http://bit.ly/2LkNdZU

Why a smell test should become part of a regular doctor visit

Nearly 50% increase in risk of dying within 10 years for older adults with poor sense of smell

EAST LANSING, Mich. - A new Michigan State University study suggests that older adults with poor sense of smell may see an almost 50% increase in their risk of dying within 10 years - surprisingly in healthier individuals. The research is published in the journal Annals of Internal Medicine.

"Poor sense of smell becomes more common as people age, and there's a link to a higher risk for death," said Honglei Chen, an epidemiologist who's focused his research on this sensory deficit in older adults. "Our study is the first to look at the potential reasons why it predicts a higher mortality."

Using data from the National Institute on Aging's Health ABC study, Chen and his research team reviewed information from almost 2,300 participants between 71 and 82 years old over a 13-year period. Participants included men and women, black and white, who completed a smell test of 12 common odors. Researchers then classified participants as having good, moderate or poor sense of smell.

Compared with older adults with a good sense of smell, those with poor smell were at a 46% higher risk for death at 10 years and 30% at 13 years.

Results were minimally affected by sex, race or other demographic and lifestyle factors. However, the surprising revelation was that the healthier participants at the start of the study were found to be largely responsible for the higher risk.

Poor sense of smell is known as an early sign for Parkinson's disease and dementia and is associated with weight loss. However, these conditions only explained 28% of the increased risk, leaving most of it unexplained.

"We don't have a reason for more than 70% of the increased risk. We need to find out what happened to these individuals," said Chen, who plans to pursue the mystery in future studies.

He added that poor sense of smell may be an early and sensitive sign for deteriorating health before it's even recognized in the doctor's office.

"It tells us that in older adults, impaired sense of smell has broader implications of health beyond what we have already known," Chen said. "Incorporating a sense of smell screening in routine doctor visits might be a good idea at some point."

So, what should people do if they think they're having trouble smelling? Talk to a doctor. "It's always prudent to talk to a physician about your health concerns," he said.

http://bit.ly/2PMdmzz

'Hippie Chimps' Had Sex with Mysterious 'Ghost Ape' Hundreds of Thousands of Years Ago

"Ghost apes" may have interbred with the great apes known as bonobos

By Charles Q. Choi, Live Science Contributor

Mysterious "ghost apes" may have interbred with the great apes known as bonobos just as modern humans repeatedly had sex with now-extinct human lineages, a new study finds. Bonobos are, with chimpanzees, humanity's closest living relatives.

Bonobos may have interbred with a mysterious "ghost ape" hundreds of thousands of years ago. Sergey Uryadnikov/Shutterstock

Together, bonobos and chimps are part of the group *Pan*, just as modern humans and extinct lineages of humans make up the group *Homo*.

Recently, geneticists discovered that ancestors of modern humans often interbred with extinct human lineages such as Neanderthals and Denisovans. The DNA from such trysts continues to influence modern humans, from potential immune boosts to increased risk for depression, obesity, heart attacks and nicotine addiction.

Previous research suggested that bonobos and chimps may have interbred as well. For example, prior work found genes likely flowed from bonobos to chimpanzees more than 200,000 years ago.

By analyzing the genomes from 10 bonobos and 59 chimpanzees for signs of genes from unknown ancient groups, scientists have now uncovered evidence that bonobos also had sex with a now-extinct ape lineage.

"We know humans have interbred with Neanderthals and Denisovans and probably other archaic human populations, and it's interesting to see that happened with our closest living relatives as well," said study lead author Martin Kuhlwilm, a population geneticist at the Biomedical Research Park of Barcelona, Spain.

The researchers looked for unusual patterns in the ape genomes that suggested ancient interbreeding with other lineages. This included a hunt for long haplotypes, or sets of DNA sequences, that were seen in one species but not the other. The reasoning is that short haplotypes are potentially explained by a few chance mutations within these species, but comparatively long haplotypes are instead likely inherited from a significantly different lineage.

Although these genetic contributions from interbreeding dwindle over time, remnants would still exist as shorter, unusual fragments. By looking at the length of these odd haplotypes, scientists can estimate how far back the interbreeding occurred.

By isolating the DNA from this "ghost ape," the researchers said they could reconstruct up to 4.8% of its genome. They said genes in these archaic fragments may have consequences on the workings of the brain, kidneys and immune system of bonobos.

Previous research suggested the ancestors of bonobos and chimps diverged from one another at most about 2 million years ago, likely separating after the Congo River grew. In contrast, the scientists estimated this ghost ape diverged from the common ancestor of bonobos and chimps about 3.3 million years ago.

"It's an extinct branch of the *Pan* family tree," Kuhlwilm said.

The researchers suggested the rendezvouses between bonobos and the ghost apes happened sometime between 377,000 and 637,000 years ago. In contrast, they detected no signs that chimpanzees ever interbred with any now-extinct lineages, perhaps because the Congo River cut off chimpanzees from other groups, Kuhlwilm said.

In the future, the researchers would like to look for signs of interbreeding within other great apes, Kuhlwilm said. Analyzing great ape genomes could shed light on extinct lineages in a way the fossil record likely cannot.

"We have absolutely nothing in terms of bonobo fossils," Kuhlwilm said. "There is one chimp fossil that's been unearthed that's maybe 400,000 years old, but that's basically it for African great apes. By analyzing living apes, we can get information on extinct ape populations that we can't get from ancient DNA, since there are almost no ancient ape fossils."

Bonobos are a species well-known for its promiscuity. "We can speculate if that might have facilitated these interactions," Kuhlwilm said.

The scientists detailed their findings online today (April 29) in the journal Nature Ecology & Evolution.

http://bit.ly/2vE33UG

A Newly Recognized Brain Disorder Can Mimic Alzheimer's. Here's How It's Different.

Researchers are officially defining a new brain disorder that mimics Alzheimer's disease, giving the condition a name and diagnostic criteria, according to a new report.

By Rachael Rettner, Senior Writer | April 30, 2019 12:00pm ET

The disorder will be known as LATE, which stands for limbic-predominant age-related TDP-43 encephalopathy, the report said. LATE has only recently been recognized as a type of dementia, and this is the first time that researchers have come to a consensus about what the disease should be called and how it is distinguished from other brain disorders.

The new report — published today, April 30, in the journal Brain — is the product of a National Institute on Aging (NIA)-sponsored workshop on the condition, which included researchers from more than 20 institutions in six countries.

Because LATE and Alzheimer's disease have similar symptoms, cases of LATE may have previously been mistaken for cases of Alzheimer's. Recognizing these as two separate disorders will advance research on both conditions, the study authors said.

"The ultimate goal ... is to either prevent or at least be able to treat the causes and the symptoms" of either brain disease, be it Alzheimer's or LATE, said Nina Silverberg, director of the Alzheimer's Disease Centers Program at the NIA and co-chair of the LATE workshop.

"In order to do that, we have to understand what's causing the symptoms," Silverberg told Live Science. "Sorting through who has what [condition] hopefully should help us" with this goal.

There is now an "urgent need" for research on LATE, the report said, as there is much more to learn about the condition, including ways to improve diagnosis and identify risk factors, as well as prevent and treat the disease. Ultimately, the new report is a "starting point for the research to move forward" on this condition, Silverberg said.

LATE vs. Alzheimer's

Dementia isn't a specific disease; rather, the term refers generally to a loss of cognitive functioning, such as declines in memory and thinking ability, that interferes with a person's daily activities. Alzheimer's is the most common type of dementia, but researchers now know that there are many different varieties of the disorder.

Although the symptoms of Alzheimer's and other dementias may be similar, these diseases look different inside the brain. The hallmark of Alzheimer's is the accumulation of plaques, made from proteins called beta-amyloid, and tangles, consisting of a different protein called tau, in the brain.

But recently, researchers have found that not everyone suspected to have Alzheimer's shows these telltale signs in their brains, meaning they actually have a different condition.

In cases of LATE, people have an accumulation of a different protein, called TDP-43, that is misfolded in the brain, according to the report.

What researchers know about LATE

LATE tends to affect the "oldest old" in the population: More than 20% of people over age 85 show signs of the condition, the report said. But more research is needed to better understand how many people have the condition, Silverberg said.

Still, the public health impact of LATE is likely at least as large as that of Alzheimer's, the authors wrote.

LATE affects multiple areas of cognition, including memory, and ultimately impairs everyday activity. It appears that LATE progresses more gradually than Alzheimer's disease, although the two conditions may coincide and cause a more rapid decline than either would alone.

The new report describes three "stages" of LATE, depending on where in the brain TDP-43 is found. (The three areas are the amygdala, hippocampus and middle frontal gyrus.)

Currently, LATE can be diagnosed only after death, during autopsy. But the authors said that they hope the new report spurs research into biomarkers for the disease, so that doctors can diagnose it before death and study it in clinical trials. Finding biomarkers for the disease is also important for the study of Alzheimer's, so researchers can distinguish between the two conditions when a person is alive, the authors said.

http://bit.ly/2VmZDoY

Earth magma ocean ended up on the moon

New modelling resolves contradictions in Earth-moon hypothesis.

Lauren Fuge reports.

A large part of the moon was created from a liquid magma ocean that covered much of the early Earth, new modelling suggests.

The study, led by Natsuki Hosono of Yokohama Institute for Earth Sciences in Japan, reconciles a major contradiction between current theories about how the moon formed.

Scientists have quarrelled over the moon's origin for more than a century. Coming up with a formation theory is tricky, because it needs to explain both the chemical and mechanical characteristics of the Earth-moon system.

The prevailing theory is a giant impact hypothesis, which goes like this: roughly four billion years ago in the late stages of planet formation, a Mars-sized object slammed into proto-Earth and flung off chunks from our planet. The swirling debris was captured in orbit and coalesced into the Moon.

But although the hypothesis is able to explain the large angular momentum of the Earth-moon system and the moon's lack of an iron-rich core, it does have some issues.

Modelling shows that the moon should be mostly made up of the material from the initial impactor, but rocks brought back from lunar missions show that it's actually compositionally similar to the Earth. Scientists have tried to play around with all kinds of weird impact angles and unconventional impact conditions to help the collision make sense. Now, Hosono and colleagues in Japan and the US suggest a simpler solution: a fiery ocean of molten rock.

In the aftermath of the solar system's formation, a lot of debris was flying around. The Earth would have been subject to a steady stream of impacts – perhaps with enough energy to melt the planet's surface. In a paper published in the journal *Nature Geoscience*, the team proposes that a solid impactor struck Earth while it was covered with a sea of magma.

They performed 3D numerical simulations of the same giant impact scenario with the addition of a magma ocean and found that it accounted for a large fraction of the moon-forming material that blasted off the Earth. In particular, the model looks at how the impactor and the proto-Earth are heated differently in the collision – something previous models didn't address.

It turns out that the magma is heated far more than the solid impacting material, which causes the former to expand in volume. About half of the ocean ends up sloshing into orbit and mixing with fragments of the impactor material, and from that combination the moon is formed. "In our model, about 80% of the moon is made of proto-Earth materials," says co-author Shun-ichiro Karato, a Yale geophysicist. "In most of the previous models, about 80% of the moon is made of the impactor. This is a big difference."

The model thus reconciles the compositional similarities and differences between the two bodies, without the need for prohibitively specific impact conditions. It's a neat little example of the scientific process in general. Instead of ditching ideas that don't quite work, researchers often tweak them to match the data.

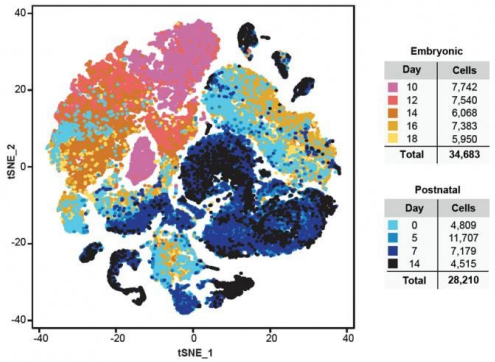
http://bit.ly/2H3lVTB

The unanticipated early origins of childhood brain cancer

Study identifies earliest traces of brain cancer long before the disease becomes symptomatic

TORONTO - Brain tumours are the leading cause of non-accidental death in children in Canada, but little is known about when these tumours form or how they develop.

Researchers have recently identified the cells that are thought to give rise to certain brain tumours in children and discovered that these cells first appear in the embryonic stage of a mammal's development - far earlier than they had expected.



Embryonic

Day	Cells
10	7,742
12	7,540
14	6,068
16	7,383
18	5,950
Total	34,683

Postnatal

Day	Cells
0	4,809
5	11,707
7	7,179
14	4,515
Total	28,210

This is a graph-plot showing the relationship between 62,040 single cells isolated from the mouse cerebellum. **Maria C. Vladoiu, Ibrahim El-Hamami and Laura K. Donovan.**

Their findings, published today in *Nature*, could lead the way to the discovery of better treatments to attack these lethal tumours.

"Progress in the development of more effective brain cancer treatments has been hampered in large part by the complex heterogeneity - or the variety of cells - within each tumour," says Dr. Michael Taylor, Paediatric Neurosurgeon and Senior Scientist in Developmental and Stem Cell Biology at The Hospital for Sick Children (SickKids) and co-lead of the study. "We recognized that new technologies could allow us to unravel some of this complexity, so we combined our expertise with McGill and OICR to approach this problem together."

Using mouse models, the research group investigated the different types of normal brain cells and how they developed at various timepoints in the cerebellum of the brain - the most common location for childhood brain tumours to appear. They mapped the lineages of over 30 types of cells and identified normal cells that would later transform into cancerous cells, also known as the cells of origin.

To pinpoint these specific cells, the group relied on single cell sequencing technology, which allows researchers to look at individual cells more clearly than traditional sequencing methods.

In their investigation, the cells of origin were observed much earlier in fetal development than one would expect, says Taylor, who is also a Professor in the Departments of Surgery and Laboratory Medicine and Pathology at the University of Toronto and Co-lead of OICR's Brain Cancer Translational Research Institute.

"Our data show that in some cases, these tumours arise from cell populations and events that would occur in humans at six weeks in utero," says Dr. Lincoln Stein, Head of Adaptive Oncology at OICR and co-lead of the study. "This means that the brain tumours may be starting long before they show in clinic, even before a woman may know she is pregnant."

"The brain is extraordinarily complex. These findings are not only important for better understanding brain tumours but they will also allow us to learn more about these cells and how they work, in order to help children with neurodevelopmental delays. What we have accomplished as a team in this study brings hope for patients," adds Dr. Nada Jabado, Paediatric Hemato-Oncologist and Senior Scientist in the Child Health and Human Development Program at the Research Institute of the McGill University Health Centre and co-lead of the study. Dr. Jabado is also a professor of Pediatrics and Human genetics at McGill University.

With this knowledge, researchers can now study the differences between the development of normal, healthy cells and the cells that will eventually give rise to cancerous cells.

This work was made possible through the 2017 Large-Scale Applied Research Project Competition Genomics and Precision Health supported by main funding agencies Génome Québec, the Canadian Institutes of Health Research (CIHR) and Genome Canada, as well as the Ontario Research Fund, SickKids Foundation, and the Montreal Children's Hospital Foundation. The work was also supported by the Ontario Institute for Cancer Research through funding provided by the Government of Ontario and the Stand Up To Cancer (SU2C) St. Baldrick's Pediatric Dream Team Translational Research Grant (SU2C-AACR-DT1113) and SU2C Canada Cancer Stem Cell Dream Team Research Funding (SU2C-AACR-DT-19-15) provided by the Government of Canada through Genome Canada and the Canadian Institutes of Health Research, with supplementary support from the Ontario Institute for Cancer Research through funding provided by the Government of Ontario. Stand Up To Cancer is a program of the Entertainment Industry Foundation administered by the American Association for Cancer Research.

http://bit.ly/2YdLHKR

Two neutron stars collided near the solar system billions of years ago

Some of the most coveted matter on Earth likely originated in violent collision of two neutron stars 4.6 billion years ago

by Columbia University

Astrophysicists Szabolcs Marka at Columbia University and Imre Bartos at the University of Florida, have identified a violent collision of two neutron stars 4.6 billion years ago as the likely source of some of the most coveted matter on Earth.

This single cosmic event, close to our solar system, gave birth to 0.3 percent of the Earth's heaviest elements, including gold, platinum and uranium, according to a new paper appearing in the May 2 issue of *Nature*.

"This means that in each of us we would find an eyelash worth of these elements, mostly in the form of iodine, which is essential to life," Bartos said.

"A wedding ring, which expresses a deep human connection, is also a connection to our cosmic past predating humanity and the formation of Earth itself, with about 10 milligrams of it likely having formed 4.6 billion years ago."

"Meteorites forged in the early solar system carry the traces of radioactive isotopes," said Bartos, who received his Ph.D. at Columbia.

"As these isotopes decay they act as clocks that can be used to reconstruct the time they were created," Marka said.

To arrive at their conclusion, Bartos and Marka compared the composition of meteorites to numerical simulations of the Milky Way.

They found that a single neutron-star collision could have occurred about 100 million years before the formation of Earth, in our own neighborhood, about 1000 light years from the gas cloud that eventually formed the Solar System.

The Milky Way galaxy itself is 100,000 light years in diameter, or 100 times the distance of this cosmic event from the cradle of Earth.

"If a comparable event happened today at a similar distance from the Solar System, the ensuing radiation could outshine the entire night sky," Marka said.

The researchers believe that their study provides insight into a uniquely consequential event in our history.

"It sheds bright light on the processes involved in the origin and composition of our solar system, and will initiate a new type of quest within disciplines, such as chemistry, biology and geology, to solve the cosmic puzzle," Bartos said.

"Our results address a fundamental quest of humanity: Where did we come from and where are we going? It is very difficult to describe the tremendous emotions we felt when realized what we had found and what it means for the future as we search for an explanation of our place in the universe, " Marka said.

Imre Bartos et al, A nearby neutron-star merger explains the actinide abundances in the early Solar System, Nature (2019). DOI: 10.1038/s41586-019-1113-7

http://bit.ly/3021w8S

Finally, a Denisovan specimen from somewhere beyond Denisova Cave

The 160,000-year-old jawbone is the first Denisovan fossil found outside Siberia.

Kiona N. Smith - 5/2/2019, 2:00 AM

Denisovans, an extinct group of hominins that once walked alongside (and had sex with) Neanderthals and modern humans, are an enigmatic branch of our family tree. They left fragments of their DNA behind in modern human genomes across Asia, Australia, and Melanesia. But their only physical remains seem to have been left in Denisova Cave in Siberia: just a finger, a few molars, a fragment of arm or leg bone, and a small chunk of skull.

The proteins in this lower jawbone identify it as Denisovan. **Dongju Zhang/Lanzhou University**

But we're starting to piece together a little more of our mysterious cousins' story. A team of paleoanthropologists recently identified a new Denisovan fossil—half of an entire jaw. And it comes from the high altitude of the Tibetan Plateau in northern China, nearly 2,000km (1,200 miles) from Denisova Cave.

An accidental find

Half a lower jaw and a few teeth may not sound like much, but it's one of the largest pieces of a Denisovan skeleton that we know of so far. Its owner died at least 160,000 years ago, according to uranium-series dating of a thin crust of carbonate on the fossil, so the Denisovan from Tibet is about the same age as the oldest Denisovan unearthed so far at Denisova Cave.

Archaeologists weren't able to recover any DNA from the Tibetan fossil, but they did find ancient proteins preserved in the dentin (the layers below the hard outer enamel) of a tooth. DNA's code spells out instructions for making proteins, so the archaeologists compared the proteins from the jawbone with the proteomes (all the proteins a particular organism's DNA codes form) of modern humans, Neanderthals, and Denisovans. It most closely matched the Denisovan genome sequenced from a fossil at Denisova Cave. They also created a virtual model of the fossil with micro-CT scans in order to digitally "excavate" away the carbonate crust and get a better look at the jawbone's features.

A monk stumbled across the fossil in 1980, but it took several years to find its way to archaeologists. "We were all too busy to start the work on this mandible until 2010," anthropologist Dongju Zhang of Lanzhou University told Ars. No one was sure exactly where the specimen had come from, and without that information, it became a low priority. When Zhang and his colleagues started surveying the region in 2010 and eventually traced the mandible back to Baishya Karst Cave in 2016, they finally started work on the fossil.

Pleistocene encounters

The find means Denisovans had been living on the Tibetan Plateau at least 120,000 years before Homo sapiens arrived in the neighborhood. Surviving on the Tibetan Plateau, typically about 3,280m (10,000 feet) above sea level, meant adapting to scarce resources, a chilly climate, and the thin air of higher altitudes. Those challenges selected for genetic traits that would help, and some of those traits got shared with the strange new species that moved into the area sometime between 30,000 and 40,000 years ago.

One of those alleles codes for a specific protein in the cells lining blood vessels, which helps a person function in hypoxic conditions at high altitude. The Denisovan version of that gene is still found in the genomes of modern Tibetans, Sherpas, and neighboring peoples. It's been a bit of a puzzle, given the low altitude of Denisova Cave

(about 800m above sea level) and the fact that modern humans didn't arrive on the Tibetan Plateau until well after the latest fossil evidence we have of Denisovans.

But this find, and its date, suggest that modern humans had plenty of time to commingle with Denisovans in Tibet and that natural selection would have favored keeping that chunk of the Denisovan genome even when most of the rest of the genome got discarded.

The Xiahe mandible is also concrete evidence of how widespread Denisovan populations once were. The presence of fragments of Denisovan DNA in modern human genomes suggests that the species once had an extensive range, but the only physical traces we've found so far have come from a single site in Siberia, so we don't know much about their actual range. A 2018 study suggested that those traces actually came from at least two populations of Denisovans who had been separated for long enough to have genetic differences. That means humans encountered and mingled with Denisovans at least twice—and at a large enough scale to leave genetic traces behind 30,000 years later.

A comparison between the Denisovan genome recovered from a fossil fragment at Denisova Cave and fragments of Denisovan DNA in modern human genomes suggests that both populations were recognizably Denisovan, but they'd split apart around 300,000 years ago. That find raises questions about how genetically diverse the Denisovans were and how many groups they branched into (and when) as they spread through their slice of the world.

"These two groups split more than 300,000 years ago and therefore could be almost as different, one from the other, as Neanderthals from Denisovans," anthropologist Jean-Jacques Hublin of the Max Planck Institute for Evolutionary Anthropology told Ars. (Analysis of Neanderthal and Denisovan genomes suggest that the two sister species diverged between 445,000 and 473,000 years ago.)

More Denisovans out there?

As usual, we still need more data to answer some burning questions about our past; the question of Denisovan diversity is just one among many. Paleoanthropologists also need more fossils from other areas to fully understand how much of the world the Denisovans once called home. At the moment, all we can definitely say about Denisovans' geographic reach is that they lived in Siberia and Tibet. "We need more fossil material outside of China, in particular in southeast Asia," Hublin told Ars.

But it's possible that some of those fossils have already been found and, like the Xiahe jawbone, are just waiting to be identified. For example, the molars in the lower jaw from Xiahe have some important features in common with molars from hominin lower jaws from Taiwan and north China. That's not enough to prove those hominins are Denisovans, of course, but ancient DNA or ancient protein analysis could test the idea if they've been preserved well enough. University of Copenhagen anthropologist Fredo Welker is optimistic. "I would have to say that although the Tibetan Plateau is colder, the proteome recovered from the Xiahe mandible is not particularly rich (in other words, there are not many proteins preserved in the mandible)," he told Ars. Yet the team still managed to identify the fossil's species based on those few preserved proteins. "I therefore think it is reasonable to expect that other fossils can be identified as Denisovans or Denisovan-related hominins based on ancient protein analysis in the future," said Welker.

Meanwhile, the search for new sites and new fossils continues. Zhang and his colleagues started excavations in Baishiya Karst Cave in 2018, and they plan to spend the next few years continuing that excavation and analyzing fossils and artifacts from the site. "And at the same time, we plan to do archaeological surveys in a much wider region on the Tibetan Plateau, hoping that we could find more good Paleolithic sites," Zhang told Ars Technica.

Nature, 2019. DOI: 10.1038/s41586-019-1139-x;(About DOIs).

http://bit.ly/2VhUIVZ

Alzheimer's disease is a 'double-prion disorder,' study shows

Self-propagating amyloid and tau prions found in post-mortem brain samples, with highest levels in patients who died young

Two proteins central to the pathology of Alzheimer's disease act as prions -- misshapen proteins that spread through tissue like an infection by forcing normal proteins to adopt the same misfolded shape -- according to new UC San Francisco research.

Using novel laboratory tests, the researchers were able to detect and measure specific, self-propagating prion forms of the proteins amyloid beta (A-β) and tau in postmortem brain tissue of 75 Alzheimer's patients. In a striking finding, higher levels of these prions in human brain samples were strongly associated with early-onset forms of the disease and younger age at death.

Alzheimer's disease is currently defined based on the presence of toxic protein aggregations in the brain known as amyloid plaques and tau tangles, accompanied by cognitive decline and dementia. But attempts to treat the disease by clearing out these inert proteins have been unsuccessful. The new evidence that active A-β and tau prions could be driving the disease -- published May 1, 2019 in *Science Translational Medicine* -- could lead researchers to explore new therapies that focus on prions directly.

"I believe this shows beyond a shadow of a doubt that amyloid beta and tau are both prions, and that Alzheimer's disease is a double-prion disorder in which these two rogue proteins together destroy the brain," said Stanley Prusiner, MD, the study's senior author and director of the UCSF Institute for Neurodegenerative Diseases, part of the UCSF Weill Institute for Neurosciences. "The fact that prion levels also appear linked to patient longevity should change how we think about the way forward for developing treatments for the disease. We need a sea change in Alzheimer's disease research, and that is what this paper does. This paper might catalyze a major change in AD research."

What are Prions?

Prions are misfolded versions of a protein that can spread like an infection by forcing normal copies of that protein into the same self-propagating, misfolded shape. The original prion protein, PrP, was identified by Prusiner in the 1980s as the cause of Creutzfeldt Jakob Disease (CJD) and spongiform bovine encephalopathy, also known as Mad Cow Disease, which spread through consumption of meat and bone meal tainted with PrP prions. This was the first time a disease had been shown to infect people not by an infestation of an organism such as a bacterium or a virus, but through an infectious protein, and Prusiner received a Nobel Prize for that discovery in 1997.

Prusiner and colleagues have long suspected that PrP was not the only protein capable of acting as a self-propagating prion, and that distinct types of prion could be responsible for other neurodegenerative diseases caused by the progressive toxic buildup of misfolded proteins. For example, Alzheimer's disease is defined by A-β plaques and tau tangles that gradually spread destruction through the brain. Over the past decade, laboratory studies at UCSF and elsewhere have begun to show that amyloid plaques and tau tangles from diseased brains can infect healthy brain tissue much like PrP, but considerably more slowly.

Many scientists have been reluctant to accept that A-β and tau are self-propagating prions -- instead referring to their spread as "prion-like" -- because unlike PrP prions, they were not thought to be infectious except in highly controlled laboratory studies. However, recent reports have documented rare cases of patients treated with growth hormone derived from human brain tissue, or given transplants of the brain's protective dura mater, who went on to develop A-β plaques in middle age, long before they should be seen

in anyone without a genetic disorder. Prusiner contends that these findings argue that both Aß and tau are prions even though they propagate more slowly than highly aggressive PrP prions.

In response to these debates, Prusiner likes to quote from a 1969 lecture by neuroscientist Bernard Katz: "There is a type of scientist who, if given the choice, would rather use his colleague's toothbrush than his terminology!"

Laboratory Bioassays Reveal Aß and Tau Prions in Human Postmortem Brain Samples

In the new study, the researchers combined two recently developed laboratory tests to rapidly measure prions in human tissue samples: a new A-β detection system developed in the Prusiner lab and a tau prion assay previously developed by Marc Diamond, PhD, a former UCSF faculty member who is now director of the Center for Alzheimer's and Neurodegenerative Diseases at UT Southwestern Medical Center.

Unlike earlier animal models that could take months to reveal the slow spread of A-β and/or tau prions, these cell-based assays measure infectious prion levels in just three days, enabling the researchers to effectively quantify for the first time the levels of both tau and A-β prions in processed extracts from post-mortem brain samples. In the new study, they applied the technique to autopsied brain tissue from over 100 individuals who had died of Alzheimer's disease and other forms of neurodegeneration, which was collected from repositories in the United States, Europe, and Australia.

In assays comparing the samples from Alzheimer's patients with those who died of other diseases, prion activity corresponded exactly with the distinctive protein pathology that has been established in each disease: in 75 Alzheimer's disease brains, both A-β and tau prion activity was elevated; in 11 samples from patients with cerebral amyloid angiopathy (CAA), only A-β prions were seen; and in 10 tau-linked frontotemporal lobar degeneration (FTLD) samples, only tau prions were detected. Another recently developed bioassay for alpha-synuclein prions only found these infectious particles in the seven samples from patients with the synuclein-linked degenerative disorder multiple system atrophy (MSA).

"These assays are a game-changer," said co-author and protein chemist William DeGrado, PhD, a professor of pharmaceutical chemistry and member of the UCSF Cardiovascular Research Institute, who contributed to the design and analysis of the current study. "Previously Alzheimer's research has been stuck looking at collateral damage in the form of misfolded, dead proteins that form plaques and tangles. Now it turns out that it is prion activity that correlates with disease, rather than the amount of plaques and tangles at the time of autopsy. So if we are going to succeed in developing effective therapies and diagnostics, we need to target the active prion forms, rather than the large amount of protein in plaques and tangles."

A-β and Tau Prion Activity Linked to Alzheimer's Patients' Longevity

The most remarkable finding of the new study may be the discovery that the self-propagating prion forms of tau and A-β are most infectious in the brains of Alzheimer's patients who died at a young age from inherited, genetically driven forms of the disease, but much less prevalent in patients who died at a more advanced age.

In particular, when compared to measurements of overall tau buildup -- which is known to increase with age in Alzheimer's brains -- the researchers found a remarkable exponential decline in the relative abundance of the prion forms of tau with age. When the researchers plotted their data, they saw an extremely strong correlation between tau prions and patients' age at death: relative to

overall tau levels, the quantity of tau prions in the brain of a patient who died at age 40 were on average 32 times higher than in a patient who died at 90.

"I still remember where I was sitting and what time of day it was when I first saw this data over a year ago," said co-author and leading neurodegeneration researcher William Seeley, MD, a professor of neurology at the UCSF Memory and Aging Center who directs the UCSF Neurodegenerative Disease Brain Bank, which provided tissue used in the study. "I've very rarely, if ever, seen this kind of correlation in human biological data. Now the job is to find out what the correlation means."

The research raises a number of questions that will need to be addressed by future studies, including whether differences in prion infectivity could explain the long-standing mystery of why Alzheimer's progresses at such different rates in different patients. Other open questions resulting from the research include whether higher prion levels in brain samples from younger patients are linked to the early onset of the disease or how quickly it progressed, and whether lower prion levels in older brains reflect less "infective" prion variants or instead some ability of these patients' brains to dispose of misfolded proteins.

The evidence that prion forms of A-β and tau play a specific role in Alzheimer's disease -- one that cannot be captured by simply counting amyloid plaques and tau tangles in patient brains -- also raises questions on current approaches to Alzheimer's diagnosis, clinical trial design, and drug discovery, say the authors, who hope their novel assays will spur renewed interest in developing therapies to target the now-measurable prion proteins.

"We have recently seen many seemingly promising Alzheimer's therapies fail in clinical trials, leading some to speculate that we have been targeting the wrong proteins," said Carlo Condello, PhD, one of the study's lead authors. "But what if we just haven't been designing drugs against the distinctive prion forms of these proteins that actually cause disease? Now that we can effectively measure the prion forms of A-β and tau, there's hope that we can develop drugs that either prevent them from forming or spreading, or help the brain clear them before they cause damage."

Authors: *Atsushi Aoyagi, PhD, of Daiichi Sankyo Co. in Tokyo and Carlo Condello, PhD, were co-lead authors of the new study. Stanley B. Prusiner, MD, the director of the UCSF Institute for Neurodegenerative Diseases and professor in the departments of Neurology and of Biochemistry and Biophysics, was the study's senior author. Prusiner and Condello are the study's corresponding authors. For a full list of additional authors and brain banks that supplied tissue samples used in the research, please see the study online.*

Funding: *This work was supported by grants from the National Institutes of Health (NIH) (AG002132, AG031220, AG061874), the Oak Meadow Foundation, the Brockman Foundation, the Glenn Foundation, Rainwater Charitable Foundation, the Sherman Fairchild Foundation, and the Alzheimer's Association (2015-NIRG-339935).*

Disclosures: *The Institute for Neurodegenerative Diseases (UCSF) has a research collaboration with Daiichi Sankyo (Tokyo, Japan). Prusiner is a member of the Board of Directors of Trizell Inc. and a member of the scientific advisory board of ViewPoint Therapeutics, neither of which contributed support for this study. DeGrado is a member of the scientific advisory boards of Pliant, Longevity, Cytegen, Amai, and ADRx Inc., none of which contributed support for this study. Seeley received consulting fees from Bristol Myers-Squibb, Merck Inc., and Biogen Idec. Aoyagi, Prusiner, and other co-authors are coinventors on patent # WO/2017/172764 entitled "Modified cell line and method of determining tauopathies."*

http://bit.ly/2DQfeT9

Arsenic-breathing life discovered in the tropical Pacific Ocean

Arsenic is a deadly poison for most living things, but new research shows that microorganisms are breathing arsenic in a large area of the Pacific Ocean.

A University of Washington team has discovered that an ancient survival strategy is still being used in low-oxygen parts of the marine environment.

"Thinking of arsenic as not just a bad guy, but also as beneficial, has reshaped the way that I view the element," said first author Jaclyn Saunders, who did the research for her doctoral thesis at the

UW and is now a postdoctoral fellow at the Woods Hole Oceanographic Institution and the Massachusetts Institute of Technology.

The study was published this week in the Proceedings of the National Academy of Sciences.

"We've known for a long time that there are very low levels of arsenic in the ocean," said co-author Gabrielle Rocap, a UW professor of oceanography. "But the idea that organisms could be using arsenic to make a living -- it's a whole new metabolism for the open ocean."

The researchers analyzed seawater samples from a region below the surface where oxygen is almost absent, forcing life to seek other strategies. These regions may expand under climate change.

"In some parts of the ocean there's a sandwich of water where there's no measureable oxygen," Rocap said. "The microbes in these regions have to use other elements that act as an electron acceptor to extract energy from food."

The most common alternatives to oxygen are nitrogen or sulfur. But Saunders' early investigations suggested arsenic could also work, spurring her to look for the evidence.

The team analyzed samples collected during a 2012 research cruise to the tropical Pacific, off the coast of Mexico. Genetic analyses on DNA extracted from the seawater found two genetic pathways known to convert arsenic-based molecules as a way to gain energy. The genetic material was targeting two different forms of arsenic, and authors believe that the pathways occur in two organisms that cycle arsenic back and forth between different forms.

Results suggest that arsenic-breathing microbes make up less than 1% of the microbe population in these waters. The microbes discovered in the water are probably distantly related to the arsenic-breathing microbes found in hot springs or contaminated sites on land.

"What I think is the coolest thing about these arsenic-respiring microbes existing today in the ocean is that they are expressing the genes for it in an environment that is fairly low in arsenic," Saunders said. "It opens up the boundaries for where we could look for organisms that are respiring arsenic, in other arsenic-poor environments."

Biologists believe the strategy is a holdover from Earth's early history. During the period when life arose on Earth, oxygen was scarce in both the air and in the ocean. Oxygen became abundant in Earth's atmosphere only after photosynthesis became widespread and converted carbon dioxide gas into oxygen.

Early lifeforms had to gain energy using other elements, such as arsenic, which was likely more common in the oceans at that time.

"We found the genetic signatures of pathways that are still there, remnants of the past ocean that have been maintained until today," Saunders said.

Arsenic-breathing populations may grow again under climate change. Low-oxygen regions are projected to expand, and dissolved oxygen is predicted to drop throughout the marine environment.

"For me, it just shows how much is still out there in the ocean that we don't know," Rocap said. Saunders recently collected more water samples from the same region and is now trying to grow the arsenic-breathing marine microbes in a lab in order to study them more closely.

"Right now we've got bits and pieces of their genomes, just enough to say that yes, they're doing this arsenic transformation," Rocap said. "The next step would be to put together a whole genome and find out what else they can do, and how that organism fits into the environment."

Co-author Clara Fuchsman collected the samples and led the DNA sequencing effort as a UW postdoctoral research scientist and now holds a faculty position at the University of Maryland. The other

co-author is Cedar McKay, a research scientist in the UW School of Oceanography. The study was funded by a graduate fellowship from NASA and a research grant from the National Science Foundation.

http://bit.ly/2LyUJAK

Humans will eat maggots, scientists insist

University of Queensland researchers are investigating the use of maggots, locusts and other alternative proteins in a range of specialty foods.

by University of Queensland

University of Queensland Meat Science Professor Dr. Louwrens Hoffman said conventional livestock industries would not be able to meet worldwide demand for meat, and alternatives were needed to replace or complement traditional protein sources.

"An overpopulated world is going to struggle to find enough protein unless people are willing to open their minds, and stomachs, to a much broader notion of food," Professor Hoffman said. "Would you eat a commercial sausage made from maggots? What about other insect larvae and even whole insects like locusts? The biggest potential for sustainable protein production lies with insects and new plant sources."

Professor Hoffman said studies had shown that Western consumers who were willing to try insects in pre-prepared food recoiled from the idea of eating or preparing insect-based meals themselves, unless the insects were processed and disguised.

"In other words, insect protein needs to be incorporated into existing food products as an ingredient. For example, one of my students has created a very tasty insect ice-cream."

Sausages made from fly larvae. Credit: University of Queensland

Professor Hoffman said kangaroo meat was a potential source of global protein, as kangaroos used landscapes unsuitable for grazing.

Professor Hoffman's Queensland Alliance for Agriculture and Food Innovation (QAAFI) research involves the use of larvae (maggots) from the black soldier fly (Hermetia illucens) as a protein source for chicken production.

"Poultry is a massive industry worldwide and the industry is under pressure to find alternative proteins that are more sustainable, ethical and green than the grain crops currently being used," he said.

He and his collaborators have found that broiler chicken diets that include up to 15 per cent larvae meal don't compromise chicken production performance, nutrient-use efficiency, breast meat aroma, flavour, juiciness and tenderness, or long-chain fatty acid composition.

"It's all pretty logical if you think about it," he said. "Chickens in the wild don't eat feed preparations. They eat insects and larvae.

"And, while insects are largely foreign as a food in Western cultures, for many millions of people around the world they are a familiar part of the diet."

Professor Louwrens said insect larvae could be produced as a product from 'upcycled waste' including sewage.

"There needs to be a better understanding of the difference between animal feed and human food, and a global reappraisal of what can constitute healthy, nutritional and safe food for all."

http://bit.ly/2Y8bLXx

New Study Shows How Elderberries Fight Influenza Virus

Compounds from elderberries exhibit multiple modes of therapeutic action against influenza infection

by News Staff / Source

The **elderberry (*Sambucus nigra*)** is a small, antioxidant-rich fruit common to Europe and North America that is still commonly consumed as a jam or wine. According to a **new study**, published in the ***Journal of Functional Foods***, compounds from elderberries

exhibit multiple modes of therapeutic action against influenza infection.

"Elderberry extract is effective in treatment of flu. We aimed to determine the mechanism of action of elderberry and its active compounds against influenza virus," said University of Sydney's Professor Fariba Deghani and colleagues.

Compounds from elderberries (セイヨウニワトコ) can directly inhibit the influenza virus' entry and replication in human cells, and can help strengthen a person's immune response to the virus. **Anemone123.**

The researchers performed a comprehensive examination of the mechanism by which phytochemicals, compounds that positively effect health, from elderberries combat influenza infections.

They used commercially farmed elderberries which were turned into a juice serum and were applied to cells before, during and after they had been infected with the influenza virus.

The phytochemicals from the elderberry juice were shown to be effective at stopping the virus infecting the cells, however to the surprise of the researchers they were even more effective at inhibiting viral propagation at later stages of the influenza cycle when the cells had already been infected with the virus.

"Elderberries have a potent direct antiviral effect against the flu virus. They inhibit the early stages of an infection by blocking key viral proteins responsible for both the viral attachment and entry into the host cells," said study first author Dr. Golnoosh Torabian, also from the University of Sydney.

"This observation was quite surprising and rather significant because blocking the viral cycle at several stages has a higher chance of inhibiting the viral infection," said University of Sydney's Dr. Peter Valtchev, co-author of the study.

"In addition to that, we identified that the elderberry solution also stimulated the cells to release certain cytokines, which are chemical messengers that the immune system uses for communication between different cell types to coordinate a more efficient response against the invading pathogen," Professor Deghani said.

The scientists also found that the elderberry's antiviral activity can be attributed to its anthocyanidin compounds — phytonutrients responsible for giving the fruit its vivid purple coloring.

Golnoosh Torabian et al. *2019. Anti-influenza activity of elderberry (*Sambucus nigra*).* Journal of Functional Foods *54: 353-360; doi: 10.1016/j.jff.2019.01.031*

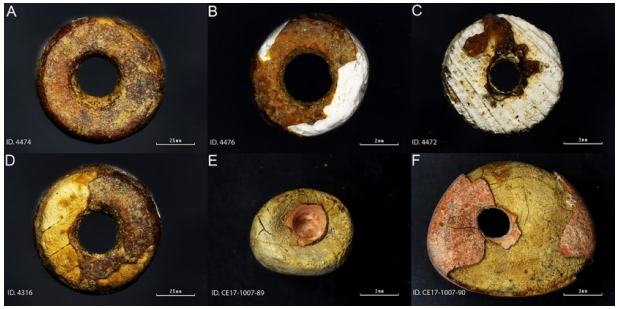
http://bit.ly/2Via38Z

'Amber' beads revealed as prehistoric fakes

Neolithic purchasers buying high status goods may have been ripped off by unscrupulous dealers.

Andrew Masterson reports.

Pieces of amber jewellery made in the second and third millennia BCE have been found to be fakes – revealing that the practice of passing off dodgy imitations to unsuspecting customers stretches back at least 5000 years.



The six fake 'amber' beads, clearly showing their moody origins. **Odriozola et al., 2019**

In a paper in the journal *PLOS One*, researchers led by Carlos Odriozola from the University of Seville in Spain report on a chemical analysis of six ostensibly amber prehistoric beads. Two were found in a cave tomb at an archaeological site called La Molina, near Seville, which dates to the third millennium BCE, and four came from a burial site in Cova del Gegant near Barcelona, dating from the second millennium BCE.

All turned out to be fakes.

Amber has always been a rare and expensive commodity, much prized by many civilisations. This was very much the case in prehistoric Iberia, where the ancient tree sap was acquired from Sicily via long-distance trade routes and prized as a status symbol, often in the form of grave goods.

To date, archaeologists have recovered 647 Iberian amber artefacts, dating from between the sixth and second millennia BCE.

The beads retrieved by Odriozola and colleagues will not, strictly speaking, add to the total.

"The allure and rarity of amber triggered the exchange and use of this resinite, but also the development of imitations by the use of other local translucent minerals or the application of coatings, as described by this paper, to reproduce the colour of amber," the authors write.

Analysis of the beads from Cova del Gegant revealed that far from being made of Sicilian sap they comprised an inner core of mollusc shell, covered in several layers of a resin that the researchers think was possibly extracted from a pine tree.

The beads from La Molina were also covered in tree resin, but had had seeds at their centres. They were also reddish rather than golden in hue, but the researchers suggest that this might be the result of exposure to cinnabar, a form of mercury sulfide and another much sought-after luxury, after they were placed in the grave.

The presence of the fake amber beads at both sites, which are the final resting place of some very high-status individuals, represent a mystery. Rare and exotic items, such as ivory carvings, are present, suggesting that money was no barrier to purchasing, and that the deceased (before their demise) were well wired into luxury good trade networks.

Odriozola and colleagues advance three possible explanations.

Perhaps real amber had become difficult to acquire due to increasing demand, they suggest, or perhaps the grave occupants weren't actually as wealthy as they appear and had to opt for lower-cost lookalikes.

Or perhaps, they add, the imitation beads were "products used by middlemen to cheat the purchasers".

They also note that many of the hundreds of prehistoric artefacts previously recovered have been identified as amber primarily through visual inspection. More detailed chemical analysis might expose a proportion of them to be similarly counterfeit.

http://bit.ly/2vEZGNu

Boys with a rare muscle disease are breathing on their own, thanks to gene therapy

A new gene therapy treatment has had striking results in nine boys born with myotubular myopathy

By Jocelyn Kaiser

Washington, D.C.—A new gene therapy treatment has had striking results in nine boys born with myotubular myopathy (MTM), a rare disease that causes extreme muscle weakness often from birth. All of the boys have better neuromuscular function, most can sit on their own, and four are now breathing without ventilators. As videos of their improvements were shown here on 1 May at the annual meeting of the American Society of Gene & Cell Therapy (ASGCT), the audience broke out in applause. The results, the first of their kind for this rare disease, cap a year of early signs of success in using gene therapy for inherited muscle diseases.

As far as muscle function is concerned, the boys "have gone from nothing to something," says principal investigator Perry Shieh, a neurologist at the University of California, Los Angeles. "Time will tell how much that something will be."

The patients in the new study have X-linked MTM, caused by a defect in a gene called *MTM1* that encodes an enzyme,

myotubularin. Skeletal muscles need the enzyme to develop and function. Boys with the disease have low muscle tone and, in many cases, can barely breathe or move on their own; most require a ventilator and feeding tube. Half of patients die by 18 months, and few live past age 10.

In the trial, sponsored by Audentes Therapeutics, a gene therapy company in San Francisco, California, nine boys between 8 months and 6 years old with X-linked MTM received an intravenous (IV) infusion of many trillions of particles of a harmless virus, called an adeno-associated virus. The viruses were designed to carry a good copy of the *MTM1* gene into the boys' muscle cells. The gene, a free-floating piece of DNA, could then trigger the cell's proteinmaking machinery to produce myotubularin. Three patients had serious side effects that may have been related to the therapy, such as heart inflammation, but all were treatable.

Biopsies showed that 48 weeks after the first six boys received treatment, their leg muscle cells that previously had virtually no myotubularin were making, on average, 85% of the normal amount, Shieh reported yesterday. The boys' abnormally small muscle fibers had grown larger. Four can now sit up without help, and three are taking steps with assistance; although still receiving nutrition through a feeding tube, several have started to eat food. And some can vocalize sounds for the first time, Shieh says.

In one set of before-and-after videos, a 1-year-old boy lay passively on an examining table; 48 weeks after his treatment, he could stand and take steps with help. In another, a child who wobbled and needed help to sit up later sat alone and reached out to grab a toy. Three children treated with a higher dose are showing similar motor function gains after 6 months, along with faster changes in their muscle cells and up to double the amount of myotubularin that a healthy child's cells make, Shieh reported.

"They're getting great results," says gene therapy researcher and ASGCT president Michele Calos of Stanford University in Palo Alto, California, who chaired a symposium of the meeting's top abstracts, where Shieh presented. And in theory, those results could last: Because muscle cells don't normally divide, the extra myotubularin could keep the boys' muscles working for years to come. Dogs with a milder form of MTM that received the same therapy and gained the ability to run are still doing fine years later, Shieh notes.

The treatment will be tested in more children before Audentes seeks approval from the U.S. Food and Drug Administration (FDA). Meanwhile, another IV gene therapy, for a rare genetic disease called spinal muscular atrophy that led to dramatic improvements in 15 children is expected to soon become the second FDA-approved gene therapy for an inherited disorder. (The first was gene therapy for an inherited form of blindness in late 2017.)

In the past year, experimental IV gene therapy from the biotech company Sarepta Therapeutics in Cambridge, Massachusetts, has also helped four boys born with Duchenne muscular dystrophy gain muscle strength—they can now more easily climb stairs, for example. And 60 days after a similar treatment, patients with a disease called limb-girdle muscular dystrophy are making substantial amounts of a missing muscle protein, Sarepta recently reported. To see such treatments finally helping patients is "surreal," says Louise Rodino-Klapac, who spent her career developing these therapies in the lab at Ohio State University and Nationwide Children's Hospital in Columbus before joining Sarepta last year to head its gene therapy unit.

These and other successes have helped spur an explosion of interest in the field. The ASGCT meeting, which for years attracted about 2000 attendees, drew more than 4800 this year, forcing the hotel hosting the meeting to turn people away from packed rooms and set

up tents for some sessions. Many of the new attendees were from biotech companies. That's a signal, says Calos, that after overcoming early obstacles, gene therapy is now "maturing as a branch of medicine." From now on, she adds, the meeting will take place at larger venues.

http://bit.ly/2ZYyqr0

The Giant Panda Is a Closet Carnivore

A new study shows that the nutrient profile of the bear's all-bamboo diet is much closer to that of a typical meat eater.

Ed Yong

The giant panda, a consummate vegetarian, belongs to a group of mammals called Carnivora, so-called because almost all of them—dogs, cats, hyenas, weasels, mongooses, raccoons, and more—eat meat. But the giant panda's diet of bamboo, and little else, makes it a vegetarian.

At least, outwardly.

Yonggang Nie and Fuwen Wei of the Chinese Academy of Sciences have spent years tracking wild pandas, analyzing exactly what kinds of bamboo they eat, and measuring the chemicals within those mouthfuls. And they found that the nutrient profile of a panda's all-bamboo diet—very high in protein, and low in carbohydrates—is much closer to that of a typical carnivore than to that of other plant-eating mammals. "It was a surprise," Wei says. Nutritionally, "bamboo looks like a kind of meat."

In other words, "the giant panda does what human vegetarians do," says Silvia Pineda-Munoz of the Georgia Institute of Technology. "We have high protein requirements, so we wouldn't be able to survive if we just ate kale salad. Thus, we choose to eat tofu, beans, nuts, and other plant-based foods that compensate for the protein we aren't getting from animal products. In the end, vegetarians and nonvegetarians don't have such different diets when it comes to nutrients." And so it is with China's black-and-white bear.

This discovery explains some puzzling parts of panda biology. The panda's ancestors switched to a vegetarian diet more than 2 million years ago. In that time, the panda has evolved stronger jaws for chewing tough, fibrous mouthfuls, and one of its wristbones has become a false thumb, for gripping bamboo stems. But despite these superficial hardware changes, it still has a meat eater's digestive system.

Plant-eating mammals almost always have enlarged, elongated guts to slow the passage of food, and to give their inner bacteria more time to digest their meals. The panda, however, has the short, vanilla gut of a carnivore. Even its gut microbes are closer to a bear's than, say, a cow's or deer's. Nie and Wei's study makes sense of this paradoxical combination of traits. The giant panda has the plumbing of a half-committed herbivore because it has the *diet* of a closet carnivore.

The team used tracking collars to follow pandas in China's Foping National Nature Reserve, which harbors the highest density of these bears in the world. The pandas, it turned out, migrate over long distances to exploit the shoots and leaves of two bamboo species, which grow at different altitudes. Every year, the bears cycle from low-growing leaves, to low-growing shoots, to high-growing shoots, to high-growing leaves, and back again. The team analyzed these varied mouthfuls and determined that the pandas' decisions seem largely motivated by protein. They're always selecting the species and tissues that offer the most protein and the least fiber.

Their selective tastes mean that at least 50 percent of their energy comes from protein, while just 39 percent comes from carbohydrates, and 13 percent from fat. That's comparable to feral cats and wolves, which also get half their energy from protein. And it's starkly different from other plant-eating mammals, which typically get 20 percent of their energy from protein.

Panda poop, which the team also collected and analyzed, told the same story. So did panda milk. Nutritionally, it stands apart from most herbivore milk, and falls in with typical carnivore milk.

This suggests that the move from meat to plants might have been easier for ancestral pandas than commonly assumed. By simply choosing parts of plants that are richer in protein, they could switch to vegetarianism without needing to radically overhaul their bodies. "If you're going to switch to a specific plant, bamboo isn't too bad, as it does have respectable plant protein levels, as well as a swath of different vitamins," says Garret Suen of the University of Wisconsin at Madison.

These results should help to counter the tiresome myth that pandas are evolutionary dead ends: lazy, poorly adapted creatures that eat deficient diets, are inept at sex, and should be allowed to go extinct. Nonsense. Pandas have beautifully adapted to eat an extremely plentiful food source—bamboo—and they go to great, careful lengths to get exactly the right balance of nutrients.

Perhaps by felling large expanses of China's bamboo forests, humans have disrupted the panda's ability to find the specific protein-rich morsels that it needs. And perhaps captive pandas are so famously prone to digestive problems, and loath to breed, because they're not being fed the right kinds of bamboo.

Pandas aside, Nie and Wei's study should also make us rethink how we classify animals. Terms such as *herbivore* and *carnivore* can be misleading if they only account for what a species is eating, and not the nutrients that it's actually using for energy. The same goes for labels such as *generalist* or *specialist*. The former implies versatility, and the latter, inflexibility. But a generalist animal might eat a wide range of foods precisely because it needs to keep its nutritional levels within narrow boundaries. Its versatility in choices might reflect a hidden, underlying inflexibility.

Samantha Price of Clemson University wants to know what kind of nutrient levels other bear species shoot for, especially because their diets are so varied. "Sloth bears predominantly eat insects; spectacled bears predominantly eat plants, especially bromeliads; sun bears eat fruit and insects; polar bears rely on marine mammals; while grizzly bears [and] American and Asiatic black bears are omnivorous and will eat fruits, seeds, leaves, insects, and mammals," she says. Do they all resemble the panda, or do they differ?

Even in these species, appearances can be deceiving. Black and brown bears in the U.S. "have a diet that is about 80 percent vegetation," Pineda-Munoz says. "During the summer, they load [up] on animal protein for a few weeks, but in general they are herbivores. Diet is more complex than we think."

https://bbc.in/2JjTiDp

Bell's palsy: 'I woke and the night had stolen my smile'

Clare Mount will always remember the evening of Christmas Day 2003 as "the night that stole my smile".

On Boxing Day she awoke with Bell's palsy, a nerve condition that causes paralysis to part of the face. It affects up to 24,000 people in the UK a year, but charity Facial Palsy UK said a lack of awareness means many still cannot get timely treatment.

The Royal College of GPs (RCGP) Wales said doctors should recognise it and urged patients to seek early help.

Mother-of-one Clare, 40, of Crumlin, Caerphilly county, has lived with Bell's palsy for 15 years and, at times, it has left her a shadow of her former self. "It makes me feel awful, it's devastating and I hide myself from people. I try and act like it doesn't bother me, but it's your face," she said.

The housing association worker said people sometimes stare and strangers have called her cruel names, such as "freak", "tramp" and "Sloth from the Goonies".

In eight out of 10 cases people recover from Bell's palsy, with the effects to their face reversing within weeks or months. But for the rest, like Clare, it persists. In these cases, the patient's chances of a long-term recovery are greatly increased if they were given steroids within the first 72 hours of the palsy's onset.

Clare went to the hospital when Bell's palsy first struck and medics allayed her family's fears that she'd had a stroke. She was advised to see her GP but, as her surgery was closed for the festive period, she was unable to get a diagnosis and steroids within the 72-hour window. "It would have reduced it a lot," Clare said.

"Every case is different, so it may not have gone away completely, but certainly it would have meant that I would not have to have suffered as much as I have had over the last few years."

What is Bell's palsy?

**** The most common facial palsy, it causes temporary weakness or paralysis of the muscles on one side of the face, with the symptoms varying from person to person.***

**** The weakness on one side of the face can be described as either a partial palsy, a mild muscle weakness, or a complete palsy, which is no movement at all.***

**** Bell's palsy can also affect the eyelid and mouth, making them difficult to close and open.***

**** It is not known exactly what causes Bell's palsy but links have been * made to viruses.***

**** Symptoms can include a facial droop, pain in the inner ear, chronic pain, difficulty with eating and speaking, and the inability to close one eye.***

Sources: **NHS and Facial Palsy UK**

People with persistent Bell's palsy can also receive help through additional specialist treatments, such as surgical procedures, Botox and physiotherapy.

Clare said over the years she has been repeatedly referred by GPs to ear, nose and throat services, which have been unable to help.

She said: "There is definitely lack of awareness because the doctors don't know where to signpost you to. They can't signpost you to where they don't know."

But after getting online advice from another person with Bell's palsy, Clare recently learned of a specialist facial palsy team at Morriston Hospital, in Swansea, and secured an appointment after passing the information to her GP.

"It was mixed emotions at first," she said.

"I was very angry that I could've had this help 14 years ago, because the doctor had been there that long, but now I just feel that there is a light at the end of the tunnel."

The advice came from Marcus Horton, 31, of Pembrey, Carmarthenshire; he was an Army sniper based in England when he developed Bell's palsy in January 2017.

Marcus said he was mistakenly diagnosed with meningitis at first - despite suggesting Bell's palsy to medics - and by the time his condition was properly identified, it was also too late for steroids.

The father-of-three said it ultimately meant he could not carry on in his dream job and left him suffering physically and mentally as he tried to adjust. "It's been quite a bit of an emotional rollercoaster to be honest," he said. "I've got my down days and it's hard not to think about the anxiety and depression. It has an affect on me now, [but] not so much as when it first happened."

Marcus, who now works for a utility company, said anyone who suspects they have Bell's palsy should be given steroids immediately as a precaution and more specialist treatment centres are needed.

A recent survey of 421 people with facial palsy in the UK found 19% were initially misdiagnosed, while 41.7% said their GP had not known who or where to refer them. And one in five of those with Bell's palsy said it took them more than a year to see a specialist, according to the Facial Palsy UK research.

Debbie Byles, a trustee of the charity, said: "The quicker the treatment, the better the outcomes for the patient. The longer it's left, the harder the symptoms are to overcome."

Dr Mair Hopkin, joint chairman of the Royal College of GPs Wales, said Bell's palsy was "fairly well-known" to most doctors and "fairly easy to recognise", although it can be confused with a stroke. She said early diagnosis and oral steroids were critical to upping the chances of a long-term recovery but other specialist services may not actually help that much.

"Unfortunately the evidence that any of these additional treatments will make a difference in the long term is very slim," she said.

"Patients do need to be reassured that, for the majority, they will make a recovery. "It's the unfortunate few patients who need a lot of ongoing support and sometimes a lot of ongoing psychological support from their local GP services."

http://bit.ly/2H3VMnZ

The Oral and Genital Herpes Viruses Are Having 'Sex.' The Result Is Worrisome.

There's a lot more "sex" going on between the oral and genital herpes viruses than scientists previously thought, according to a new study.

By Rachael Rettner, Senior Writer

The study, published April 23 in The Journal of Infectious Diseases, found that the two herpes simplex viruses — known as HSV-1 and HSV-2 — mix their genetic material together, or "recombine," more often than thought. (HSV-1 classically causes oral infections and HSV-2 causes genital infections.)

The researchers "found, basically, that there was considerably more recombination than had previously been appreciated," between the two viruses, said study co-author Dr. Alex Greninger, an assistant professor of laboratory medicine at the University of Washington (UW) School of Medicine.

What's more, although scientists knew that the two viruses had mixed in the distant past, the new study shows that this mixing continues to this day. "Herpes viruses are still having sex," Greninger told Live Science.

But the mixing appears to be a "one-way" exchange, with HSV-2 acquiring genes from HSV-1, and not the other way around, the authors said.

As a result, the genital herpes virus (HSV-2) continues to evolve, which could have negative implications for public health, the researchers said. For example, HSV-2 might evolve in a way that makes it resistant to current antiviral drugs.The ability of HSV-2 to mix with HSV-1 could also be a barrier to the development of a vaccine against herpes, which doesn't yet exist, Greninger added.

Herpes history

The two herpes simplex viruses diverged from a single virus about 6 million years ago, with HSV-1 evolving to infect human ancestors, and HSV-2 evolving to infect primates, the authors wrote. But about 1.6 million years ago, HSV-2 jumped species to infect the human lineage as well. Since that time, HSV-2 has been "adapting to the human lineage," Greninger said.

In recent years, studies have shown that most HSV-2 strains actually have some HSV-1 genes, indicating that these viruses mixed a long time ago. But whether they still mixed today was unclear.

In the new study, led by Dr. Amanda Casto, a senior fellow in infectious diseases at UW School of Medicine, the researchers sequenced the genomes of more than 250 herpes simplex viruses that were collected as samples from patients (mostly in Seattle) between 1994 and 2016. Additionally, they used data from 230 HSV samples that had already been sequenced and made publicly available to researchers.

The team found evidence of recent mixing between HSV-1 and HSV-2. In several cases, HSV-2 acquired large chunks of DNA from HSV-1: 10 times larger than had previously been observed, Greninger said.

One case in particular was notable because it occurred in a person with a genital "co-infection" with both HSV-1 and HSV-2. The HSV-2 strain in this patient contained a large chunk of DNA from HSV-1. In this case, it's likely that the mixing occurred in that very patient, showing that recombination "continues to occur today," the paper said.

Such co-infections are likely contributing to the ability of the two viruses to mix, the authors said. Interestingly, although HSV-1 classically causes oral infections, in recent years, it has been causing more genital infections, creating opportunities for co-infections.

Vaccine challenges

The mixing of HSV-2 with HSV-1 could create challenges to developing vaccines against herpes simplex viruses. For example, if researchers create an HSV-2 vaccine, the virus might be able to "swap out" some of its genes to escape being targeted by the vaccine, Greninger said.

In addition, if researchers make a vaccine that contains a live, "attenuated" (or weakened) strain of HSV-2, it might be possible for this weakened strain to "reboot" and become more virulent if it acquired genes from HSV-1, the authors said.

One limitation of the new study is that it used samples collected mainly in Seattle, the researchers said. As such, they are calling l for larger studies that sequence herpes simplex viruses from a more diverse population to get a better idea of the extent of mixing occurring between the viruses.

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A Man in Oklahoma Cracked His Neck. It Caused a Stroke.

A 28-year-old man in Oklahoma experienced a stroke after simply cracking his neck, according to news reports.

By Rachael Rettner, Senior Writer

The man, Josh Hader, had felt discomfort in his neck for a few weeks, and thought some neck stretches might help, according to the Washington Post. But as he was stretching his neck, he "heard a pop," Hader told the Post.

Then, Hader's left side went numb and he "couldn’t walk straight," the Post reported. Hader was rushed to the emergency room, where doctors determined he'd torn an artery in his neck and had a stroke.

Specifically, Hader's neck-cracking caused a tear in one of his neck's main arteries, a condition known as cervical artery dissection. This condition, which can be caused by blunt trauma to the neck, is known to increase the risk of stroke, according to the Cleveland Clinic.

A stroke can occur if a blood clot forms at the site of the tear and blocks the flow of blood to the brain.

A stroke caused by neck cracking is rare, but it can happen. In March, a woman in the United Kingdom also had a stroke after cracking her neck, and was partially paralzyed, Live Science previously reported.

Experts say it's not a good idea to crack your neck.

"There is really no 'safe' way to crack your neck," Dr. Robert Glatter, an emergency physician at Lenox Hill Hospital in New York City, told Live Science in April.

"Simply put, it's best to avoid doing it in the first place, to avoid any potential complications."

https://bbc.in/2J4q38q

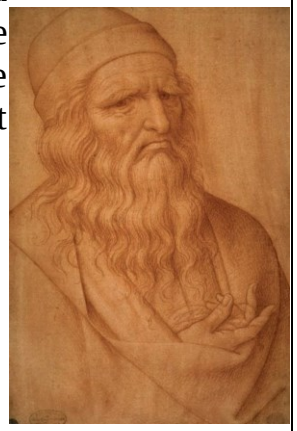
Leonardo's 'claw hand' stopped him painting

Leonardo da Vinci could have experienced nerve damage in a fall, impeding his ability to paint in later life, Italian doctors suggest.

They diagnosed ulnar palsy, or "claw hand", by analysing the depiction of his right hand in two artworks.

It had been suggested that Leonardo's hand impairment was caused by a stroke. But in the Journal of the Royal Society of Medicine, the doctors suggest it was nerve damage that meant he could no longer hold a palette and brush.

Leonardo da Vinci, who lived from 1452-1519, was an artist and inventor whose talents included architecture, anatomy, engineering and sculpture, as well as painting. But art historians have debated which hand he used to draw and paint with.



A sketch of Leonardo da Vinci showing his 'claw hand' **Museum of Gallerie dell'Accademia, Venice**

Analysis of his drawing shows shading sloping from the upper left to lower right, suggesting left-handedness. But all historical biographical documents suggest Leonardo used his right hand when he was creating other kinds of works.

'A certain paralysis'

For this research, two artworks - showing Leonardo da Vinci in the latter stages of his life - were analysed. One is a portrait of the artist, drawn with red chalk, attributed to the 16th-century Lombard artist Giovanni Ambrogio Figino.

Unusually, it shows his right arm largely concealed in folds of clothing. His hand is visible, but in a "stiff, contracted position".

Dr Davide Lazzeri, a specialist in plastic reconstructive and aesthetic surgery at the Villa Salaria Clinic in Rome, who led the analysis, said: "Rather than depicting the typical clenched hand seen in post-stroke muscular spasticity, the picture suggests an alternative diagnosis such as ulnar palsy, commonly known as 'claw hand'." The ulnar nerve runs from the shoulder to the little finger, and manages almost all the intrinsic hand muscles that allow fine motor movements, so a fall could have caused trauma to his upper arm, leading to the palsy, or weakness.

There are no reports of any cognitive decline or other motor impairment, which offers further evidence that a stroke was an unlikely cause of Leonardo's impairment. Dr Lazzeri said.

He added: "This may explain why he left numerous paintings incomplete, including the Mona Lisa, during the last five years of his career as a painter, while he continued teaching and drawing."

A further image, an engraving of a man playing a lira da braccio - a Renaissance string instrument - was examined. The man in the engraving was recently identified as Leonardo da Vinci. Further evidence was obtained from a diary entry by a Cardinal's assistant about a visit to the artist's house in 1517.

The assistant, Antonio de Beatis wrote: "One cannot indeed expect any more good work from him as a certain paralysis has crippled his right hand... And although Messer Leonardo can no longer paint with the sweetness which was peculiar to him, he can still design and instruct others."

http://bit.ly/2H2AbvS

Aging baby boomers push sky high incidence of shingles of the eye

Kellogg Eye Center study shows cases of herpes zoster ophthalmicus tripled in 12 year time span, highest among older adults

More Americans are being diagnosed with eye complications of shingles, but older adults can call the shots on whether they are protected from the painful rash that can cost them their eyesight.

Among a group of 21 million adults, occurrences of herpes zoster ophthalmicus (HZO), when shingles gets in the eyes, tripled during a 12-year-period, according to Kellogg Eye Center research presented at the 2019 Association for Research in Vision and Ophthalmology annual meeting in Vancouver.

Study author Nakul Shekhawat, M.D., MPH, says it's important to figure out which patients are at greatest risk for HZO and how to prevent it "because of the severity of the disease and potential sight-threatening complications."

Even though caused by the same virus, shingles is different than chickenpox.

Years after recovering from chickenpox, the virus can become active again, causing shingles, a painful, debilitating infection that can lead to corneal scarring and blindness.

Kellogg researchers found that incidence of herpes zoster ophthalmicus across the United States rose substantially between 2004 and 2016, occurring in 9.4 cases per 100,000 people at the beginning of the study period and growing 3 fold to 30.1 cases per 100,000 by the end of the study period.

Shingles affecting the eye may be more of a problem for women and adults over age 75 (53 cases per 100,000), two groups with the highest rates of infection, the study showed.

While shingles has been cropping up in young adults, it is still considered one of the perils of old age.

"Older patients were at far greater risk for HZO, highlighting just how important it is for older adults to get the shingles vaccination," says Shekhawat, a comprehensive ophthalmologist at the University of Michigan Department of Ophthalmology and Visual Sciences.

Whites more so than other racial groups were diagnosed with HZO, with rates lower among blacks (23.4), Asians (21.0) and Latinos (14.6). Among whites the rate was 30.6 cases per 100,000.

That females (29.1 cases per 100,000 persons) and white patients had such high infection rates raises interesting questions, Shekhawat says, about their community exposure and whether their immune systems uniquely place them at risk.

The shingles vaccination provides strong protection from shingles and its complications, but the vaccine is not widely used.

Two doses of Shingrix are more than 90% effective at preventing shingles and are recommended for those age 50 and older.

Even if an adult has had shingles in the past, Shingrix can help prevent future occurrences, according to the U.S. Centers for Disease and Protection.

The Kellogg team of vision and health services researchers included statistician Nidhi Talwar and Joshua D. Stein, M.D., a member of the U-M Institute for Healthcare Policy and Innovation and the U-M Center for Eye Policy and Innovation. They studied demographics and variations in herpes zoster ophthalmicus in the United States with support from Eversight Eye Bank and the Blue Cross Blue Shield of Michigan Foundation.

The findings were based on health claims data for patients enrolled in a large nationwide managed care plan.

http://bit.ly/301EKhq

Ancient Guatemalan Sculptors Knowingly Crafted Magnetic 'Potbelly' Statues

Ancient stone "potbelly" sculptures on display in a park in Guatemala are magnetized on certain spots, suggesting the pre-Columbian civilization that made them had a practical knowledge of magnetism.

By Tom Metcalfe, Live Science Contributor

Eleven of these sculptures of giant heads and distorted bodies, known as "potbellies" because of their distinctive rotund shapes, are on display in a plaza in the small town of La Democracia, near Guatemala's Pacific coast. They were installed there in the 1970s

after being brought from ancient sites in the nearby Monte Alto region.

Guatemalans are thought to have created these potbelly sculptures more than 2,000 years ago, which would date them to the Late Preclassic period of Mesoamerican civilizations.

Previous studies of the sculptures had suggested several had magnetic anomalies on their surfaces.

Potbelly sculptures on display near Guatemala's Pacific coast.

In the new research, a team led by scientists at Harvard University studied the potbellies with both a handheld magnetometer and a portable scanning magnetometer that could be fixed to the sculptures to provide detailed magnetic mapping of their surfaces.

They found that 10 of the 11 sculptures had significant magnetic anomalies and six of them showed strong magnetic anomalies that were probably created by lightning strikes while the rocks were still in the ground.

What's more, many of the giant heads and bodies of the ancient sculptures were carved to make the magnetic anomalies align with either the sculptures' right cheeks or their belly buttons — suggesting that ancient sculptors knew how to detect magnetism, and that they had selected magnetic boulders to highlight these parts of the body.

The finding gives strength to a theory that early Mesoamerican civilizations knew about the attractive properties of magnetism, and how to detect it with magnetic objects like lodestones suspended on a string — possibly even before magnetism is first known to have been described in China about 2,700 years ago.

It is not known for certain why those body parts were chosen, but it's likely that the magnetism of the sculptures contributed to their cultural influence.

"Potbellies may have represented the ancestors of the ruling class and given physical form to their heredity-based claim on power," the researchers wrote in their study. "If this interpretation is correct, the ability of potbellies to deflect, dramatically in most cases, a suspended lodestone would have served to reinforce their message of living ancestral continuity."

Art historian Julia Guernsey, a professor at the University of Texas at Austin who has written a book about Guatemalan potbelly sculptures, is enthusiastic about the new research.

"Their results speak to the significance of stone in ancient Mesoamerica and its symbolic properties, but also to ancient understandings of human bodies and beliefs that certain key features — like faces or stomachs and navels — were particularly potent or powerful," she said.

The research will be published in the June issue of the Journal of Archaeological Science.