a diaper (82%), an increase from 2007 (73%). Women are better than men at this practice: 88% of the ladies say they always wash their hands after diaper duty, compared to 80% of the guys.

Food for Thought

Those of us who say we always clean our hands before handling or eating food is staying about the same: 77% in 2010, compared to 78% in 2007. Among women, 83% say they clean their hands before touching their food; just 71% of men say they do. And only 39% of Americans say they always wash their hands after coughing or sneezing.

"Although we are happy about the latest results, there is still work to do," Daly said. "Only a minority indicate they wash their hands after coughing or sneezing. Handwashing in this context is particularly important because we now know that many respiratory and gastrointestinal illnesses are transmitted primarily by hand contact when contaminated hands touch the mucous membranes of the eyes, nose, or mouth."

"Whether it's cold and flu season or baseball season, handwashing is a no-brainer," said ACI's Nancy Bock. "Washing with soap and water for 20 seconds or more is a simple way to stay healthy. And if you're out and about, hand sanitizers or hand wipes are good alternatives for keeping your hands clean."

Good Hygiene Online

ASM and ACI offer educational hand hygiene materials you can download online at www.washup.org and www.cleaninginstitute.org/clean_living/hands_publications.aspx.

Methodology

Harris Interactive observed the behavior of 6,028 adults who appeared to be age 18 and older in public restrooms located at major public attractions in the U.S. and recorded whether or not they washed their hands after using the facilities.

The research was conducted in four cities and at six different locations:

Atlanta - Turner Field

Chicago - Museum of Science and Industry and Shedd Aquarium

New York City - Penn Station and Grand Central Station

San Francisco - Ferry Terminal Farmers Market

Observers discreetly watched and recorded whether or not adults using public restrooms washed their hands. Observers were instructed to groom themselves (comb their hair, put on make-up, etc.) while observing and to rotate bathrooms every hour or so to avoid counting repeat users more than once. Observers were also instructed to wash their hands no more than 10% of the time.

The data from the telephone survey are based on a nationally representative sample, stratified by census region and weighted by gender, education and ethnicity composition to represent the U.S. population. The 1,006 telephone interviews were conducted between August 4-8, 2010. Provided by American Society for Microbiology

Recovery from autism

A University of Connecticut expert says early intervention can help some children recover from autism.

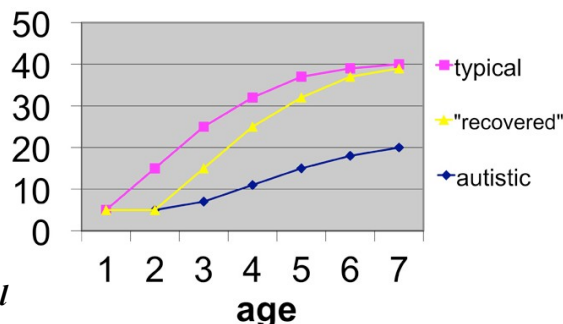
When Deborah Fein first met "Catherine," the 13-month-old child was almost completely nonverbal. She avoided eye contact, did not respond to her name, and displayed little facial expression - all classic signs of autism, a complex developmental disease that affects 1 in 110 births in the United States.

The top curve shows the hypothetical development of a skill in a normal (typical) child. The lowest curve shows the development of skills (for example, expressive language) in an autistic child. The "recovered child" starts by looking like the autistic child, then accelerates sharply and reaches a normal level before leveling off. Graph supplied by Deborah Fein

Yet after five months of targeted intervention with a home-based therapist, Catherine, who had a regressive form of autism spectrum disorder, began recovering some of the communication and social skills she had lost. Fein, Board of Trustees Distinguished Professor of Psychology and Pediatrics at UConn, was intrigued.

By age three, Catherine was doing well enough to enroll in a private preschool for typically developing children where, with additional support, she continued to progress. By age five, Catherine was enrolled in a public school kindergarten with no autism diagnosis, no individualized education plan, and no ongoing specialized interventions of any kind.

Theoretical Curves



Now, years later, Fein's research into recovery from autism has brought her international attention and offered hope to thousands of parents around the globe. Catherine remains a subject in one of Fein's ongoing studies and is one of many formerly autistic children who, Fein says, are now living typical lives with no significant impairments.

"They are doing just great. They are not having any major behavioral issues," says Fein, whose work has been featured on NBC's Today Show and in The New York Times and TIME magazine. "Their cognitive functioning is good. Their academics are excellent. Their reading comprehension is mostly above grade level. Their math is terrific, their memory is terrific, and their language is terrific."

Based on her research, Fein believes that at least 10 percent, and possibly as many as 20 percent, of children who receive a diagnosis of autism or autism spectrum disorder can "recover" from it if they are provided the right kind of intensive behavioral therapy.

Fein cautions that not all children achieve the same degree of progress from the treatment, which can take years and which professionals refer to as Applied Behavior Analysis (ABA). In fact, she says, most children with autism will remain autistic despite therapists' and parents' best efforts. But in looking at a group of 20 "recovered" children between the ages of 9 and 18 who were once diagnosed with autism, Fein says she recognized a pattern.

"Almost all of the kids in recovery received intense behavioral intervention and they tended to be diagnosed with autism earlier, almost a year earlier," says Fein, a certified clinical neuropsychologist and former board member of the American Academy of Clinical Neuropsychology. "A higher percent of the recovered group also received more than 20 hours a week of intense behavioral intervention compared with the comparison group of kids with autism who have not recovered."

Fein arrived at UConn in 1976 and has since received more than \$15 million in research grants from the National Institute of Mental Health and other sources to pursue her analysis. Geraldine Dawson, chief science officer for the national advocacy group Autism Speaks and a research professor of psychiatry at the University of North Carolina at Chapel Hill, calls Fein a leader in her field.

"Dr. Fein has been a true leader in the field of autism research," says Dawson. "She helped develop the most widely used screener for autism in toddlers. More recently, she was the first to validate that children with autism can lose their diagnosis. In both of these areas, as well as others, Dr. Fein's work has been very influential in shaping the field."

Fein says that the children most likely to see improvement from Applied Behavior Analysis are those with generally milder symptoms and higher IQs who are diagnosed early. She also says that those who have recovered from autism tend to have some "residual psychiatric vulnerability" that may include depression, anxiety, phobias, and tics, although the tics usually subside by late adolescence.

Currently, Fein is working with other specialists in analyzing brain scans of the individuals in her study to see whether the size, structure, and networks of the brains of the recovered children look like those of children with typical development or the brains of those with autism.

"Most professionals still think that autistic kids cannot recover," says Fein. "But the parents, they know they had an autistic kid and now they know this kid is doing great, so that is validation. Here is a national researcher who is demonstrating that what they know to be true is true."

Fein is a highly respected researcher who, along with former graduate student Diana Robins (now a researcher at Georgia State University), modified an early detection "checklist" for autism that has become the most widely used screening method around the world and has been published in 25 languages. Fein and her research team are currently working on revising the checklist from 23 questions to 10, to simplify the process and make it more accessible for parents.

Fein says she's been fascinated with autism since she first worked with children with the disability in the early 1970s.

"They are just endlessly fascinating, because their behavior is both inexplicable and in some ways consistent from kid to kid," she says. "Every year, the field gets more confusing at higher and higher levels. Thirty years ago, autism was thought not to be a genetic illness. Now it is considered one of the most heritable of all the psychiatric illnesses. Yet when you try to pin down what the genetics are, it's as confusing as any illness. It's a tangled mess. There's hardly a segment of the chromosome that hasn't been implicated, yet the findings have been inconsistent from study to study."

In addition to her research, Fein teaches undergraduate and graduate courses in neuropsychology at UConn, and is editing a volume on the neuropsychology of autism for Oxford University Press. In 2007, she published a book on autism for teachers.

Looking back, Fein says that despite all the unknowns, there have been significant advances in the diagnosis and treatment of autism.

"Things are much better," she says. "Many more kids are having better outcomes. Even kids who are very limited, their behavior is under better control and their parents have a much better idea of what to expect. When I used to go out 30 years ago with a kid with a physical disability or autism, people would stare. One woman followed us around crying. People are much more understanding today. Public awareness has really increased."

Provided by University of Connecticut

Video Games Lead to Faster Decisions That Are No Less Accurate

Cognitive scientists from the University of Rochester have discovered that playing action video games trains people to make the right decisions faster. The researchers found that video game players develop a heightened sensitivity to what is going on around them, and this benefit doesn't just make them better at playing video games, but improves a wide variety of general skills that can help with everyday activities like multitasking, driving, reading small print, keeping track of friends in a crowd, and navigating around town.

In an upcoming study in the journal *Current Biology*, authors Daphne Bavelier, Alexandre Pouget, and C. Shawn Green report that video games could provide a potent training regimen for speeding up reactions in many types of real-life situations.

Video games have grown in popularity to the point where 68 percent of American households have members that play them, according to a 2009 report by the Entertainment Software Association.

The researchers tested dozens of 18- to 25-year-olds who were not ordinarily video game players. They split the subjects into two groups. One group played 50 hours of the fast-paced action video games "Call of Duty 2" and "Unreal Tournament," and the other group played 50 hours of the slow-moving strategy game "The Sims 2."

After this training period, all of the subjects were asked to make quick decisions in several tasks designed by the researchers. In the tasks, the participants had to look at a screen, analyze what was going on, and answer a simple question about the action in as little time as possible (i.e. whether a clump of erratically moving dots was migrating right or left across the screen on average). In order to make sure the effect wasn't limited to just visual perception, the participants were also asked to complete an analogous task that was purely auditory.

The action game players were up to 25 percent faster at coming to a conclusion and answered just as many questions correctly as their strategy game playing peers.

"It's not the case that the action game players are trigger-happy and less accurate: They are just as accurate and also faster," Bavelier said. "Action game players make more correct decisions per unit time. If you are a surgeon or you are in the middle of a battlefield, that can make all the difference."

The authors' neural simulations shed light on why action gamers have augmented decision making capabilities. People make decisions based on probabilities that they are constantly calculating and refining in their heads, Bavelier explains. The process is called probabilistic inference. The brain continuously accumulates small pieces of visual or auditory information as a person surveys a scene, eventually gathering enough for the person to make what they perceive to be an accurate decision.

"Decisions are never black and white," she said. "The brain is always computing probabilities. As you drive, for instance, you may see a movement on your right, estimate whether you are on a collision course, and based on that probability make a binary decision: brake or don't brake."

Action video game players' brains are more efficient collectors of visual and auditory information, and therefore arrive at the necessary threshold of information they need to make a decision much faster than non gamers, the researchers found.

The new study builds on previous work by Bavelier and colleagues that showed that video games improve vision by making players more sensitive to slightly different shades of color.

Journal Reference: I. C. Shawn Green, Alexandre Pouget, Daphne Bavelier. *Improved Probabilistic Inference as a General Learning Mechanism with Action Video Games. Current Biology, 2010; 20 (17): 1573-1579 DOI: 10.1016/j.cub.2010.07.040*

Air Force Invests in 'Batman' Technologies for Soldiers

By Adam Hadhazy, TechNewsDaily Staff Writer

A military program named for and inspired by the superhero Batman is bringing together advanced technologies to equip U.S. Special Forces soldiers for the 21st century.

Started by the Air Force in 2004, BATMAN – short for Battlefield Air Targeting Man-Aided kNowledge – aims to modernize the gear that commandos take with them on covert missions. "In the earliest stages when we were coming up with a name for the program, we were perceived as having a lot of gadgets," said Reggie Daniels, BATMAN program engineer at Wright Patterson Air Force Base in Ohio. "[Batman's] devices allow him to have an advantage. That is what we're trying to do." Fittingly, the motto of the program is "lighter, smarter, deadlier."

Regarding the first objective, elite Air Force soldiers often must lug up to 160 pounds (73 kilograms) of equipment during a mission, Daniels said. This equipment includes communications gear, helmet displays, a headset and a computer, plus a host of batteries to keep all these electronics juiced in the field.

Special ops missions include setting up runways and landing zones as well as retrieving injured people from aircraft down behind enemy lines. "They have a very dangerous job," said Daniels.

Yet in many cases, Special Forces' outdated gear has overly burdened them, impeded their time-critical decision-making, or simply not been up to the task at hand, he added. Before recent battlefield incidents spurred reform, Special Forces "were basically using paper and pencil and calculating [their positions in the field] and they had to hobble equipment together that wasn't supposed to be together," said Daniels.

In one particular disaster in Afghanistan, an improperly reinitialized piece of equipment essentially called in an airstrike on the Special Forces' position, killing a number of troops, said Daniels, though he demurred on the details. The Department of Defense wanted to ensure that this sort of incident would never happen again, and thus BATMAN was born.

To the Batcave

The military version of Bruce Wayne's Batcave is a laboratory at Wright Patterson Air Force Base. This is where Daniels and his colleagues devise, test and integrate technologies to boost Special Forces' effectiveness.

Although there is no "Batsuit" per se, the BATMAN program does center around what Daniels called the "human chassis," or the idea of the body as a scaffold for all of a mission's appropriate gear.

For example, components such as communications antennas have been placed closer to the torso rather than at distances that can tax a soldier's balance, Daniels said.

A key BATMAN achievement has been reducing the weight of carried batteries by 25 percent. New fuel cells powered by methanol actually get lighter as the methanol is consumed, Daniels said, so instead of toting drained batteries, a soldier's load decreases over time.

BATMAN has additionally pioneered the use of a small, chest-mounted computer to provide warriors with real-time logistical and tactical information. Speech recognition, or telling one's equipment what to do – which is arguably more Inspector Gadget than Batman – is also in the works.

Fancy gizmos

Other technologies brought to bear in the BATMAN initiative include a device that soldiers throw over low-voltage, overhead power lines to draw electricity.

"The time spent by [Special Forces] in the field is limited by how long their batteries last," said Dave Coates, lead test engineer at Ohio-based Defense Research Associates (DRA). "When those batteries die, they've got to come back in." The DRA-developed device, the Remote Auxiliary Power System – though better known as the Bat Hook – was similarly inspired by the Dark Knight.

A Special Forces soldier working with DRA said, "You know what would be really cool?" recalled Coates. "Something like what Batman has on his belt that he can take out and wing it up to a power line and get power."

The black, stereo remote-size Bat Hook has a notch that catches onto a power line and then a tiny razor cuts into the wire's insulation. The Bat Hook slurps down energy into its cable's housing, where the alternating current is converted into the direct current fed into electronics. Coates said he weighted the device such that it easily pops off a wire as well once charging is done.

Another DRA technology, a so-called KeCo switch, allows soldiers to manually toggle between "line of sight" and satellite-enabled communications on their tactical radios. Pre-KeCo, soldiers had to physically swap out an antenna when switching from talking to nearby compatriots over to contacting command headquarters.

Building a better Batman

Some BATMAN technologies have already debuted while others continue making progress as prototypes, Daniels said. Down the road, he looks forward to eliminating many of the wires that link elements of BATMAN technology, such as the ones that run from the wearable computer to the helmet display and to an operator's rucksack.

A San Diego-based company called Torrey Pines Logic is developing a non-radio frequency, light-based mode of wireless communication that could make these snag-hazard wires disappear.

The deployed technology will be both "eye-safe" and compatible with the low-light levels required of equipment used clandestinely at night, Daniels said.

Daniels envisions a time when in the most hostile and remote areas, Special Forces troops will feel as connected and informed as anyone using a smartphone or a computer does in a non-warzone.

Sometimes the problems facing Special Forces are as simple as "knowing where you are in the world accurately and knowing where the good guys are at and the bad guys are at," Daniels said.

New Study Reconciles Conflicting Data on Mental Aging

A new look at tests of mental aging reveals a good news-bad news situation. The bad news is all mental abilities appear to decline with age, to varying degrees. The good news is the drops are not as steep as some research showed, according to a study published by the American Psychological Association.

"There is now convincing evidence that even vocabulary knowledge and what's called crystallized intelligence decline at older ages," said study author Timothy Salthouse, PhD. Longitudinal test scores look good in part because repeat test-takers grow familiar with tests or testing strategies, said the University of Virginia psychologist. Factoring out these "practice effects" showed a truer picture of actual mental aging, according to Salthouse.

Still, the declines, although pervasive, are smaller than thought, according to the report in the July issue of *Neuropsychology*. That finding contradicts data gathered by the other major research approach to aging, cross-sectional studies, which compare the performance of different age groups at the same time.

With both methods subject to bias, "It remains important to recognize the limitations of each type of study design when interpreting results," Salthouse said.

To learn what really happens as people age, Salthouse tackled how different research methods have led to different findings. Cross-sectional studies that compared the abilities of younger and older adults showed big drops in key areas. Longitudinal studies suggested that, until about age 60, abilities are stable or even improve.

Which type of study, if either, was right?

To find out, Salthouse analyzed data on five key cognitive abilities from the longitudinal Virginia Cognitive Aging Project. Scores were available for 1,616 adults age 18 to more than 80 on tests of reasoning, spatial visualization, episodic memory, perceptual speed and vocabulary. The data were collected over an average test-retest interval of two-and-a-half years.

First, Salthouse sorted participants into age brackets by decade, each with well more than 100 participants, except for the 80-89 bracket, with 87 participants. Second, he estimated the size of practice effects by comparing scores earned on the second test by the longitudinal participants with scores on a first test by another group of participants. He also used statistical methods to adjust for the chance that weaker performers dropped out between the first and second tests.

Practice effects were evident across the board, allowing test-takers to score higher the second time around not because they truly were more able, but because they knew the test - an unavoidable byproduct of repeated testing. Although the numbers varied by ability and age, practice effects were found to be as large as or larger than the annual cross-sectional differences.

Numbers in hand, Salthouse removed the practice-related "bonus points." Stripping them out generated a new set of cognitive scores that could be expected to reflect more accurately normal mental aging in healthy adults.

With practice effects taken into account, the age trends in the longitudinal data became more similar to results from cross-sectional studies in the places where they had diverged. The different methods now agreed on the downward direction of change. However, the increments were smaller. In other words, the mental abilities of younger adults still rose over time, but not nearly as much. And the mental abilities of older adults still fell over time, but not quite as much.

Knowing how practice effects, selective attrition and actual maturation affect how people change over time will put psychologists in a better position "to evaluate true age changes, and how they might relate to late-life pathology and everyday functioning," Salthouse said. Salthouse also found that practice effects played a bigger role in younger than older adults, possibly because younger people learn better. "Longitudinal comparisons in people of different ages may be even more complicated because the amount of longitudinal change may be partially determined by the individual's learning ability at a given age," he noted.

Salthouse is a fellow of the American Psychological Association and other scientific associations, and a past winner of the APA's William James Award. This study was supported by the National Institute on Aging.

Journal Reference: 1. Timothy A. Salthouse. *Influence of age on practice effects in longitudinal neurocognitive change.* *Neuropsychology*, 2010; 24 (5): 563 DOI: 10.1037/a0019026

Nutrition: Risky Additions to a Low-Carb Diet

By RONI CARYN RABIN

Atkins-style low-carbohydrate diets help people lose weight, but people who simply replace the bread and pasta with calories from animal protein and animal fat may face an increased risk of early death from cancer and heart disease, a new study reports.

The study found that the death rate among people who adhered most closely to a low-carb regimen was 12 percent higher over about two decades than with those who consumed diets higher in carbohydrates. But death rates varied, depending on the sources of protein and fat used to displace carbohydrates. Low-carb eaters who

drew more protein and fat from vegetable sources like beans and nuts were 20 percent less likely to die over the period than people who ate a high-carbohydrate diet.

But low-carb dieters who got most of their protein and fat from animal sources like red and processed meats were 14 percent more likely to die of heart disease and 28 percent more likely to die of cancer, the analysis found.

The study, published Sept. 7 in *Annals of Internal Medicine*, analyzed data from more than 85,000 healthy women aged 34 to 59 who participated in the Nurses' Health Study, and almost 45,000 men aged 40 to 75 who took part in the Health Professionals' Follow-Up Study. Participants filled out questionnaires every four years.

"If people want to follow a low-carb diet, this provides some guidance," said the paper's lead author, Teresa T. Fung, an associate professor of nutrition at Simmons College in Boston. "They should probably eat less meats."

Wives as the New Breadwinners

Women Entering Workforce When Husbands Become Unemployed During the "Great Recession"

During the recent recession in the United States, many industries suffered significant layoffs, leaving individuals and families to revise their spending and rethink income opportunities. Many wives are increasingly becoming primary breadwinners or entering the labor market. A new article in *Family Relations* tests "the added worker" theory, which suggests wives who are not working may seek work as a substitute for husband's labor if he becomes unemployed, and finds that during a time of economic downturn wives are more likely to enter the labor force when their husbands stop working.

Lead Carsey Institute researchers Marybeth Mattingly and Kristin Smith explain, "With many of the recent layoffs coming from male-dominated fields, families are relying on wives as breadwinners to a larger extent than during a recent period of relative prosperity."

The research suggests that the recent recession accelerated employment trends that have been emerging for several decades, and in turn highlights changing gender roles in the family, equity in the workplace, and work and family balance.

The study compares the likelihood that wives will look for or start work when their husbands stopped working during the relatively prosperous time period of May 2004–2005 to the financial downturn period of May 2007–2008. Wives of husbands who stopped working during the recession had nearly three times the odds of entering the labor force as compared to those whose husbands remained in the labor force.

The study also finds that in times of prosperity and recession married women who work part-time increase their hours when their husband stopped working. Jobs in the health and education industries (two female dominated occupations) remained level or increased throughout the recent recession, creating a potentially more reliable source of income for families.

Article: "Changes in Wives' Employment When Husbands Stop Working: A Recession-Prosperity Comparison." Marybeth J. Mattingly & Kristin E. Smith. Family Relations; Published Online: September 11, 2010 (DOI: 10.1111/j.1741-3729.2010.00607.x).

Frosty times for dinosaurs

Fossils as climate archives: Evidence of a major fall in temperature 137 million years ago during the Cretaceous greenhouse period

A major drop in temperature 137 million years ago briefly interrupted the warm, equable climate of the Cretaceous Period. The water temperature in the Arctic Ocean fell from around 13°C to between 4 and 7°C, possibly causing the poles to freeze over. Gregory Price from the University of Plymouth, UK and Elizabeth Nunn from Johannes Gutenberg University Mainz, Germany investigated rock samples with fossil belemnites and glendonites from Svalbard in order to determine the temperature of the Arctic Ocean between 140 and 136 million years ago. Such paleoclimate reconstructions help to improve predictions for future climate and environmental development and to gauge the impact of the human race on climate. The temperature of the oceans plays an important role in the history of the Earth's climate.

Current findings indicate that the global climate during the Cretaceous Period was warm and equable with high atmospheric CO₂ values, although scientists have already speculated that this global warmth may have been punctuated by colder episodes. The latest research carried out by Price and Nunn proves that there was a brief cold episode approximately 137 million years ago. "Temperatures fell drastically compared with the average water temperatures of 13°C or even 20°C in the Arctic region during the rest of the Cretaceous Period," states Nunn. Dinosaurs inhabited the polar regions during the Cretaceous greenhouse period. While marine reptiles such as pliosaurus and ichthyosaurs may have migrated with the onset of the cold snap, it is not clear how dinosaurs would have handled the colder conditions.

During the course of their work, Nunn and Price investigated rock outcrops on Svalbard, which provide an ideal sequence of marine deposits offering paleontologists insights into a time when the area was still a flat sea. Some rock layers from the Valanginian Stage of the Lower Cretaceous are rich in belemnites, i.e., fossils reminiscent of modern squid, and glendonites, calcium carbonate crystal aggregates of between two and three centimeters in size. Scientists can use these relics to determine the relationship between two oxygen isotopes and use these findings to draw conclusions about the water temperature. "If global temperatures fall, the oxygen isotope O16 is increasingly incorporated into polar ice and the isotope O18 is consequently enriched in the seawater relative to O16. Belemnites and glendonites store this ratio," Nunn explained.

Dr Elizabeth Nunn joined the Department of Applied and Analytical Palaeontology in the Mainz Institute for Geosciences from the University of Plymouth two and a half years ago. She is currently carrying out research to determine whether, and to what extent, seasonal temperature fluctuations occurred during the Early Cretaceous interval. Such changes from summer to winter values or vice versa are probably recorded during the short life span of the belemnites – they probably only lived between one and three years – and could be identified today using modern analytical methods.

Tool 'may help' early meningitis diagnosis

Meningitis glass test A simple way to test the rash is to press a clear glass against the skin

The most dangerous form of meningitis can kill within hours - but doctors think they have developed the best way to identify it early. The "predictive model" developed by the Health Protection Agency could clear the way for the right treatment to be given quickly. It uses a combination of blood tests and symptoms to help identify bacterial meningitis.

Charities welcomed the model, while calling for further testing.

Meningitis is an inflammation in the membranes surrounding the spinal cord and brain. It is most often caused by either bacterial or viral infection. Knowing which is which can make a big difference to the best treatment. Bacterial meningitis needs antibiotic treatment as soon as possible - and it is often prudent to give these drugs to close family members as well.

Rash

There are tests to identify the cause of meningitis, the best known being a lumbar puncture to obtain spinal fluid for analysis. However, this does not always yield clear-cut results.

The new model has a simple set of three criteria which helps doctors tell the difference without having to wait for conclusive spinal fluid results.

Researchers found them by examining 385 confirmed meningitis cases over a 12-month period.

The first two criteria are blood tests positive for two specific chemicals associated with bacterial meningitis, the third is the presence of the "classic" meningitis rash of spots which do not disappear when pressed with a glass. The three results are combined to provide a score which then tells the doctor how likely bacterial meningitis is.

Dr Toyin Ejidokun, a consultant in communicable disease at the HPA, said: "The total score allows a treating clinician to simply and quickly assess the likelihood of whether or not the case is bacterial meningitis by checking it against the predictive probabilities we have developed.

"While further testing needs to take place to test the accuracy of the model, it offers the prospect of a rapid predictive tool to help clinical and public health management of suspected bacterial meningitis cases."

'Step forward'

Steve Dayman, the chief executive of Meningitis UK, said the protocol was "an excellent step forward".

He said: "It's vital that the differentiation between bacterial and viral meningitis is made straight-away because the bacterial form can kill in less than four hours. Quick treatment can mean the difference between life and death. "In the absence of a vaccine to protect against all forms of meningitis, this new model could help to save precious lives."

Experts said people should still be vigilant for the warning signs of meningitis to maximise the chances of recovery.

Although not every patient has every symptom, common signs include a combination of "classic rash", suddenly appearing high fever, a severe and worsening headache, stiff neck, vomiting, joint and muscle pain, a dislike of bright lights, very cold hands and feet, and severe drowsiness.

A spokesman for the Meningitis Research Foundation said: "Early detection of meningitis and septicaemia is critical when treating these diseases, every second matters. "We welcome all research and development to identify meningitis early so treatment of antibiotics can be administered as soon as possible to prevent the worst outcome." However, she said that doctors should stick with existing protocols for diagnosing and treating meningitis until the new version had been fully tested.

'Time bomb' superbug requires global response: doctor

A new superbug from India thought to be resistant to nearly every known antibiotic poses a global threat, scientists warned Monday, urging health authorities to track the bacteria.

"There is an urgent need, first, to put in place an international surveillance system over the coming months and, second, to test all the patients admitted to any given health system" in as many countries as possible, said Patrice Nordmann of France's Bicetre Hospital.

"For the moment, we don't know how fast this phenomenon is spreading... it could take months or years, but what is certain is that it will spread," he told AFP, noting that measures have already been agreed in France and are under discussion in Japan, Singapore and China. "It's a bit like a time bomb."

Nordmann was in Boston for the 50th annual meeting of the Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC), the world's largest gathering of infectious disease specialists, which is drawing some 12,000 people here September 12-14.

The head of Bicetre's department of bacteriology and virology said the bacteria will find fertile ground in India's vast population of 1.3 billion, and could easily be carried back and forth by the country's widespread diaspora.

The so-called "superbug," dubbed NDM-1 (New Delhi metallo-beta-lactamase 1), and its variants appear to have originated in India and were first detected in Britain in 2007. The NDM-1 is a gene that produces an enzyme that deactivate basically all antibiotics.

After the bug was detected, the number of infected people began to increase, reaching more than 70 in Britain and more than 170 in India and Pakistan.

The bug attracted media attention after the August publication of a research article in Britain's Lancet journal that said an Indian "medical tourist" appeared to have brought the bacteria to Britain.

After the article, cases were reported in Canada, the United States, Belgium, Netherlands, Austria, France, Germany, Kenya, Australia, Hong Kong and Japan. A Belgian citizen hospitalized in Pakistan after a car accident was the first known death related to infection by the superbug.

Unlike other multi-drug resistant bugs reported during the last 20 years, NDM "brings several additional factors of deep concern for public health," said Nordmann. For example, scientists have determined that the NDM gene "is very mobile, hopping from one bacteria to another," he said.

Specialists can help "stem the onslaught of DNМ producers" through "early identification of the very first cases of NDM-related infections and preventing their spread by implementing screening, hygiene measures and isolation of carriers," Nordmann said.

Timothy Walsh with Cardiff University in Britain, who first uncovered the gene and wrote the Lancet report, worried that experts did not know how wide the bug had spread in India.

"One of the great concerns is the lack of sanitation - more than 600 million people in India don't have sanitation - and also because of the massive antibiotic use in those countries that can fuel the antibiotic resistance," Walsh said.

Drug resistance in bacteria, blamed on excessive and improper use of antibiotics, is not new, and health experts warn of an increasingly dangerous environment where the problem can flourish. *(c) 2010 AFP*

Researchers discover key mechanism behind sleep

Washington State University researchers have discovered the mechanism by which the brain switches from a wakeful to a sleeping state. The finding clears the way for a suite of discoveries, from sleeping aids to treatments for stroke and other brain injuries.

"We know that brain activity is linked to sleep, but we've never known how," said James Krueger, WSU neuroscientist and lead author of a paper in the latest Journal of Applied Physiology. "This gives us a mechanism to link brain activity to sleep. This has not been done before."

The mechanism - a cascade of chemical transmitters and proteins - opens the door to a more detailed understanding of the sleep process and possible targets for drugs and therapies aimed at the costly, debilitating and dangerous problems of fatigue and sleeplessness. Sleep disorders affect between 50 and 70 million Americans, according to the Institute of Medicine of the National Academies. The Institute also estimates the lost productivity and mishaps of fatigue cost businesses roughly \$150 billion, while motor vehicle accidents involving tired drivers cost at least \$48 billion a year.

The finding is one of the most significant in Krueger's 36-year career, which has focused on some of the most fundamental questions about sleep.

Even before the dawn of science, people have known that wakeful activity, from working to thinking to worrying, affects the sleep that follows. Research has also shown that, when an animal is active and awake,

regulatory substances build up in the brain that induce sleep. "But no one ever asked before: What is it in wakefulness that is driving these sleep regulatory substances?" said Krueger. "No one ever asked what it is that's initiating these sleep mechanisms. People have simply not asked the question."

The researchers documented how ATP (adenosine triphosphate), the fundamental energy currency of cells, is released by active brain cells to start the molecular events leading to sleep. The ATP then binds to a receptor responsible for cell processing and the release of cytokines, small signaling proteins involved in sleep regulation.

By charting the link between ATP and the sleep regulatory substances, the researchers have found the way in which the brain keeps track of activity and ultimately switches from a wakeful to sleeping state. For example, learning and memory depend on changing the connections between brain cells. The study shows that ATP is the signal behind those changes.

The finding reinforces a view developed by Krueger and his colleagues that sleep is a "local phenomenon, that bits and pieces of the brain sleep" depending on how they've been used.

The link between sleep, brain cell activity and ATP has many practical consequences, Krueger said. For example:

- * The study provides a new set of targets for potential medications. Drugs designed to interact with the receptors ATP binds to may prove useful as sleeping pills.
- * Sleep disorders like insomnia can be viewed as being caused by some parts of the brain being awake while other parts are asleep, giving rise to new therapies.
- * ATP-related blood flow observed in brain-imaging studies can be linked to activity and sleep.
- * Researchers can develop strategies by which specific brain cell circuits are oriented to specific tasks, slowing fatigue by allowing the used parts of the brain to sleep while one goes about other business. It may also clear the way for stroke victims to put undamaged regions of their brains to better use.
- * Brain cells cultured outside the body can be used to study brain cell network oscillations between sleep-like and wake-like states, speeding the progress of brain studies.

More information: An abstract of "ATP and the purine type 2 X7 receptor affect sleep" can be found at [http://jap.physiol ...00586.2010v1](http://jap.physiol...00586.2010v1) Provided by Washington State University

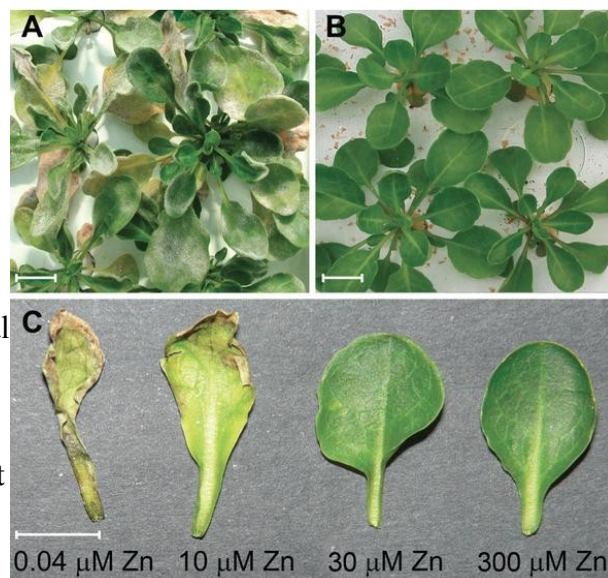
Wildflower 'armors' Itself Against Disease

An unusual wildflower that accumulates metals in its leaves has been found to use them as a kind of 'armour' against bacterial infection.

Alpine pennycress (*Thlaspi caerulescens*) is a small plant in the mustard family that grows on metal-rich soils scattered around Britain and Europe, such as the sites of former mine workings. The plant is known to accumulate zinc, nickel and cadmium to very high concentrations in its leaves, but why it should do this has remained a mystery.

Now scientists from Oxford University have shown that when *Thlaspi* plants accumulate metals in their leaves they become resistant to attack by the bacterium *Pseudomonas syringae* pv. *maculicola*. They report their findings in the journal *PLoS Pathogens*.

'Our results demonstrate that these plants are exploiting their metal-rich environment to armour themselves against disease,' said Dr Gail Preston of Oxford University's Department of Plant Sciences, co-author of the report. 'What we've found is a direct link between these high metal concentrations and resistance to bacterial infection.'



High zinc concentrations suppress disease symptoms in *Thlaspi caerulescens*. A. *T. caerulescens* plants growing on 10 μM zinc during an outbreak of mildew (*Erysiphe* sp.) in the glasshouse. B. *T. caerulescens* plants growing on 300 μM zinc during the same outbreak of mildew in the glasshouse. C. *T. caerulescens* plants were grown for 10 weeks on nutrient solution containing 0.04, 10, 30, or 300 μM ZnSO₄. Leaves were infiltrated with *P. syringae* pv. *maculicola* M4 suspended in 10 mM MgCl₂ at 10⁸ cfu/ml and photographed 96 hours after inoculation. Scale bars represent 10 mm. (Credit: Fones et al.; doi:10.1371/journal.ppat.1001093.g004)

Helen Fones, the graduate student who carried out the experimental work, cultivated *Thlaspi* plants on progressively higher concentrations of zinc, nickel and cadmium and showed that all three metals were able to defend the plant against the pathogenic bacterium. By studying diverse strains of the bacterium, she was able to

demonstrate a close relationship between the ability of bacteria to grow in the presence of high concentrations of metal and their ability to infect the plants.

'Previously, it has been difficult to explain why *Thlaspi* plants should accumulate such high concentrations of potentially toxic metals,' said Professor Andrew Smith of Oxford's Department of Plant Sciences, co-supervisor of the research. 'Our findings provide good evidence that, by accumulating metals, these plants benefit from enhanced protection against enemies such as pathogenic microorganisms and herbivores.'

The researchers also showed that bacteria surviving on *Thlaspi* plants on the site of a former lead-zinc mine in Wales had a higher tolerance for zinc than bacteria isolated from plants growing on normal soils. This indicates that both the plant and its pathogens show evidence of local adaptation to survival in metal-rich environments, and that pathogens can adapt to overcome plant defences based on metals. Dr Preston said: 'heavy metals may be part of an evolutionary 'arms race' between plants and the microorganisms that try to colonise them.'

Home of "Ice Giants" thaws, shows pre-Viking hunts

By Alister Doyle, Environment Correspondent

JUVFONNA, Norway (Reuters) - Climate change is exposing reindeer hunting gear used by the Vikings' ancestors faster than archaeologists can collect it from ice thawing in northern Europe's highest mountains.

"It's like a time machine...the ice has not been this small for many, many centuries," said Lars Piloe, a Danish scientist heading a team of "snow patch archaeologists" on newly bare ground 1,850 meters (6,070 ft) above sea level in mid-Norway.

Specialized hunting sticks, bows and arrows and even a 3,400-year-old leather shoe have been among finds since 2006 from a melt in the Jotunheimen mountains, the home of the "Ice Giants" of Norse mythology.

As water streams off the Juvfonna ice field, Piloe and two other archaeologists - working in a science opening up due to climate change - collect "scare sticks" they reckon were set up 1,500 years ago in rows to drive reindeer toward archers.

But time is short as the Ice Giants' stronghold shrinks. "Our main focus is the rescue part," Piloe said on newly exposed rocks by the ice. "There are many ice patches. We can only cover a few...We know we are losing artefacts everywhere." Freed from an ancient freeze, wood rots in a few years. And rarer feathers used on arrows, wool or leather crumble to dust in days unless taken to a laboratory and stored in a freezer. Jotunheimen is unusual because so many finds are turning up at the same time - 600 artefacts at Juvfonna alone. Other finds have been made in glaciers or permafrost from Alaska to Siberia. Italy's iceman "Otzi," killed by an arrow wound 5,000 years ago, was found in an Alpine glacier in 1991. "Ice Mummies" have been discovered in the Andes.

RESCUE

Patrick Hunt, of Stanford University in California who is trying to discover where Carthaginian general Hannibal invaded Italy in 218 BC with an army and elephants, said there was an "alarming rate" of thaw in the Alps. "This is the first summer since 1994 when we began our Alpine field excavations above 8,000 ft that we have not been inundated by even one day of rain, sleet and snow flurries," he said. "I expect we will see more 'ice patch archaeology discoveries'," he said. Hannibal found snow on the Alpine pass he crossed in autumn, according to ancient writers.

Glaciers are in retreat from the Andes to the Alps, as a likely side-effect of global warming caused by human emissions of greenhouse gases, the U.N. panel of climate experts says. The panel's credibility has suffered since its 2007 report exaggerated a thaw by saying Himalayan glaciers might vanish by 2035. It has stuck to its main conclusion that it is "very likely" that human activities are to blame for global warming.

"Over the past 150 years we have had a worldwide trend of glacial retreat," said Michael Zemp, director of the Swiss-based World Glacier Monitoring Service. While many factors were at play, he said "the main driver is global warming."

In Norway, "some ice fields are at their minimum for at least 3,000 years," said Rune Strand Oedegaard, a glacier and permafrost expert from Norway's Gjøvik University College. The front edge of Juvfonna has retreated about 18 meters (60 ft) over the past year, exposing a band of artefacts probably from the Iron Age 1,500 years ago, according to radiocarbon dating. Others may be from Viking times 1,000 years ago.

Juvfonna, about 1 km across on the flank of Norway's highest peak, Galdhoepiggen, at 2,469 meters, also went through a less drastic shrinking period in the 1930s, Oedegaard said.

REINDEER

Inside the Juvfonna ice, experts have carved a cave to expose layers of ice dating back 6,000 years. Some dark patches turned out to be ancient reindeer droppings - giving off a pungent smell when thawed out.

Ice fields like Juvfonna differ from glaciers in that they do not slide much downhill. That means artefacts may be where they were left, giving an insight into hunting techniques.

On Juvfonna, most finds are "scare sticks" about a meter long. Each has a separate, flapping piece of wood some 30 cm long that was originally tied at the top. The connecting thread is rarely found since it disintegrates within days of exposure. "It's a strange feeling to be tying a string around this stick just as someone else did maybe 1,500 years ago," said Elling Utvik Wammer, a archaeologist on Piloe's team knotting a tag to a stick before storing it in a box for later study.

All the finds are also logged with a GPS satellite marker before being taken to the lab for examination.

The archaeologists reckon they were set up about two meters apart to drive reindeer toward hunters. In summer, reindeer often go onto snow patches to escape parasitic flies.

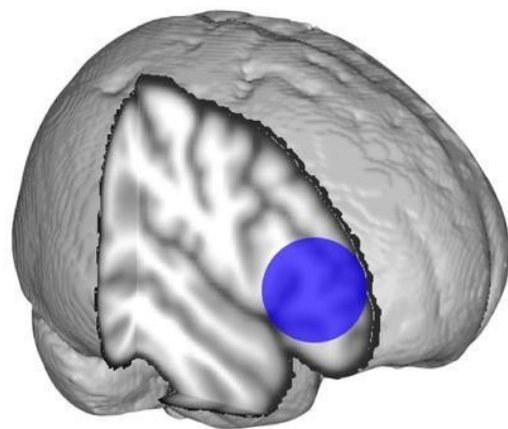
Such a hunt would require 15 to 20 people, Piloe said, indicating that Norway had an organized society around the start of the Dark Ages, 1,500 years ago. Hunters probably needed to get within 20 meters of a reindeer to use an iron-tipped arrow. "You can nearly feel the hunter here," Piloe said, standing by a makeshift wall of rocks exposed in recent weeks and probably built by an ancient archer as a hideaway. *(Editing by Philippa Fletcher)*

How Our Brains Get Tripped Up When We're Anxious

A new University of Colorado at Boulder study sheds light on the brain mechanisms that allow us to make choices and ultimately could be helpful in improving treatments for the millions of people who suffer from the effects of anxiety disorders.

In the study, CU-Boulder psychology Professor Yuko Munakata and her research colleagues found that "neural inhibition," a process that occurs when one nerve cell suppresses activity in another, is a critical aspect in our ability to make choices.

"The breakthrough here is that this helps us clarify the question of what is happening in the brain when we make choices, like when we choose our words," Munakata said. "Understanding more about how we make choices, how the brain is doing this and what the mechanisms are, could allow scientists to develop new treatments for things such as anxiety disorders."



Competing neurons in this part of the brain help us make decisions, such as choosing words. (Credit: Image courtesy of Marie Banich)

Researchers have long struggled to determine why people with anxiety can be paralyzed when it comes to decision-making involving many potential options. Munakata believes the reason is that people with anxiety have decreased neural inhibition in their brain, which leads to difficulty making choices.

"A lot of the pieces have been there," she said. "What's new in this work is bringing all of this together to say here's how we can fit all of these pieces of information together in a coherent framework explaining why it's especially hard for people with anxiety to make decisions and why it links to neural inhibitors."

A paper on the findings appeared in the Aug. 30 Proceedings of the National Academy of Sciences. CU-Boulder professors Tim Curran, Marie Banich and Randall O'Reilly, graduate students Hannah Snyder and Erika Nyhus and undergraduate honors thesis student Natalie Hutchison co-authored the paper.

In the study, they tested the idea that neural inhibition in the brain plays a big role in decision-making by creating a computer model of the brain called a neural network simulation.

"We found that if we increased the amount of inhibition in this simulated brain then our system got much better at making hard choices," said Hannah Snyder, a psychology graduate student who worked with Munakata on the study. "If we decreased inhibition in the brain, then the simulation had much more trouble making choices."

Through their model they looked at the brain mechanisms involved when we choose words. They then tested the model's predictions on people by asking them to think of the first verb that comes to mind when they are presented with a noun.

"We know that making decisions, in this case choosing our words, taps into this left-front region of the brain, called the left ventrolateral prefrontal cortex," Munakata said. "We wanted to figure out what is happening in that part of the brain that lets us make these choices. Our idea here, which we have shown through the word-choosing model, is that there's a fight between neurons in this area of the brain that lets us choose our words."

They then tested the model's predictions that more neural inhibition in the brain makes it easier to make choices by examining the effects of increased and decreased inhibition in people's brains. They increased

inhibition by using a drug called midazolam and found that people got much better at making hard choices. It didn't affect other aspects of their thinking, but rather only the area of making choices. They investigated the effects of decreased inhibition by looking at people with anxiety.

"We found that the worse their anxiety was, the worse they were at making decisions, and the activity in their left ventrolateral prefrontal cortex was less typical," Munakata said.

There are two ways in which the research could be helpful in improving treatments for anxiety, according to Snyder. While specific medications that increase neural inhibition are currently used to treat the emotional symptoms of anxiety disorders, the findings suggest that they might also be helpful in treating the difficulty those suffering from anxiety have in selecting one option when there are too many choices.

"Secondly, a more precise understanding of what aspects of cognition patients are struggling with could be extremely valuable in designing effective approaches to therapy for each patient," she said. "For example, if someone with an anxiety disorder has difficulty selecting among multiple options, he or she might benefit from learning how to structure their environment to avoid choice overload."

The work was done in CU-Boulder's Center for Determinants of Executive Function and Dysfunction, which brings together researchers from different areas of expertise on campus and beyond including experts on drug studies, neuroimaging and anxiety. The center is funded by the National Institute of Mental Health.

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by University of Colorado at Boulder.

Journal Reference: I. H. R. Snyder, N. Hutchison, E. Nyhus, T. Curran, M. T. Banich, R. C. O'Reilly, Y. Munakata. Neural inhibition enables selection during language processing. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.1002291107

Watercress May 'Turn Off' Breast Cancer Signal

New scientific research from the University of Southampton has revealed that a plant compound in watercress may have the ability to suppress breast cancer cell development by 'turning off' a signal in the body and thereby starving the growing tumour of essential blood and oxygen.

The research, unveiled at a press conference Sept. 14, 2010, shows that the watercress compound is able to interfere with the function of a protein which plays a critical role in cancer development.

As tumours develop they rapidly outgrow their existing blood supply so they send out signals which make surrounding normal tissues grow new blood vessels into the tumour which feed them oxygen and nutrients.

The research, led by Professor Graham Packham of the University of Southampton, shows that the plant compound (called phenylethyl isothiocyanate) found in watercress can block this process, by interfering with and 'turning off' in the function of a protein called Hypoxia Inducible Factor (HIF).

Professor Packham, a molecular oncologist at the University of Southampton, comments: "The research takes an important step towards understanding the potential health benefits of this crop since it shows that eating watercress may interfere with a pathway that has already been tightly linked to cancer development. "Knowing the risk factors for cancer is a key goal and studies on diet are an important part of this. However, relatively little work is being performed in the UK on the links between the foods we eat and cancer development."

Working with Barbara Parry, Senior Research Dietician at the Winchester and Andover Breast Unit, Professor Packham performed a pilot study in which a small group of breast cancer survivors, underwent a period of fasting before eating 80g of watercress (a cereal bowl full) and then providing a series of blood samples over the next 24 hours. The research team was able to detect significant levels of the plant compound PEITC in the blood of the participants following the watercress meal, and most importantly, could show that the function of the protein HIF was also measurably affected in the blood cells of the women.

The two studies, which have been published in the *British Journal of Nutrition and Biochemical Pharmacology*, provide new insight into the potential anti-cancer effects of watercress, although more work still needs to be done to determine the direct impact watercress has on decreasing cancer risk.

Watercress Alliance member Dr Steve Rothwell says: "We are very excited by the outcome of Professor Packham's work, which builds on the body of research which supports the idea that watercress may have an important role to play in limiting cancer development."

A summary of the research has been accepted for inclusion in the Breast Cancer Research Conference which is taking place in Nottingham from 15 to 17 September. Breast cancer is the most common cancer in women in the western world and currently affects approximately 1 in 9 women during their lifetime.

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2. Xiu-Hong Wang, Breeze E. Cavell, Sharifah S. Syed Alwi, Graham Packham. *Inhibition of hypoxia inducible factor by phenethyl isothiocyanate. Biochemical Pharmacology*, 2009; 78 (3): 261 DOI: 10.1016/j.bcp.2009.04.010

'One-off' prostate cancer tests backed for 60-year-olds

A single blood test for all 60-year-old men could pick out the vast majority of those likely to die from prostate cancer, say scientists

Some doctors oppose regular screening, saying it leads to too many men having unnecessary treatment.

However, testing just once at 60 could reveal men who need no further checks, claims the study published in the British Medical Journal. Other experts welcomed the findings - but called for more research.

Cancer of the prostate - a walnut-sized gland located next to the bladder - is the most common cancer in UK men, with more than 35,000 new cases a year.

Few obvious symptoms

It usually emerges after the age of 60, and there are frequently few obvious symptoms until it is well-advanced, making treatment more difficult. Doctors can offer a blood test looking for raised levels of "prostate specific antigen (PSA)", which may be a tell-tale sign of the body's response to the tumour.

However, PSA levels can be raised naturally, or could represent a slow-growing tumour which offers no threat to the patient in their lifetime. This can mean that men who would never become ill from prostate cancer undergo distressing further investigations, or even potentially damaging radiotherapy or surgery.

One piece of research published in the journal appears to confirm this, finding that routine prostate cancer screening did not greatly reduce deaths from the disease, while boosting the risk of "over-treatment".

However, the second study, led by Professor Hans Lilja from the Memorial Sloan Kettering Medical Center in New York, offers an alternative approach.

They carried out a single test on all 60-year-old men, and split them into two groups depending on PSA levels. They found that nine out of 10 prostate cancer deaths occurred in the men with the highest levels, while those with average or low levels had negligible rates of disease or death.

Screened regularly

This would mean that more than half of men could be told at that point that, even if they had a prostate tumour, it was unlikely to ever threaten their life or make them ill. The other group could then continue to be screened regularly.

Professor Gerard Andriole, from the Washington University School of Medicine, said that while the findings needed to be tested again in other groups of men, particularly those from different ethnic groups, in the future much older men, and those at lower risk of disease could be spared further testing. He said: "Approaches such as these will hopefully make the next 20 years of PSA based screening better than the first 20."

Dr Sarah Cant, from the Prostate Cancer Charity, said that the idea of a single test at 60 was an "interesting proposition", but agreed that more work would be needed to confirm the results of this early study.

"We believe that investment needs to be made in research for a new generation of screening and diagnostic tests - critically, ones capable of distinguishing between aggressive and slow-growing forms of the disease, the so-called 'tigers' and 'pussycats'." She added that men needed to be made fully aware of the pros and cons of PSA testing before being asked for their consent.

Fountain of youth in bile? Longevity molecule identified

Discovery from Concordia University researchers published in journal Aging

Montreal September 15, 2010 – The human quest for longer life may be one step closer, thanks to research from Concordia University. Published in the journal *Aging*, a new study is the first to identify the role of a bile acid, called lithocholic acid (LCA), in extending the lifespan of normally aging yeast. The findings may have significant implications for human longevity and health, as yeast share some common elements with people.

"Although we found that LCA greatly extends yeast longevity, yeast do not synthesize this or any other bile acid found in mammals," says senior author Vladimir Titorenko, Concordia University Research Chair in Genomics, Cell Biology and Aging and a professor in the Department of Biology. "It may be that yeast have evolved to sense bile acids as mildly toxic molecules and respond by undergoing life-extending changes. It is conceivable that the life-extending potential of LCA may be relevant to humans as well."

Over 19 000 small molecules screened

Titorenko and colleagues screened more than 19 000 small molecules to test their ability to extend yeast-lifespan. Under both normal and stressed conditions, LCA had a major impact.

"Our findings imply that LCA extends longevity by targeting two different mechanisms," says first author Alexander Goldberg, a Concordia doctoral student. "The first takes place regardless of the number of calories and involves the day-to-day or housekeeping proteins. The second system occurs during calorie-restriction and involves stressor proteins."

"Regardless of their triggers both of these mechanisms work to suppress the pro-aging process," he continues.

Bile acids may be beneficial to health

"Although we have an overall idea how LCA works to extend longevity in yeast, we still need to determine if this is the case for other species," says Titorenko. "We do know from previous studies, however, that bile acids are beneficial to health and longevity. For example, they have shown to accumulate in the serum of long living mice and play a role in improving rodent liver and pancreatic function."

"This leads us to believe that bile acids have potential as pharmaceutical agents for the treatment of diabetes, obesity and various metabolic disorders, all of which are age-related," continues Titorenko. "They may indeed offer hope for a healthy aging life."

Partners in research: This study was funded by the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation and the Concordia University Chair Fund.

About the study: The paper, "Chemical genetic screen identifies lithocholic acid as an anti - aging compound that extends yeast chronological life span in a TOR independent manner, by modulating housekeeping longevity assurance processes," published in the journal Aging, was authored by Alexander A. Goldberg, Vincent R. Richard, Pavlo Kyryakov, Simon D.

Bourque, Adam Beach, Michelle T. Burstein, Anastasia Glebov, Olivia Koupaki, Tatiana Boukh - Viner, Christopher Gregg, Mylène Juneau, Ann M. English and Vladimir I. Titorenko of Concordia University, David Y. Thomas of McGill University.

On the Web: Cited Aging study: www.impactaging.com/papers/v2/n7/pdf/100168.pdf

Why Is Yawning Contagious?

Yawning when others yawn is a sign of empathy and a form of social bonding.

By Emily Sohn

Watch someone yawn, and try not to yawn yourself. It can be impossible to resist. Even reading about yawning can make you do it. Now, a new study offers insight into why contagious yawning is such a powerful force.

Yawning when others yawn, the study suggests, is a sign of empathy and a form of social bonding. Kids don't develop this deeply rooted behavior until around age four, the study found. Kids with autism are half as likely to catch yawns. In the most severe cases, they never do.

Yawning might eventually help doctors diagnose developmental disorders. The work could also lead to a better understanding of the subtle ways that people communicate and connect.

"Emotional contagion seems to be a primal instinct that binds us together," said Molly Helt, a graduate student in clinical psychology at the University of Connecticut, Storrs. "Yawning may be part of that."

Inspiration for her study came when she tried to get her own autistic son to clear his ears on an airplane. She repeatedly yawned at him, hoping he would yawn back. He never did.

"The fact that autistic kids don't do it might mean they're really missing out on that unconscious emotional linkage to those around them," she said. "The big thing people try to figure out in infant development is how we become humans who understand that humans have minds that are different from ours," she added. "Autistic people never sort of seem to understand that."

Fetuses begin yawning in the womb as early as 11 weeks after conception, said Robert Provine, a developmental neuroscientist at the University of Maryland, Baltimore County. For reasons scientists still can't explain, spontaneous yawning continues throughout life. (Studies have shot down theories about yawning to bring in more oxygen.) In fact, all vertebrates yawn, including snakes and lizards. Contagious yawning is a different story. Only humans, chimpanzees and possibly dogs have been shown to do it.

Like contagious laughter and contagious crying, scientists have theorized that contagious yawning is a shared experience that promotes social bonding. Specifically, Helt said, it could diffuse stress after a period of being on high alert and spread a feeling of calm through a group.

To find out when in life the behavior develops, Helt read a story to 120 healthy kids, ages one through six. The kids were grouped by age, so that all of the one-year-olds heard one reading, all the two-year-olds heard another, and so on. There were 20 kids in each age group.

During each 10-minute story, Helt intentionally yawned every 90 seconds. A camera recorded whether the kids were watching her and if so, whether they yawned, too. She and colleagues repeated the experiment with 28 autistic kids, ages 6 to 15. Some of the children were further along the autistic spectrum than others.

Given four opportunities to catch a yawn, the researchers report today in the journal *Child Development*, none of the healthy one-year-olds did. Only one of the two-year-olds yawned back, and two of the three-year-olds caught a yawn. There was a dramatic leap in the group of four-year-olds, where yawning spread to 9 out of 20 kids. That rate held steady for the older groups.

And it matches experiments in grown-ups, which find that between 40 and 60 percent of healthy adults yawn after seeing someone yawn, thinking about yawning or even reading the word "yawn."

In the second part of the study, Helt and colleagues found that contagious yawning happened half as often in kids with a mild versions of autism. Kids with the most severe diagnoses never caught yawns.

Besides offering potential for diagnosing and understanding autism, the new work gives overdue attention to a fundamental and unconscious behavior that the field of psychology has long ignored, Provine said. He studies a cluster of contagious behaviors, including emotional tears, and has written a book about laughter.

"Yawning is a really big deal," Provine said. "We're dealing with something ancient, deep, and at the very root of our being. And psychologists have basically ignored it."

"It's a primal social bonding process," he added. "We're looking at the roots of empathy."

Sunspots could soon disappear for decades: study

Sunspot formation is triggered by a magnetic field, which scientists say is steadily declining. They predict that by 2016 there may be no remaining sunspots, and the sun may stay spotless for several decades. The last time the sunspots disappeared altogether was in the 17th and 18th century, and coincided with a lengthy cool period on the planet known as the Little Ice Age.

Sunspots are regions of electrically charged, superheated gas (plasma) on the surface of the sun, formed when upwellings of the magnetic field trap the ionized plasma. The magnetic field prevents the gas from releasing the heat and sinking back below the sun's surface. These areas are somewhat cooler than the surrounding sun surface and so appear to us as dark spots.

Sunspots have been observed at least since the early 17th century, and they are known to follow an 11 year cycle from solar maximum to solar minimum. The solar minimum usually lasts around 16 months, but the current minimum has already lasted 26 months, which is the longest minimum in a hundred years.

Since 1990, Matthew Penn and William Livingston, solar astronomers with the National Solar Observatory (NSO) in Tucson, Arizona, have been using a measurement known as Zeeman splitting to study the magnetic strength of sunspots. The Zeeman splitting is the distance between a pair of infrared spectral lines in a spectrograph taken of the light emitted by iron atoms in the atmosphere of the sun. The wider the distance, the greater is the intensity of the magnetic field.

Penn and Livingston examined 1500 sunspots and found that the average strength of the magnetic field of the sunspots has dropped from around 2700 gauss to 2000 gauss. (In comparison, the Earth's magnetic field is below one gauss.) The reasons for the decline are unknown, but Livingston said that if the strength continues to decrease at the same rate it will drop to 1500 gauss by 2016, and below this strength the formation of sunspots appears to be impossible.

During the period from 1645 to 1715, a time known as the Maunder Minimum, there were almost no sunspots. This period coincided with the Little Ice Age, which produced lower than average temperatures in Europe. Livingston said their results should be treated with caution as their techniques are relatively new and it is not yet known if the decline in magnetic field strength will continue, and that "only the passage of time will tell whether the solar cycle will pick up."

David Hathaway, a solar physicist with the Marshall Space Flight Center in Huntsville, Alabama, also cautioned the calculations do not take into account that many small sunspots with relatively weak magnetic fields appeared during the last solar maximum, and if these are not included in the calculations the average magnetic field strength would seem higher than it actually was.

Penn and Livingston's paper has been submitted to the online colloquium, International Astronomical Union Symposium No. 273.

More information: Long-term Evolution of Sunspot Magnetic Fields, Matthew Penn and William Livingston, arXiv:1009.0784v1 [astro-ph.SR]

Prehistoric Bird Sets Wingspan Record

At 17 feet, the new species' wingspan may exceed that of any other bird that ever existed. Size, however, has its drawbacks.

By Jennifer Viegas

Soaring the Chilean skies 5-10 million years ago, an enormous bony-toothed bird has set the world avian wingspan record. The bird's wingspan was at least 17 feet, according to scientists.

The measurement is based on well preserved wing bones from the newly named bird species, *Pelagornis chilensis*, a.k.a. "huge pseudoteeth" from Chile. The animal weighed about 64 pounds and belonged to a group known as pelagornithids - birds characterized by long, slender beaks bearing many spiny, tooth-like projections.

It's now thought that 17 feet may be close to the maximum wingspan that can be achieved by a flying bird. Prior wingspan estimates for pelagornithids went up to 20 feet, but they were based on more fragmented fossils.



"Most likely, evolution of such large sizes was to avoid competition with other birds," lead author Gerald Mayr, a paleornithologist at the Senckenberg Research Institute and Natural History Museum, told Discovery News. "Birds with such a large size can, of course, sail across huge distances and may more easily find prey in the open ocean."

However, "there are a number of drawbacks if you become large," he added. Chicks would have to be raised over a long period of time, making them more prone to predation.

"Moreover," he added, "bird feathers are quite heavy, so very large birds may have become too heavy."

Mayr and paleontologist David Rubilar of Chile's National Museum of Natural History analyzed the big bird's fossilized remains, which are 70 percent complete. The bird is described in the latest issue of the Journal of Vertebrate Paleontology.



Giant Wingspan, Giant Glider *The giant seabird P. chilensis was probably a glider, not a flapper, researchers say.* Above, an artist's rendering shows the bird's skeleton and life reconstructions as the species would have appeared in flight. Illustration courtesy Carlos Anzures

The shape of the species' arm bones shows that *P. chilensis* couldn't rotate its wings to flap and provide lift, Rubilar said. Instead, the seabird "just opened its arms" and - like modern Andean condors - caught updrafts rising from the Andes to become airborne and stay aloft for miles. Modern albatrosses, the largest of which are about two-thirds the size of *P. chilensis*, can travel hundreds of miles without flapping.

This new species was a seabird from northern Chile, but fossils of other bony-toothed birds have been found on other continents. It's likely that all of these species were huge. The researchers think the birds soared the skies looking for food, such as fish and squid. Once prey was spotted, the birds would cruise across the surface with their lower jaws immersed in the water, grabbing the slippery prey securely with their beaks.

Bony-toothed birds were a very successful group, living during most of the Cenozoic period over a time span of 50-60 million years. They all became extinct approximately 2 million years ago at a time when the Panamanian isthmus between North and South America closed.

Our distant human ancestors may have even watched these boat-sized birds in action. Fossils suggest pelagornithids lived in North Africa during the Pliocene Era. "If early humans, such as australopithecines or *Homo erectus*, lived in Morocco by that time and went to the sea, they would have seen these birds," Mayr said.

Mayr thinks it's possible predation by mammals coming over from North America could have wiped out the birds at their breeding grounds, or perhaps they couldn't tolerate resulting changes in sea currents.

Cecile Mourer-Chauvire, a paleornithologist at Claude Bernard University, told Discovery News that she wasn't surprised by the study, since it's been theorized for a while that pelagornithids "were really gigantic flying birds."

Stig Walsh, Senior Curator of Vertebrate Paleontology at National Museums Scotland, also thinks it's "entirely possible the Chilean Pelagornis could have had a wingspan of 17 feet." Walsh explained that the bird's bones had extremely thin walls, like those of pterosaur bones. "The lightness this must have given their bodies probably contributed to their ability to grow to such a large size," Walsh added.

A life-size reconstruction of *Pelagornis chilensis* will soon go on display at the Senckenberg Museum in Frankfurt, Germany.

Implanted Fuel Cell Powered by Rat's Body Fluids

In a medical first, the device made electricity from inside a living animal.

Brian Handwerk for National Geographic News

A new fuel cell is putting a twist on alternative energy from biofuels: The implanted device draws power from chemicals in living animals. Dubbed a glucose biofuel cell, the implant gets its juice from glucose - aka blood sugar - and oxygen, both of which are naturally present in the fluids between a body's cells.

In a recent study, researchers created a test version of their glucose biofuel cell and implanted it in a white lab rat named Ricky. The rat sported the device successfully for 11 days and suffered no ill effects. Wires running from the fuel cell out of the rat's neck showed that the device was producing a significant amount of energy. The team hopes that their biofuel cell could one day provide safe, longer-lasting power to the next generation of medical implants, such as smaller pacemakers and artificial organs.

"In the future we are expecting to develop, for instance, implantable biosensors able to monitor the level of glucose to control the insulin pump," an implant used to treat diabetes, said study co-author Serge Cosnier of the Université Joseph Fourier in Grenoble, France.

"The injection of insulin will be more efficient if the glucose level is detected continuously."

First Fuel Cell to Work in Live Animal

Previous versions of glucose biofuel cells worked only in specific lab conditions and not inside living bodies. That's because the chemicals used required acidic conditions not typical of body fluids, as well as higher than normal glucose levels.

The new fuel cell uses a unique arrangement of two graphite discs, each containing special enzymes and connected by platinum wire. The entire device is wrapped in a dialysis bag that lets in glucose and oxygen from body fluids. The enzymes react with the glucose and oxygen to create a current that flows along the platinum wire and out of the fuel cell via wires encased in tubing.

With the enzymes protected by graphite and the dialysis bag controlling chemical flow, the new glucose biofuel cell is the first to work from inside the abdomen of a living rat, the study team showed. (Explore an interactive human body.)

The device didn't cause inflammation and, when it was removed, the researchers found that the rat's body had coated the device with tissue containing newly grown blood vessels - proof that the animal's body had accepted the fuel cell and would facilitate the movement of glucose and oxygen into the device.

Next Steps: Power for Brain Chemicals, Urinary Sphincter

The trial biofuel cell described in the study produced about two microwatts of power for several hours at a time, with a peak energy density - the amount of energy stored in a given volume - of 24.4 microwatts per milliliter.

A standard pacemaker battery requires sustained power of ten microwatts, but those batteries have significantly smaller energy densities. This means a larger version of the new biofuel cell could easily run a pacemaker but still be smaller than batteries now in use, according to the study.

With improvements, Cosnier said, the system could power far more complex and power-hungry devices.

For instance, Cosnier said, the device could power future biosensors, like the ones proposed for insulin pumps, that would aid sufferers of Parkinson's and Alzheimer's disease by monitoring and controlling brain chemicals such as dopamine, adrenaline, and glutamate.

The team is also considering using their biofuel cell in an artificial urinary sphincter, a device used by patients who've had their prostates surgically removed and are suffering from incontinence. Currently, the artificial sphincter has to be operated manually with a pump. "The development of a robotized form [of the urinary sphincter] is strongly linked to the development of implanted biofuel cells," Cosnier said.

Artificial organs such as kidneys and hearts could also be developed or greatly improved with a renewable, in-body fuel source at hand, he said - provided the side effects are minimal.

One possible risk, Cosnier said, is that the device could malfunction and consume too much of the body's glucose, leading to hypoglycemia, or low blood sugar.

The rat-implanted biofuel-cell research was published online in May in the open-access journal PLoS ONE.

Mild memory loss is not a part of normal aging

Simply getting older is not the cause of mild memory lapses often called senior moments, according to a new study by researchers at the Rush Alzheimer's Disease Center. The study, published in the September 15, 2010, online issue of *Neurology*, the medical journal of the American Academy of Neurology, found that even the very early mild changes in memory that are much more common in old age than dementia are caused by the same brain lesions associated with Alzheimer's disease and other dementias.

"The very early mild cognitive changes once thought to be normal aging are really the first signs of progressive dementia, in particular Alzheimer's disease," said Robert S. Wilson, PhD, neuropsychologist at Rush University Medical Center. "The pathology in the brain related to Alzheimer's and other dementias has a much greater impact on memory function in old age than we previously recognized."

The study involved over 350 nuns, priests and brothers who participated in Rush's Religious Orders Study and completed up to 13 years of annual cognitive testing. After death, the brains were examined for the lesions associated with dementia: neurofibrillary tangles, cerebral infarction (stroke), and Lewy bodies.

Researchers looked at the rate of change in cognitive function over time. The last four to five years of life showed a very rapid decline. The preceding years showed a much more gradual decline that would be described as normal aging.

As expected, pathologic lesions were related to the rapid decline, but researchers were somewhat surprised to find the pathology was very strongly predictive of the mild changes in cognitive function.

Higher tangle density adversely affected all forms of cognition at all trajectory points. Both Lewy bodies and stroke approximately doubled the rate of gradual memory decline, and almost no gradual decline was seen in the absence of lesions.

"Our study finds that Alzheimer's disease and related dementias are the root cause of virtually all loss of cognition and memory in old age. They aren't the only contributing factors; other factors affect how vulnerable we are to the pathology and to its effects. But the pathology does appear to be the main force that is driving cognitive decline in old age," said Wilson.

According to Wilson, recognizing that the earliest changes in memory are related to Alzheimer's pathology can lead to early diagnosis and will be critical information if a treatment is developed that can alter the pathologic course of the disease. *Provided by Rush University Medical Center*

Even Very Low Dose of Regular Aspirin Wards Off Bowel Cancer, Study Finds

Even the lowest possible dose of aspirin (75 mg) can ward off bowel cancer, if taken regularly, finds research published online in the journal *Gut*. This protective effect is apparent after just one year and in the general population, not just those considered to be at risk of developing the disease, which is the second most common cause of cancer death in the world, killing almost half a million people every year.

Although previous research has shown that aspirin protects against bowel cancer, it is not known what the most effective dose is and how long it needs to be taken for.

The research team investigated just under 2,800 people with bowel cancer and just under 3,000 healthy people, matched for age, sex, and residential locality. All participants completed food frequency and lifestyle questionnaires to assess their usual diet and lifestyle choices, which are known to influence bowel cancer risk.

NSAID (non-steroidal anti-inflammatory drug) intake was categorised as taking more than four tablets a month of low dose aspirin (75 mg), other NSAIDs, or a mix. The likelihood of surviving bowel cancer once diagnosed or developing the disease anew was then tracked over five years.

In all, 354 (15.5%) of those with bowel cancer were taking low dose aspirin compared with 526 (18%) of their healthy peers. Taking any NSAID regularly, curbed the chances of developing bowel cancer compared with those who didn't take these painkillers. This finding held true, irrespective of lifestyle choices, age, diet, weight, and level of deprivation

After a year, taking daily low dose aspirin was associated with a 22% reduced risk of developing bowel cancer, and the magnitude of the reduction in risk was cumulative, rising to 30% after five years.

Some 1,170 people died out of a total of 3,417 people diagnosed with bowel cancer (including those who were healthy at the start of the study) during the monitoring period. Most of these deaths (1,023) were attributable to the disease.

Information on NSAID intake was available for 676 of these 1,023 deaths, and it showed that taking NSAIDs of any kind did not influence the risk of death from any cause nor did it increase bowel cancer survival.

But, crucially, the findings show that high doses of aspirin, taken for a long time, are not needed to help ward off bowel cancer, say the authors.

Journal Reference: *I. Farhat V N Din, Evropi Theodoratou, Susan M Farrington, Albert Tenesa, Rebecca A Barnetson, Roseanne Cetnarskyj, Lesley Stark, Mary E Porteous, Harry Campbell, Malcolm G Dunlop. Effect of aspirin and NSAIDs on risk and survival from colorectal cancer. Gut, 2010; DOI: 10.1136/gut.2009.203000*

High levels of cholesterol said better for longevity

The Japan Society for Lipid Nutrition has drawn up new guidelines stating that high cholesterol levels are better for living longer, defying conventional wisdom.

There are two kinds of cholesterol -- low-density lipoprotein (LDL) that is considered "bad," and high-density lipoprotein (HDL), which is regarded as "good" cholesterol. LDL cholesterol is delivered to cells throughout the body, while HDL is excess cholesterol collected from the body. The Japan Atherosclerosis Society, an organization focusing on lifestyle-related diseases, has advocated people lower their LDL cholesterol levels by improving dietary habits and using medication, because high LDL levels could cause heart disease.

In 2007, the society set diagnostic criteria for hyperlipemia, or elevated levels of lipids in the bloodstream, flagging LDL cholesterol levels of at least 140 mg/dl and HDL levels less than 40 mg/dl as dangerous for both men and women.

"According to domestic and foreign research, the higher LDL levels become, the more arterial stiffening advances. Correspondingly, incidence of heart disease also rises. We concluded that LDL cholesterol levels more than 140 mg/dl could easily cause heart disease," said Hirotsugu Ueshima, professor emeritus at Shiga University of Medical Science, who devised the atherosclerosis society's criteria.

However, Tomohito Hamazaki, a professor at Toyama University's Institute of Natural Medicine, who compiled the new cholesterol levels guidelines for the Japan Society for Lipid Nutrition, countered Ueshima's argument. "When examining all causes of death, such as cancer, pneumonia and heart disease, the number of

deaths attributable to LDL cholesterol levels exceeding 140 mg/dl is less than people with lower LDL cholesterol levels."

The lipid nutrition society guidelines do not posit new criteria, but Hamazaki cited some study results to prove his thesis. According to a eight-year study of about 26,000 men and women in Isehara, Kanagawa Prefecture, the death rate of men whose LDL cholesterol levels were between 100 mg/dl and 160 mg/dl was low, while the rate rose for those with LDL cholesterol levels of less than 100 mg/dl. The LDL figures exhibited less influence on women, but the death rate still rose for women with LDL cholesterol levels less than 120 mg/dl.

A separate study of 16,850 patients nationwide who suffered cerebral stroke showed the death rate of people with hyperlipemia who died from a cerebral stroke was lower, and their symptoms more slight. "Cholesterol is an essential component for the creation of cell membranes and hormones. It's not recommended to lower LDL figures by means of dietary intake and medication," Hamazaki said.

Additional differences exist between men and women's LDL figures.

"When women reach menopause, their cholesterol figures rise sharply, yet do not affect the arteriosclerosis process or development of heart diseases. At the very least, cholesterol criteria is not necessary for women," Hiroyuki Tanaka, director of Niko Clinic in Takeo, Saga Prefecture.

The society's for lipid nutrition's recently issued guidelines should become an opportunity to highlight the need for treatments to focus on the difference between genders and the related disease risks.

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Tyrannosaurs Were Human-size for 80 Million Years

T. rex's genus was slow to grow, review finds.

Brian Handwerk for National Geographic News

Tyrannosaurus rex may have towered over its Cretaceous competition, but for their first 80 million years, most tyrannosaur species were small-timers—no bigger than humans, researchers say.

Recent fossil finds—including six new tyrannosaur species last year alone—suggest that *T. rex's* genus had a mysterious growth spurt relatively late in its lineage, according to a review of tyrannosaur fossils in tomorrow's issue of the journal *Science*.

"Ten years ago we only knew about five or six different tyrannosaur species, and they were all very similar—giant apex predators like *T. rex*," said paleontologist Stephen Brusatte, a Ph.D. student at Columbia University affiliated with New York's American Museum of Natural History.

"Now we have 20 tyrannosaurs, spanning a hundred million years through the Jurassic and Cretaceous," said Brusatte, who co-authored the new review. "They range in size from small dogs all the way up to *T. rex*," which could reach 40 feet (12 meters) from nose to tail tip.

Tyrannosaurs originated in the Middle Jurassic period, about 165 million years ago. Though they generally remained small for 80 million years, early tyrannosaur species resembled *T. rex* in that they were bipedal predators with "incisor like" teeth (prehistoric time line). But significant physical differences are also in evidence. Some animals had longer arms, for instance, or relatively small heads.

"There is quite a difference between the oldest species and *T. rex*," Brusatte said. "But there were a hundred million years of evolution to play with."

University of Maryland tyrannosaur expert Thomas Holtz, Jr., added: "I like to call [early tyrannosaurs] the jackals of the Jurassic and Early Cretaceous. "They were tough little guys, but they were little guys, sort of hanging out in the wings and taking out young dinosaurs and small dinosaurs but leaving the big prey to things like *Allosaurus*," said Holtz, who was not involved in the new review.

Tyrannosaur Growth Spurt

It's not known exactly why or how the tyrannosaurs surged in size, study co-author Brusatte said.

"About 80 million years ago, they became not just huge in a physical sense but also in an ecological sense," he said. "They became dominant, apex predators."

Unfortunately for paleontologists, this relatively sudden evolutionary shift took place during a 15-million-year Middle Cretaceous period that's poorly represented in the fossil record.

What scientists do know is "that for the first 80 million years there were other groups of large, carnivorous dinosaur predators," said Brusatte, referring to the allosauroids and megalosauroids.

"So for most of their history, the tyrannosaurs were kept in check. Then, for some reason, most of these groups went extinct, and tyrannosaurs had the opportunity to flourish."

Raising Dinosaurs From the Dead

Even as new tyrannosaur fossil finds have provided precious evidence about the lineage, high-tech analyses have produced a much clearer picture of what *T. rex* and its evolutionary cousins were like in life. For example,

massive T. rex, some say, was likely slow moving but possessed of sharp senses of smell and hearing and—of course—the ability to deliver a bone-splitting bite.

Tyrannosaur abilities and behaviors are being reconstructed with imaging techniques such as CT scans, which reveal brain size and inner ear structures. Also, computer-driven biomechanical models are incorporating masses of data into programs that determine muscle strength or reveal how a dinosaur might have used its legs.

Fossils from some species, including T. rex, have also been uncovered in various stages of life. This information—fed into software that correlates body sizes and age data—is allowing scientists to virtually watch the animals grow and mature the way biologists do with living species.

It all adds up to a much clearer understanding of a genus of dinosaur that is not quite as familiar as we once thought. "Technology is giving us new insights into what fossils we do have," the University of Maryland's Holtz said, "and allowing us to look at dinosaurs as living animals in ways that an isolated skeleton can't."

Jupiter Makes Close Pass At Earth...

by Tammy Plotner

Look! Up in the sky! Is it a bird? Is it a plane? No... It's super Jupiter! "Jupiter is always bright, but if you think it looks a little brighter than usual this month, you're right," says Robert Naeye, editor in chief of Sky & Telescope magazine. "Jupiter is making its closest pass by Earth for the year. And this year's pass is a little closer than any other between 1963 and 2022."

Where do you find Jupiter? Try about 368 million miles away and (for most observers) low to the southeast after the skies get dark. The giant planet will reach its nearest point to us on the evening of September 20, 2010 – but will remain one of the brightest objects in the night through the end of the month.

Why does Jupiter appear to be more luminous now than at any other time? Although the varying distances over the years may seem marginal – about 10 to 11 million miles over a period of around 60 years – it translates into significance when it comes to magnitude factors. At its brightest, Jupiter can reach -2.94 , and dimmest at -1.6 . Just a 1% distance change can mean either 4% brighter or dimmer!

The mighty Jove has also undergone some cosmetic changes in the past year as well, making it an additional 4% brighter than usual.

For nearly a year the giant planet's South Equatorial Belt has slowly been covered by a highly reflective ammonia cloud. Normally the SEB appears to be brown, a result of Jupiter's chemical compounds reacting to the Sun's ultraviolet light. Known as "chromophores", these chemicals are known to mix with lower cloud decks and just a few stormy days could mean rising convection cells are forming crystallized ammonia – masking the light absorbing dark zone and adding to reflectivity.

Of course, a close pass doesn't mean Jupiter is going to appear to be the size of the Moon – nor be as bright – but it's certainly going to make a grand appearance on the nights of September 22 and September 23 when it joins Selene on the celestial scene!

Precursor to H.I.V. Was in Monkeys for Millenniums

By DONALD G. McNEIL Jr.

In a discovery that sheds new light on the history of AIDS, scientists have found evidence that the ancestor to the virus that causes the disease has been in monkeys and apes for at least 32,000 years — not just a few hundred years, as had been previously thought. That means humans have presumably been exposed many times to S.I.V., the simian immunodeficiency virus, because people have been hunting monkeys for millennia, risking infection every time they butcher one for food.

And that assumption in turn complicates a question that has bedeviled AIDS scientists for years: What happened in Africa in the early 20th century that let a mild monkey disease move into humans, mutate to become highly transmissible and then explode into one of history's great killers, one that has claimed 25 million lives so far? Among the theories different researchers have put forward are the growth of African cities and the proliferation of cheap syringes.

Confirming that the virus is very old also helps explain why it infects almost all African monkeys but does not sicken them. Over many generations, as any disease kills off vulnerable victims, the host adapts to it.

The new research, published Thursday in Science magazine, was relatively simple. Scientists tested 79 monkeys from Bioko, a volcanic island 19 miles off the West African coast. Bioko used to be the end of a



peninsula attached to the mainland in what is now Cameroon, but it was cut off when sea levels rose 10,000 years ago at the end of the last ice age.

Since then, six monkey species have developed in isolation on the island, and scientists from the National Primate Research Center at Tulane University in Louisiana and other American and African universities found that four of them — drills, red-eared guenons, Preuss's guenons and black colobuses — had members that were infected with S.I.V.

The four strains in the four species were genetically very different from one another - meaning they presumably did not come from monkeys carried over to the island by humans in the last few centuries. But each was close to the strain infecting members of the same four genera on the mainland, meaning they must have existed before Bioko was cut off.

Knowing that all four strains were at least 10,000 years old, scientists recalculated the virus's "molecular clock," measuring how fast it mutates. They now believe that all the S.I.V. strains infecting monkeys and apes across Africa diverged from a common ancestor between 32,000 and 78,000 years ago.

"When we only had 25 years of data, we were dating from the tip at the end of a branch of the evolutionary tree," said Preston A. Marx, a virologist at the Tulane primate center and an author of the paper in *Science*. "I knew that what we had before couldn't be right, because the virus had spread from the Atlantic to the Indian Ocean to the southern end of the continent, and it couldn't have done that in a couple of hundred years."

Beatrice H. Hahn, a virologist from the University of Alabama at Birmingham and a discoverer of the simian virus, called the study "a very nice paper," adding, "This is what people like us have been looking for."

Previous methods of dating the virus had concluded it was a few hundred to 2,000 years old, "and that just didn't seem right," Dr. Hahn said. The ancestor virus — which, like many diseases, may have crossed into simians from another, still-unknown species — may have existed for millions of years.

That theory was given greater credence two years ago with the discovery that some Madagascar lemurs have in their genomes the remnants of a virus that was not an S.I.V., but related to it. Madagascar, a Texas-size island 250 miles off the southeastern African coast, separated from Africa 160 million years ago. It has no monkeys, but lemurs' ancestors arrived there, possibly on floating mats of vegetation, probably more than 10 million years ago.

H.I.V., which is almost universally fatal to humans, is obviously very new to us. As Dr. Marx pointed out, if it had been in humans before the 20th century, it would have arrived in the Americas in some of the 12 million Africans kidnapped for the slave trade.

Its immediate ancestor is probably also relatively new to chimpanzees. Last year, Dr. Hahn showed that it can sicken and kill chimps, although not as quickly, meaning they have probably been adapting to it for generations.

The virus has probably crossed over from simians into humans at least five times. There are two human immunodeficiency viruses, H.I.V.-1, by far the most common, and H.I.V.-2, which is milder and rarely seen outside West Africa, and which jumped to humans from sooty mangabeys, a monkey that West Africans hunt and eat.

H.I.V.-1, in turn, has four substrains, designated M, N, O and P. The first, which has spread around the world, clearly came from chimpanzees, as did N and O. But P appears to have crossed over from a gorilla; it was discovered only last year, and in only one woman, who was from Cameroon, where lowland gorillas are hunted for meat.

It is very likely, scientists said, that a little infected monkey or ape blood got into human veins many times in history as hunters cut themselves while butchering carcasses. But even if it sickened those hunters, it probably died out with them or their immediate contacts.

The earliest confirmed H.I.V. case in humans was found in blood drawn in 1959 from a man in Kinshasa, in what was then called the Belgian Congo. Sometime between the 1800s and 1959, something presumably allowed a human infection with a chimpanzee virus to spread widely enough to evolve into modern H.I.V.-1, which could spread easily among humans.

Dr. Marx believes that the crucial event was the introduction into Africa of millions of inexpensive, mass-produced syringes in the 1950s. Campaigns to wipe out yaws, syphilis, malaria, smallpox and polio required syringes, and many were reused, often with official approval. Traditional healers adopted them for injecting their decoctions, and they became status symbols; a study in Uganda in the 1960s found that 80 percent of families owned one.

Not everyone agrees. Michael Worobey, a virologist at the University of Arizona and another author of the *Science* paper, said backdating the molecular clock, which he did by comparing the 1959 blood sample with the only other known early one — a paraffin-embedded lymph node from 1960, also from Kinshasa — suggested that the virus emerged closer to 1910, when syringes were handmade, expensive and rare.

He and Dr. Hahn suspect that the growth of colonial cities is to blame. Before 1910, no Central African town had more than 10,000 people. But urban migration rose, increasing sexual contacts and leading to red-light districts.

Less Is More in the Fight Against Terrorism

Terrorist networks are complex. Now, a mathematical analysis of their properties published this month in the *International Journal of Networking and Virtual Organisations*, suggests that the best way to fight them is to isolate the hubs within the network rather than trying to destroy the network as a whole through short-term battles.

According to Philip Vos Fellman a Lecturer at Suffolk University, Boston, and member of the New England Complex Systems Institute, USA, tools used to analyze complex systems can also be used to study terrorist networks with a view to undermining them.

Vos Fellman explains how terrorist networks are "typical of the structures encountered in the study of conflict, in that they possess multiple, irreducible levels of complexity and ambiguity."

"This complexity is compounded by the covert activities of terrorist networks where key elements may remain hidden for extended periods of time and the network itself is dynamic," adds Vos Fellman, an expert in mathematical modeling and strategy. The nature of a dynamic network is akin to the robust Internet but contrasts starkly with the structure of the armed forces or homeland security systems, which tend to be centralized and hierarchical.

Vos Fellman has used network analysis, agent-based simulation, and dynamic NK Boolean fitness landscapes to try and understand the complexities of terrorist networks. In particular, he has focused on how long-term operational and strategic planning might be undertaken so that tactics which appear to offer immediate impact are avoided if they cause little long-term damage to the terrorist network.

Vos Fellman's computer simulations of terrorist networks suggest that isolation rather than removal could be the key to successfully defeating them.

"The results which these simulation and dynamical systems modeling tools present suggest that quite literally sometimes less is more," says Vos Fellman, "and that operational objectives might be better directed at isolation rather than removal." He also points out that the simulations show that soft, or easy, targets of small cells within a network are, for the most part, not worth pursuing. Instead efforts should be focused on the hubs around which the network hinges. "If you are not focused on the top problems, then considerations of opportunity cost suggest that it may be better to do nothing rather than to waste valuable resources on exercises which are doomed to fail," he says.

1. Philip Vos Fellman. The complexity of terrorist networks. Int. J. Networking and Virtual Organisations, 2010, 8, 4-14

Researcher Discovers New 'Anti-Pathogenic' Drugs to Treat MRSA

Menachem Shoham, PhD, associate professor and researcher in the department of biochemistry at the Case Western Reserve University School of Medicine, has identified new anti-pathogenic drugs that, without killing the bacteria, render Methicillin Resistant Staphylococcus Aureus (MRSA) harmless by preventing the production of toxins that cause disease.

Infections of MRSA are a growing public health problem causing 20,000 deaths per year in the U.S. alone. MRSA is the most prevalent bacterial pathogen in hospital settings and in the community at large. The problem has become increasingly severe due to the fact that the bacteria develop resistance to antibiotics.

Currently, there are only two antibiotics available to treat MRSA (vancomycin and linezolid) and strains are emerging that are resistant even to these two remaining antibiotics. As result, healthcare providers are running out of options to treat patients suffering from antibiotic-resistant infections, creating a dire need for alternative treatments and approaches.

"Staph bacteria are ubiquitous and normally do not cause infections, however, occasionally these bacteria become harmful due to their secretion of toxins," said Dr. Shoham. "We have discovered potential "anti-pathogenic" drugs that block the production of toxins, thus rendering the bacteria harmless. Contrary to antibiotics, these new anti-pathogenic drugs do not kill the bacteria. And since the survival of the bacteria is not threatened by this approach, the development of resistance, like that to antibiotics, is not anticipated to be a serious problem."

Dr. Shoham identified a bacterial protein, known as AgrA, as the key molecule responsible for the release of toxins. AgrA, however, needs to be activated to induce toxin production. His goal was to block the activation of AgrA with a drug, thus preventing the cascade of toxin release into the blood that can lead to serious infections throughout the body.

The screening for AgrA inhibitors was initially carried out in a computer by docking a library of 90,000 compounds and finding out which compounds would fit best into the activation site on AgrA. Subsequently,

about one hundred of the best scoring compounds were acquired and tested in the laboratory for inhibition of the production of a toxin that ruptures red blood cells. Seven of these compounds were found to be active. Testing compounds bearing chemical similarity to the original compounds lead to the discovery of additional and more potent compounds. More than a dozen active compounds have been discovered by this method. The best drug candidate reduces red blood cell rupture to 12% of the value without the drug at a concentration of 10 µg/mL, without affecting bacterial growth.

"It is possible to inhibit virulence of MRSA without killing the bacteria," continued Dr. Shoham. "Such anti-pathogenic drugs may be used for prophylaxis or therapy by themselves or in combination with an antibiotic."

This research was carried out in the laboratory of Dr. Menachem Shoham in the Department of Biochemistry at the Case Western Reserve University School of Medicine in Cleveland, Ohio. Funding was provided by grants from the Steris Corporation and from the American Heart Association. The results were presented at the 50th Interscience Conference on Antimicrobial Agents and Chemotherapy, Boston Conference Center earlier this week.

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Case Western Reserve University.

Case Western Reserve University (2010, September 17). Researcher discovers new 'anti-pathogenic' drugs to treat MRSA. ScienceDaily.

Government Urges Universal Flu Vaccinations

Flu vaccine will soon be available at local pharmacies and doctor's offices, and government officials are urging everyone over 6 months of age to receive it. This year's vaccine protects against H1N1 and two other strains of seasonal flu.

The recommendation represents a break from past years, when the government focused on vaccinating people in certain "high-risk" groups and those in contact with people at high risk.

"The message is simple now," said David Weber, MD, MPH, professor of medicine, pediatrics and epidemiology at the University of North Carolina at Chapel Hill. "If you're more than 6 months of age, get the vaccine."

"In an average year, there are more than 200,000 hospitalizations and more than 35,000 deaths from flu. Many of those would be preventable by simply getting the flu shot," said Weber. "Flu shots are far and away the best way for preventing flu."

The Advisory Committee on Immunization Practices, a Centers for Disease Control and Prevention (CDC) advisory panel that set the recommendation for universal vaccination cited last year's H1N1 outbreak -- which affected many young, healthy people not traditionally considered to be at high risk for complications from flu -- as part of the reason for the change. In addition, the list of conditions that put a person at high risk has grown so much over the years that many people are unaware of their high-risk status. Universal vaccination is expected to better protect individuals and the population as a whole.

People should receive the vaccine every year as soon as it becomes available, said Weber. "It's important every year. This year it may be more important because anybody who didn't get H1N1 last year is susceptible to it, and since that was the first year H1N1 was around, many people, if not most people, are susceptible."

The vaccine is reformulated each year to provide protection against the virus strains that present the greatest public health threat for that year. People who contracted H1N1 last year may have a lower chance of contracting it again this year, but they should still receive the vaccine for protection against seasonal flu.

Adults need only one dose of the vaccine. Children 6 months to 8 years old may need two doses, depending on which vaccines they received last year.

The vaccine will be available at doctor's offices and at many pharmacies as both a nasal spray and as a shot. The shot is recommended for people younger than 2 or older than 49, and people with a suppressed immune system. The nasal spray is appropriate for most other healthy people.

Superbug: Neither Super Nor a Bug

Before you hunker down in your panic room, take a closer look at what the latest "superbug" really is. By Emily Sohn Fri Sep 17, 2010

Bacteria have developed a new way to resist a sweeping array of antibiotics, raising alarms about the spread of infections that might defy nearly all treatments.

Three Americans were recently diagnosed with the new infection, which they acquired during medical treatment in India and Pakistan. Media reports have dubbed the new infection a "superbug."

So how worried should we be?

While the infection is worth taking seriously, experts say, the public health implications are uncertain, and the finding has been widely misunderstood. Multi drug-resistant bacteria have been around for decades, they

say. Furthermore, there are still two kinds of antibiotics that fight the new infection, which crops up only in hospitals not in communities.

And while the new bug is highly resistant to drugs, it is not spreading rapidly -- at least not in the United States -- and it is not particularly deadly. In fact, it is not actually a bug at all. Instead, the drug resistance comes from a gene called NDM-1 that gets passed from one kind of bacteria to another.

"Calling it a superbug doesn't quite make sense," said Stephen Calderwood, chief of the infectious disease division at Massachusetts General Hospital in Boston, who recently treated someone with the infection. "It is highly resistant, but it doesn't make someone more sick. And as far as we know, it doesn't more easily go from one person to another."

Rather than sparking fears of an imminent epidemic, he added, the arrival of the gene points to the need for new kinds of antibiotics, tighter controls on existing antibiotics in some places, better international cooperation on health prevention, and more careful controls on medical tourism.

"If you put this into context, there are some worrisome features that need close attention. But with the data available to date, we don't know how worrisome it will be," Calderwood said. "Drug resistance is a big problem. It's underappreciated, and it needs a new investment. This latest bug is just one more example. It's not that dramatically different."

For decades, there has been an ongoing arms race between the bacteria that cause illnesses and the drugs that are designed to kill them. Traditionally, when bacteria developed resistance to one drug, another drug that works in a slightly different way was able to do the job. Worries escalated in the mid-1990s, when bacteria began to defy a variety of antibiotics at once. Many of these multi-drug resistant bacteria had acquired new genes, which produced enzymes that cut antibiotic molecules into pieces. That rendered the drugs powerless.

These genes have sparked even more concerns because they don't lie in the genomes of the bacteria themselves. Instead, they sit on small, circular pieces of DNA called plasmids, which can be passed between bacteria. On a single plasmid, there might be as many as 15 antibiotic-resistant genes, said Timothy Walsh, professor of medical microbiology at the University of Cardiff, in Wales. He discovered NDM-1.

What sets NDM-1 apart, Walsh said, is that it lies on a plasmid that seems to move especially freely between bacteria, even if they are completely unrelated. That means the gene could move from an E. coli bacterium that causes urinary tract infections to other types of bacteria that cause pneumonia, salmonella or cholera.

With some 100 trillion bacteria on and in our bodies at all times, plasmids with the NDM-1 gene have many opportunities to spread. That can happen inside a person's gut, in the soil, or within water that contains fecal contamination.

In a paper published in *The Lancet* last month, Walsh and colleagues reported clusters of the gene in Indian and Pakistan and in British people who had received medical treatment in those countries, suggesting that that's where the gene emerged. In that part of the world, he said, antibiotics are available over the counter and used indiscriminately, millions of people drink contaminated water, and hygiene is often lacking. These conditions can cause drug resistance to both develop and spread.

"In the U.S., there's no need at the moment for people to hit the panic button," Walsh said. "On a global level, there's an awful lot to be worried about."

Stone tools 'change migration story'

By Katie Alcock Science reporter, BBC News, Birmingham

A research team reports new findings of stone age tools that suggest humans came "out of Africa" by land earlier than has been thought.

Geneticists estimate that migration from Africa to South-East Asia and Australia took place as recently as 60,000 years ago.

But Dr Michael Petraglia, of Oxford University, and colleagues say stone artefacts found in the Arabian Peninsula and India point to an exodus starting about 70,000 to 80,000 years ago - and perhaps even earlier.

Petraglia, whose co-workers include Australian and Indian researchers, presented his ideas at the British Science Festival, which is hosted this year at Aston University.

"I believe that multiple populations came out of Africa in the period between 120,000 and 70,000 years ago," he said. "Our evidence is stone tools that we can date."

Dr Petraglia says robust dates can be put against the tools his group is uncovering



Most of the tools are from far inland - hundreds of kilometres from the coasts. This means it was more likely humans migrated by land than in boats, he said.

The tools are found in areas that are often very inhospitable now, but which at the time would have been much more conducive to migration. "During the period we're talking about, the environments were actually very hospitable," he told BBC News. "So where there are deserts today, there used to be lakes and rivers, and there was an abundance of plants and animals."

The team found the stone tools - ranging from a couple of centimetres to nearly 10cm in size - in layers of sediment that they can date using sand and volcanic material found above and below the implements. The tools were mainly either spear heads or scrapers. In particular, some tools were sandwiched in ash from the famous Toba eruption that geologists can date very accurately to 74,000 years ago.

Other species of early humans clearly left Africa before our species (*Homo sapiens*), but Dr Petraglia's team thinks that the tools it has found are the type made by modern humans - and not those of Neanderthals, for instance. Previous research has leaned heavily on examining the genetics of different modern populations to find out how long ago they shared a common ancestor - their African common ancestor.

Professor Chris Stringer, of the Natural History Museum in London, said this genetic data showed humans left Africa around 60,000 years ago or even more recently.

He agreed that "these tools show that people were in these regions, but the genetic data show an exit from Africa of later than 60,000 years ago. The people in India could have died out."

Dr Petraglia, however, suggested that researching these migrations using population genetics might not lead to accurate results, because all of the genetic studies were based on today's people. The absence of ancient DNA to make additional tests made this area of investigation much less reliable, he claimed.

Dr Petraglia's team now hopes to continue its excavations in the region. "We have literally hundreds of projects in Europe and a handful in the Arabian-South Asian belt," he said.

Virus 'link' to childhood obesity

A virus which causes respiratory infections has been linked to childhood obesity, in a study that is likely to reignite a controversial debate.

Previous animal research has implicated common viruses in weight gain, but the evidence has been disputed.

The latest study, in Pediatrics, found that obese children with antibodies specific to a certain virus weighed 35lbs (15.8kg) more than those without.

Nothing has yet been proven on this theory, say UK experts.

Previous research has shown that chicken or mice injected with similar types of viruses showed a statistically significant weight gain.

A link between the AD36 virus (adenovirus 36) and obesity in human adults has also been written about previously.

But how AD36 infects people and why it affects people differently is still not known.

Antibodies found

In the University of California study of 124 children aged eight to 18, half of the children were considered obese based on their Body Mass Index.

The researchers found the AD36 antibodies in 19 of the children, 15 of whom were in the obese group.

Within the group of obese children studied, those with evidence of AD36 infection weighed an average of 35lbs more than obese children who were AD36-negative, says the study.

Jeffrey Schwimmer, lead researcher and professor of clinical paediatrics at the University of California school of medicine, said he hoped his research would change attitudes to obese people.

"Many people believe that obesity is one's own fault or the fault of one's parents or family. This work helps point out that body weight is more complicated than it's made out to be.

"And it is time that we move away from assigning blame in favour of developing a level of understanding that will better support efforts at both prevention and treatment.

"These data add credence to the concept that an infection can be a cause or contributor to obesity," he said.

Julian Hamilton-Shield, professor in diabetes and metabolic endocrinology at the School of Clinical Sciences, University of Bristol, says the jury is still out on this idea.

"It's an interesting if small and non-definitive study. This does not show causation, just an association.

"For instance, it may be that obese people are at more risk of catching AD36.

"However, it does add a little evidence to suggestions that AD36 may be implicated in some way with childhood obesity," he said.

Manganese in drinking water: Study suggests adverse effects on children's intellectual abilities

A team of researchers led by Maryse Bouchard, adjunct professor at the Center for Interdisciplinary Research in Biology, Health, Environment and Society (CINBIOSE) of the Université du Québec à Montréal and a researcher at Sainte-Justine University Hospital, and Donna Mergler, professor emerita in the Department of Biological Sciences and a member of CINBIOSE, recently completed a study showing that children exposed to high concentrations of manganese in drinking water performed worse on tests of intellectual functioning than children with lower exposures. Their results are published in the prestigious scientific journal *Environmental Health Perspectives*, in an article entitled "Intellectual Impairment in School-Age Children Exposed to Manganese from Drinking Water".

Manganese: toxic in the workplace but harmless in water?

The neurotoxic effects of manganese exposure in the workplace are well known. This metal is naturally occurring in soil and in certain conditions is present in groundwater. In several regions of Quebec and Canada and in other parts of the world, the groundwater contains naturally high levels of manganese. Does it pose a danger? What effect might it have on children's health? This is the first study to focus on the potential risks of exposure to manganese in drinking water in North America.

The study, carried out by researchers at the Université du Québec à Montréal, the Université de Montréal and the École Polytechnique de Montréal, examined 362 Quebec children, between the ages of 6 and 13, living in homes supplied by with groundwater (individual or public wells). For each child, the researchers measured the concentration of manganese in tap water from their home, as well as iron, copper, lead, zinc, arsenic, magnesium and calcium. The amount of manganese from both tap water and food was estimated from a questionnaire. Finally, each child was assessed with a battery of tests assessing cognition, motor skills, and behaviour.

Lead author Maryse Bouchard explains, "We found significant deficits in the intelligence quotient (IQ) of children exposed to higher concentration of manganese in drinking water. Yet, manganese concentrations were well below current guidelines." The average IQ of children whose tap water was in the upper 20% of manganese concentration was 6 points below children whose water contained little or no manganese. The analyses of the association between manganese in tap water and children's IQ took into account various factors such as family income, maternal intelligence, maternal education, and the presence of other metals in the water. For co-author Donna Mergler, "This is a very marked effect; few environmental contaminants have shown such a strong correlation with intellectual ability." The authors state that the amount of manganese present in food showed no relationship to the children's IQ.

What next?

So what can be done about it? Some of the municipalities where the study was conducted have already installed a filtration system that removes manganese from the water. According to one of the other co-authors of the study, Benoit Barbeau, NSERC Industrial Chair in Drinking Water at the École Polytechnique de Montréal, "A viable alternative solution is home use of filtering pitchers that contain a mixture of resins and activated carbon. Such devices can reduce the concentration of manganese by 60% to 100% depending on filter use and the characteristics of the water."

In Quebec, where the study was conducted, manganese is not on the list of inorganic substances in the Ministry of Sustainable Development, Environment and Parks Regulation respecting the quality of drinking water. "Because of the common occurrence of this metal in drinking water and the observed effects at low concentrations, we believe that national and international guidelines for safe manganese in water should be revisited." the authors conclude.