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A Brutal Disease Kills Monkeys. Flies Could Be Spreading It.

A downside of social living among monkeys and chimpanzees, a new study suggests, is being at greater risk of deadly disease.

By Veronique Greenwood

In the jungles of Ivory Coast, monkeys and chimps forage for food, sleep in trees and travel in groups.

Not far behind follow primatologists, like Jan Gogarten, a postdoctoral researcher at the Robert Koch Institute in Germany.

A mangabey in Tai National Park in Ivory Coast. **Jan Gogarten**

Dr. Gogarten was spending a lot of time in the jungle tracking mangabey monkeys when his attention was drawn to another constant presence there.

"We had these flies always around," he said. Dr. Gogarten wondered whether the clouds of these flies could travel long distances along with the primates, and whether they were carrying disease.

Now he and his colleagues have reported, last month in the journal Molecular Ecology, that some flies stayed with a group of mangabeys in Tai National Park for up to 12 days and across significant distances.

Some of these flies also tested positive for a bacterium responsible for many gruesome monkey and chimp deaths over the last few decades in the park.

If the flies are one cause of the spread of this disease among the primates, it suggests a downside of social living — more animals clustered together could make an easier target for insects and the diseases they may carry.

Studying disease transmissions between primates and flies could also help lead to better understanding of how some diseases end up hopping to humans.

To track the population of flies surrounding the monkeys, the researchers set traps using the primates' feces or synthetic odor as bait.

These traps confirmed that there were far more flies among the animals than elsewhere, and they painstakingly marked hundreds of the flies each day with a different color of nail polish before releasing them.

Each day, they set out the traps again, watching for colorful specimens. "The first one we caught we were euphoric," Dr. Gogarten said; 50 more marked flies eventually resurfaced. It suggested that flies were actually following the group, rather than just happening to find it.

Dr. Gogarten found that flies would travel with mangabeys for up to 12 days and across significant distances. **Jan Gogarten**

During the study, one of the mangabeys died, likely of sylvatic anthrax. This disease, caused by bacteria, results in enormous lesions that are difficult to look at, and it is highly lethal. In fact, sylvatic anthrax has been responsible for more than 38 percent of primate deaths in the Ivorian national park over the last 26 years, the researchers say.

At the rate of infection currently present in the park, simulations suggest the chimps who live there may not survive another 100 years.

Exactly how primates are exposed to the bacterium, Bacillus cereus biovar anthracis (Bcbva), is not well understood. They may encounter it in the soil where the carcass of an infected animal lay, or they may get it some other way.

In this study, about 5 percent of the flies they tested were positive for the anthrax bacterium; if they spread it onto leaves and other surfaces they land on, or if primates swallow the insects, that may explain one mode of transmission.

There are many benefits to living with a group of family and friends. But if additional research confirms the study's findings, it also suggests that living in groups makes animals better targets for creatures that might make them sick.

The researchers are also curious to learn whether sylvatic anthrax could spread to humans, a question they are addressing by catching flies in villages near the national park and testing inhabitants to see if they've been exposed.

As human populations around the park grow, understanding how diseases may hop between flies and primates — both human and nonhuman — will be of greater importance.

To illuminate the role played by the flies, future research may involve marking many more of them and tracking how they may move among groups of primates.

Eventually, Dr. Gogarten and his colleagues hope to sketch a map of the jungle and the organisms that travel through it, from monkeys to flies to the bacteria themselves.

http://bit.ly/2ZlAaKc

Liver transplants could be redundant with discovery of new liver cell

Researchers at King's College London have used single cell RNA sequencing to identify a type of cell that may be able to regenerate liver tissue, treating liver failure without the need for transplants.

In a paper published today in Nature Communications, the scientists have identified a new type of cell called a hepatobiliary hybrid progenitor (HHyP), that forms during our early development in the womb.

Surprisingly, HHyP also persist in small quantities in adults and these cells can grow into the two main cell types of the adult liver (Hepatocytes and Cholangiocytes) giving HHyPs stem cell like properties.

The team examined HHyPs and found that they resemble mouse stem cells which have been found to rapidly repair mice liver following major injury, such as occurs in cirrhosis.

Lead author Dr Tamir Rashid from the Centre for Stem Cells & Regenerative Medicine at King's College London said: "For the first time, we have found that cells with true stem cell like properties may well exist in the human liver. This in turn could provide a wide range of regenerative medicine applications for treating liver disease, including the possibility of bypassing the need for liver transplants."

Liver disease is the fifth biggest killer in the UK* and the third most common cause of premature death, and the number of cases is continuing to rise. It can be caused by lifestyle issues such as obesity, viruses, alcohol misuse or by non-lifestyle issues such as autoimmune and genetic mediated disease.

Symptoms of liver disease include jaundice, itching and feelings of weakness and tiredness and in more severe cases, cirrhosis. The only treatment for severe liver diseases at present is a liver transplant which can lead to a lifetime of complications and for which the need for donor organs greatly outweighs the increasing demands.

"We now need to work quickly to unlock the recipe for converting pluripotent stem cells into HHyPs so that we could transplant those cells into patients at will. In the longer term, we will also be working to see if we can reprogramme HHyPs within the body using traditional pharmacological drugs to repair diseased livers without either cell or organ transplantation," said Dr Rashid.

**Figures from Public Health England*

https://wb.md/2GAsOLN

Pediatric Lymphoma Joins Family of *BRCA2* Cancers

For the first time, a pediatric cancer has been added to the "BRCA2 family."

Helen Leask

Researchers at St. Jude Children's Research Hospital in Memphis, Tennessee, revealed that *BRCA2* mutations were five times more common in children with non-Hodgkin lymphoma compared to a control group. The study was published online on July 25 in *JAMA Oncology*.

Although this may seem like bad news, in fact it provides medicine with an unprecedented opportunity to head adult cancers off at the pass, according to study author Zhaoming Wang, PhD.

Identifying *BRCA2* mutations early could give a head start to healthcare professionals whose job it is to follow these young patients into adulthood, he added. Genetic counseling and *BRCA2* testing of all survivors of childhood non-Hodgkin lymphoma is crucial, Wang said, especially in cases in which there is a family history of cancers suggesting *BRCA2* involvement.

"There is a high chance [the patient] will test positive," he said. "Survivors whose test results are positive for these mutations can be offered surveillance for *BRCA2*-associated cancers, such as breast cancer and ovarian cancer, and consults for risk-reduction strategies."

For their study, Wang and colleagues used whole-genome sequencing for 1380 survivors of pediatric or adolescent lymphoma treated at St. Jude Hospital and compared the results to those for cancer-free adults in the Genome Aggregation Database. They found that *BRCA2* mutations were five times more common in the childhood survivors of non-Hodgkin lymphoma. Wang said, "In the general population, you might expect to see [a *BRCA2* frequency of] 1 in 1000. We saw a fivefold increase, so this really is a telling enrichment of the mutation compared to the controls."

Although non-Hodgkin lymphoma runs in families, this is the first time that researchers have put a name to a genetic mutation associated with the disease. "I was excited to see this," Wang told *Medscape Medical News*. "To the best of my knowledge, *BRCA2* seems to be the first predisposition gene identified for non-Hodgkin lymphoma, and it may explain the familial non-Hodgkin lymphoma we observed [in the patient's families]."

Wang stressed that healthcare professionals need to be aware that *BRCA2* cancers now include childhood non-Hodgkin lymphoma. "We're basically adding one new member into the *BRCA2*-associated cancers, along with breast, ovarian, prostate, pancreatic, and melanoma," he said.

As well as the implications for better surveillance, Wang said that *BRCA2* testing during or after pediatric non-Hodgkin lymphoma could open the door to personalized approaches to treatment.

"I'm just speculating," he said, "but if *BRCA2* is really a gene important for development of lymphoma, PARP [poly (ADP-ribose) polymerase] inhibitors could be one of the [treatment] options. And, more importantly, when these survivors grow up into adults and develop some other adult cancer, treatment can be tailored, and PARP inhibitors would certainly be a choice."

Wang acknowledged that the study shows an association, not causality. His team is currently investigating the genetic alterations in tumor samples from non-Hodgkin lymphoma survivors. "We need to understand how pathogenic *BRCA2* mutations lead to lymphoma development," he said.

The study was funded by a grant to St. Jude Children's Research Hospital from the American Lebanese Syrian Associated Charities and by grants to St. Jude Children's Research Hospital from the National Institutes of Health. Wang and coauthors have disclosed no relevant financial relationships.

JAMA Oncol. Published online July 25, 2019. Full text

http://bit.ly/2GBt0dE

Organic Apples Have Way More Beneficial Bacteria Than Conventional Ones

Research suggests an apple is teeming with about 90 million bacteria

By Nicoletta Lanese, Live Science Contributor

Next time you chomp into a crunchy apple, in addition to enjoying the sweet taste, you can think about all the possibly beneficial bacteria you are consuming. New research suggests an apple is teeming with about 90 million bacteria.

And if you're looking for the best "bugs" for your gut, you may want to go organic. The researchers found that fresh, organic apples may harbor a more diverse and well-balanced microbiome than conventionally produced apples.

The study also suggests a rethink on throwing out that apple core. The team used gene sequencing to analyze the bacterial communities living in different parts of the golden delicious-type apple in Austria (called the arlet).

Most of the bacteria, they found, live in the core of the apple, which includes the seeds (about 38 million), the calyx end (22 million) and the stem end (10 million). The fruit pulp holds about 20 million bacterial cells, while the peel is host to just 1.6 million.

That's why the researchers suggest eating the entire apple, including the bacteria-packed core, said Birgit Wassermann, first author of the paper, which was published June 24 in the journal Frontiers in Microbiology. Wassermann is a doctoral student in the lab of Gabriele Berg at Graz University of Technology in Austria.

The organic apples also bested conventional ones in terms of how "diverse" their microbiomes were, something that could impact the fruit's taste.

"Methylobacterium, [a bacterium] known to enhance the biosynthesis of strawberry flavor compounds, was significantly more abundant in organic apples," Berg, a biologist and biotechnologist, said in a statement. The tasty compounds accumulate in the fruit's peel and pulp. The organic apples tested also contained a wide variety of bacteria types in fairly balanced proportions, which may help prevent any one species from overtaking the rest. "The highly diverse microbiome of organically managed apples might probably limit or hamper the abundance of human pathogens," the researchers wrote in their paper.

Many of the organic apples contained the probiotic *Lactobacilli*, a gut bug completely absent from the conventionally grown and managed apples. Most of those conventional apples contained a group of bacteria that includes known pathogens, which could harm human health.

"The microbiome and antioxidant profiles of fresh produce may one day become standard nutritional information, displayed alongside macronutrients, vitamins and minerals to guide consumers," Wassermann said. Future research may also reveal how microbiomes differ between apple varieties and how exactly fruit-borne microbes support bacterial diversity in the gut, the authors said. Because the apples tested were produced in Austria, the results may not hold for apples in other regions.

The study was funded by a program within the Austrian Federal Ministry of Education, Science and Research. The authors stated that they have no financial or commercial relationships that could pose conflict-of-interest concerns.

http://bit.ly/2ylhaQ7

The Ice Is Melting Even Faster Than They Thought

Ice on the submerged bottoms of ocean-edge glaciers may be melting 100 times faster than current models predict

By Rafi Letzter, Staff Writer | July 26, 2019 12:33pm ET

The world's glaciers are melting and dumping water into the ocean. If you've read about climate change, you probably know this. But

now, once again, the rate at which all that extra water is flowing into the ocean has to be revised upward. Researchers have revealed that ice on the submerged bottoms of ocean-edge glaciers may be melting at a much faster rate — possibly 100 times faster — than current models predict. And that could have serious implications for the rate at which the seas rise.

That's the conclusion of a new paper published today (July 26) in the journal Science. A research team focused on a tidewater glacier, a flowing slab of ice that reaches all the way to the ocean such that the front of the glacier is in the sea. They used sonar to study the melting around LeConte Glacier glacier in Alaska, studying how ice shapes at the bottom of the glacier changed over time. At the same time, they measured temperature, flow rate and salinity changes in the water around it. Their results showed that existing theories of how water melts off the bottom of tidewater glaciers were significantly underestimating how fast ice was turning into water.

"We measured both the ocean properties in front of the glacier and the melt rates, and we found that they are not related in the way we expected," Rebecca Jackson, an oceanographer at Rutgers University who was a postdoctoral researcher at Oregon State University during the project, said in a statement. "These two sets of measurements show that melt rates are significantly, sometimes up to a factor of 100, higher than existing theory would predict."

The bottoms of tidewater glaciers melt in two ways: Rushing "plumes" of rapidly melting water flow off the bottom of the glaciers in coherent patterns that scientists can detect relatively easily. And at the same time, a slower, "ambient" melting process is taking place. Scientists previously believed that this ambient melting accounted for just a small fraction of total melting, and tended to focus on the plumes. But Jackson and her team's work, which compared sonar data to the plume data, showed that this ambient melting has been underestimated by a factor of up to 100.

This work focused on one glacier, Jackson said in the statement, but it can be generalized to help researchers understand glaciers all over the world. Researchers will have to work to fit this information back into existing models, but the upshot is that the seas will rise faster than previously expected.

https://nyti.ms/2Yq2n91

Should Black People Wear Sunscreen?

Does it make sense for me, a dark-skinned black woman, to wear sunscreen? The answer is more complicated than it may seem.

By Kendra Pierre-Louis

Little heralds the arrival of summer like the smell of open water, smokey grills and sunscreen.

Since the late 1970s, as medical researchers linked sun exposure to skin cancer, Americans have been told to dutifully slather, spray and rub on sunscreen as part of a broader package of sun protection. But does it make sense for me, a dark-skinned black woman, to wear it?

With record-breaking heat this summer, it's an especially relevant question, and you might even expect the answer to be "absolutely." It's more complicated than that.

The American Academy of Dermatology's official position on sunscreen, which is echoed by the Food and Drug Administration, is that everyone, regardless of skin tone, should wear it because, "anyone can get skin cancer, regardless of age, gender or race." But because people of color are often left out of clinical trials and treatments, there is very little research available about dark-skinned people and skin cancer, which raises questions about who is being considered when organizations make these public health recommendations.

Medicine, they say, is about balancing risks, and it turns out that the benefits and risks of wearing sunscreen when you have dark skin can be murky. Many experts believe that there is no clear link between sun exposure and skin cancer among people with dark skin, and there is also a growing body of research to suggest that using certain types of sunscreen may actually be harmful, no matter who uses it.

Now, let's get some — *ahem* — burning questions out of the way. Black people experience sunburn that can be painful and cause peeling. When their skin is exposed to too much sunlight, black people can suffer from hyperpigmentation and visible signs of aging, just like people with other skin types. And, of course, black skin comes in a variety of shades, some of which are more sensitive to the sun than others.

The way skin researchers often quantify different skin tones is by using a subjective measure called the Fitzpatrick scale, which breaks skin tones into six categories based on color and how easily it tans versus burns when exposed to sunlight. Under the Fitzpatrick scale, I, a person who has never had a painful sunburn in her life, rate a six.

Dr. Martin Weinstock, a professor of dermatology and epidemiology at Brown University, was an author of a study in the Journal of the American Medical Association that looked at the relationship between ultraviolet light exposure, skin color and skin cancer, and found that while such a relationship exists among people with lighter skin tones, there's no such relationship between sun exposure and skin cancer and dark-skinned individuals.

People whose skin is naturally brown when it has not been exposed to sunlight "are quite resistant to skin cancer," Dr. Weinstock said.

When dark-skinned people do get skin cancer, as Bob Marley famously did on his big toe, it tends to appear on "the palms of the hand and the sole of the feet," said Dr. Adewole Adamson, a dermatologist and the director of the pigmented lesion clinic at The University of Texas at Austin's Dell School of Medicine.

According to Dr. Adamson, the fact that dark-skinned people are most likely to get skin cancer on the areas of the body that are least likely to be exposed to sunlight suggests that this cancer is unrelated to sun exposure.

"If UV exposure was such a problem for skin cancer, you'd see a massive epidemic in sub-Saharan Africa," he added. "They don't have the same level of sunscreen promotion that they do here. And you hear nothing about it because there probably is no association."

Melanin is humankind's inborn sunscreen. Everyone has melanin, but much like swagger, some of us have more of it. Melanin is also believed to delay the visible signs of aging. It's why "black don't crack."

Dark-skinned people don't have more melanocytes, the cells that produce melanin, than lighter-skinned people. But the melanocytes that we do have tend to be more productive. And it's because of melanin that some scientists believe darker skin tones absorb between 50 to 70 percent less of the sun's ultraviolet light than paler skin tones. Exactly how much less is not well understood because fewer studies look at how darker skin reacts to the sun.

This is not to say that dark-skinned people shouldn't pay attention to their moles and get periodic skin checks — they should. Among dark-skinned people, skin cancer actually tends to be deadlier in part because it often goes undiagnosed for longer. It's just that, according to these experts, the cause of that cancer isn't necessarily the sun.

There are two broad categories of sunscreen. The first is mineral, which contains titanium dioxide or zinc. This type of sunscreen is considered safe by the F.D.A., as long it is not in powder form. It is also the type that black people tend to avoid because it often leaves a white residue on dark skin.

The second category is chemical. There is no consensus among scientists that the active ingredients in many chemical sunscreens, including oxybenzone, are safe. In fact, there's new evidence to suggest that they may carry their own health risks.

A pilot study that the F.D.A. released earlier this year in the Journal of American Medical Academy caused a stir because it found that when participants applied a day's worth of common sunscreens, they not only absorbed its chemicals but did so at levels that exceeded a target F.D.A. toxicology threshold.

That these chemicals are absorbed into the skin at such high concentrations doesn't mean they're inherently dangerous, but it does mean that they need to be studied for biological effects.

"Although over-the-counter sunscreen products are widely used, little is known about systemic exposure for most active ingredients," the F.D.A. said in a written statement.

Kurunthachalam Kannan, the deputy director of the Division of Environmental Health Sciences in New York State's Department of Health, Wadsworth Center, was the lead author on a study that looked at the correlation between chemical sunscreen use and endometriosis, a condition that affects the uterus.

Dr. Kannan's study found that women who used more sunscreen that contained benzophenone or oxybenzone, two estrogenic compounds, had higher levels of the chemicals in their urine, and had higher rates of endometriosis. Dr. Kannan said he considers chemical sunscreen use something of a double-edged sword. It potentially provides protection from skin cancer, but it can also affect estrogen levels, which could lead to a variety of diseases.

These findings are part of why Dr. Adamson thinks there needs to be more discussion around the particular risks and benefits of wearing sunscreen, especially for people with dark skin.

"As I was looking at all this stuff, I'm like, there's nothing on people of color in here and yet I see this messaging saying, 'Hey, wear your sunscreen,'" Dr. Adamson said.

In a statement, the American Academy of Dermatology said that "while there is strong evidence to show all skin types benefit from sun protection to reduce sunburn and aging, research is emerging that explores the relationship between sun exposure and skin cancer in people of color."

The organization has appointed a working group to review current science in the area, and to "assess our messaging on skin cancer and skin of color based on the latest research."

In an article published earlier this year, Dr. Adamson stressed that the "one-size-fits-all approach" to sunscreen misses the mark and must change. Telling everyone to wear sunscreen is "one of the only public health messages that we have as dermatologists," Dr. Adamson said. "We're not messaging right for black people."

http://bit.ly/2K62CJC

Most deaths related to noncardiac surgery occur after surgery and after discharge from hospital

It's not the operating room that is risky for patients undergoing noncardiac surgery; it's the recovery period.

According to a large international study, only 0.7% of deaths in these patients occurred in the operating room, whereas 29% of deaths occurred after discharge from hospital. The study, which included patients at 28 centres in 14 countries, was published in *CMAJ (Canadian Medical Association Journal)*.

"Given that most deaths in adults undergoing noncardiac surgery occur not in the operating room, but afterwards, efforts to improve postsurgical care in hospital and at home has substantial potential to reduce mortality," says author Dr. P.J. Devereaux, McMaster University, Hamilton, Ontario.

The study, which included 40 004 adults aged 45 years or older in North and South America, Asia, Europe, Africa and Australia who underwent surgery between 2007 and 2013, found that 1.8% died within 30 days of noncardiac surgery. Major bleeding, injury to the heart muscle and severe infection (sepsis) accounted for a large portion of deaths (45%).

"Approximately 100 million adults aged 45 or older undergo noncardiac surgery worldwide every year, therefore an estimated 1.8 million people die of complications within 30 days," says Dr. Devereaux. "This means that death after surgery is a major global health burden."

The authors suggest that solutions focused on prevention, early identification and close management of bleeding, cardiac issues and infection may help to reduce these preventable deaths. Data published are from the Vascular Events in Non-cardiac Surgery Patients Cohort Evaluation (VISION) study funded by more than 70 sources.

In a linked commentary, Dr. Barnaby Reeves, Bristol Medical School, University of Bristol, Bristol, United Kingdom, salutes the achievement of the study investigators but cautions policy-makers to be mindful of inherent biases in such studies when considering the observed relationships between complications and mortality.

"Association between complications and death within 30 days after noncardiac surgery" is published July 29, 2019.

http://bit.ly/2yp2wr7

Ro5 researchers suggest radioactive readings in 2017 were from a major nuclear release

Evidence suggests radioactive ruthenium readings across the continent in 2017 were from an unknown nuclear source

by Bob Yirka , Phys.org

A very large team of researchers from across Europe has found evidence that suggests radioactive ruthenium readings across the continent in 2017 were from an unknown nuclear source. In their paper published in *Proceedings of the National Academy of Sciences*, the group describes their study of the unusual readings two years ago and what they found.

Back in the 1960s, scientists around the world began to see the need to detect radiation from human sources as a means of alerting the public to possible health hazards. After the Chernobyl accident in 1986, scientists in Europe realized that a network of radiation monitoring stations was the best way to detect and alert the public to fallout from nuclear accidents. Scientists in five countries, Finland, Sweden, the Federal Republic of Germany, Denmark and Norway, set up such a network, which they called the Ro5. Scientists from other European countries have joined the network over the years, but the name has remained.

Two years ago, members of the network began reporting higher-than-normal levels of ruthenium 106 (106Ru). The levels were not high enough to be considered dangerous, but the area of detection was large enough to suggest something unusual had happened—some suspected a nuclear accident at a facility in Russia. But Russian officials insisted the levels were due to a release from a disintegrating satellite. In this new effort, 69 researchers from across Europe together found evidence that very strongly suggests the radioactivity they observed came from a Russian nuclear power plant in a southern part of the Urals—likely Majak.

Research by the team consisted of combining and compiling 1,100 atmospheric readings and 200 readings taken on the ground. The researchers were able to conclude that the radioactivity was not from a satellite. They further report that levels of radioactivity varied widely, from tenths of $\mu Bq \cdot m^{-3}$ to over 150 $mBq \cdot m^{-3}$. They also found that the widespread nature of the readings suggested an unprecedented release of 106Ru. By looking at the data placed over a map, they were able to trace it back to its source—in the Southern

Urals in Russia. The researchers suggest the evidence indicates that there was likely an unreported nuclear plant accident.

More information: *O. Masson et al. Airborne concentrations and chemical considerations of radioactive ruthenium from an undeclared major nuclear release in 2017, Proceedings of the National Academy of Sciences (2019). DOI: 10.1073/pnas.1907571116*

http://bit.ly/2GCkyL2

Pulse waves measured at the wrist uncover often-missed artery changes in menopausal women

American Heart Association meeting report-presentation 176; Poster session 1

BOSTON, July 29, 2019-- Measuring a menopausal woman's pulse wave at her wrist may help explain the increase in cardiovascular disease risk during menopause better than a standard blood pressure measurement, according to preliminary research presented at the American Heart Association's Basic Cardiovascular Sciences 2019 Scientific Sessions.

While research shows that age, gender and body mass index (BMI) play important roles in cardiovascular disease risk, it's not clear why the risk spikes when women are in menopause.

Researchers in this study used radial pulse waves, measuring the beat of the heart through the artery at the base of the wrist. Checking radial pulse waves is easy, non-invasive and can offer more data than just looking at systolic or diastolic blood pressures, the researchers said.

They studied 327 premenopausal and postmenopausal women with no history of heart disease, tracking the women's systolic and diastolic blood pressure measurements, as well as 12-second continuous radial pulse data.

"Through mathematical models, we converted the pressure wave of the radial pulse into frequency waves. Each frequency wave was assigned a corresponding harmonic amplitude classification from C1 to C5 which provides different information than pulse rate or blood pressure," said Chi-Wei Chang, Ph.D., the study lead author and director of research and development at the Mii-Ann Medical Research Center in Taipei, Taiwan.

"For example, a violin and clarinet can play the same note but sound different because of the harmonic components of these instruments' overtones," Chang said. "Two people can have a heart rate of 75 beats per minute, but their harmonic amplitudes can vary dramatically. Analyzing the differences between these harmonic components reveals more individualized information about a person's circulatory system."

The researchers found radial pulse wave information reflected changes during menopause that were not evident in systolic or diastolic blood pressure measurements. Specifically, the first and third harmonics -- C1 and C3 -- were impacted. C1 is related to heart attack and heart failure, according to Chang.

They also found:

- ***BMI is the largest factor affecting a woman's blood pressure and risk for hypertension.***
- ***Age affects only systolic blood pressure.***
- ***Menopause does not change blood pressure but can increase one's cardiovascular disease risk, as seen in changes in harmonic components of the radial pulse.***

Additionally, according to this study, the C1 and C3 harmonics in radial pulse waves may shed light on hormonal changes during menopause that indicate the progression of atherosclerosis, but more work is needed to know for sure, Chang said. This information can be useful in better understanding a woman's cardiovascular disease risk.

"Healthcare providers can measure a menopausal woman's radial pulse to see if the patient's C1 harmonic is affected. If it is, they can monitor a patient's situation more closely and take action to prevent cardiovascular disease from becoming more severe," Chang said.

One of the limitations of the study is this increase in the amplitude of the first and third harmonics of the radial pulse wave only suggests that menopause increases the risk of heart disease by exacerbating atherosclerosis. More research is needed to demonstrate how and why that occurs, Chang said.

Co-authors are Chih-Yu Chen, M.D., M.S.; Yi-Ting Chang, Sc.M.; Sheng-Hung Wang, Ph.D.; and Gin-Chung Wang, Ph.D. Author disclosures are on the abstract.

This study is funded by the Taipei City Government, as well as the Renai Branch of Taipei City Hospital, and Mii-Ann Medical Research Center which are sponsored by JinMu Health Technology.

http://bit.ly/2LNTHzR

UVA discovers incredible HULLK that controls prostate cancer progression

Finding offers potential avenue to stop disease's progression

Cancer researchers at the University of Virginia School of Medicine have identified a key to controlling the growth and progression of prostate cancer, the second most common cancer in men. The researchers have dubbed this key "HULLK," and they believe it could be used to target and stop the progression of a cancer that kills more than 30,000 American men every year.

"We have uncovered a novel non-coding RNA that may drive prostate cancer," said senior researcher Dan Gioeli, PhD, of UVA's Department of Microbiology, Immunology and Cancer Biology and the UVA Cancer Center. "This discovery could lead to new biomarkers of prostate cancer and more effective therapies for advanced prostate cancer."

HULLK and Prostate Cancer

HULLK is a form of RNA, which provides the blueprint, or code to, produce proteins. But HULLK is a "noncoding" RNA, which means that it isn't involved in coding a protein. Instead, noncoding RNAs play important roles in regulating biological processes inside our cells. To be more specific, it appears that HULLK controls the growth of prostate cancer cells.

The researchers found that there is more HULLK in tumor samples from patients with advanced prostate cancer. They also found that decreasing the level of HULLK in cultured prostate cancer cells slows tumor cell growth. "It is this data that illustrates the potential of HULLK to function as a biomarker and/or a therapeutic target," Gioeli said.

The production of HULLK is regulated by the male sex hormones known as androgens; these hormones stimulate its production. Cells that overproduce HULLK - those associated with the most aggressive cases of prostate cancer - were actually "hypersensitive" to androgen, the researchers found.

Early stage prostate cancer has long been treated with androgen deprivation therapy, where the level of androgen is therapeutically reduced. However, this type of therapy has many side effects that some men do not want to experience. Gioeli's discovery identifies HULLK as a potential target for developing new and better treatments that may avoid these side effects. In addition, the findings could allow researchers to develop blood or urine tests to determine how aggressive a patient's prostate cancer is prior to treatment. This could prove extremely useful for men who are weighing the pros and cons of their treatment options.

"There is still a lot of research to do on how HULLK functions in order realize the potential of this discovery in the clinic," Gioeli said. "We are excited to do that research and translate our basic science discovery into the clinic."

Findings Published

The researchers have published their findings in the scientific journal Molecular Cancer. The article is open access, meaning anyone may read it online for free. The research team consisted of Huy Q. Ta, Hilary Whitworth, Yi Yin, Mark Conaway, Henry F. Frierson Jr, Moray J. Campbell, Ganesh V. Raj and Gioeli.

The research was supported by the National Institutes of Health's National Cancer Institute, grant R01 CA178338; the Paul Mellon Urologic Cancer Institute; and by the UVA Cancer Center Patients & Friends Research Fund.

http://bit.ly/2YvD5yG

Alpha-synuclein is one of the good guys

Study reveals crucial role in DNA repair.

Aggregates of the protein alpha-synuclein, known as Lewy bodies, have long been connected to Parkinson's disease and other forms of dementia. However, a study published in the journal *Scientific Reports* puts things in a new light.

It suggests that these proteins perform a crucial function by repairing breaks that occur along the vast strands of DNA present in the nucleus of every cell of the body.

And this function may be lost in brain diseases such as Parkinson's, leading to the widespread death of neurons.

"This is the first time that anyone has discovered one of its functions is DNA repair," says first author Vivek Unni, a neurologist with Oregon Health & Science University, US. "That's critical for cell survival, and it appears to be a function that's lost in Parkinson's disease."

The findings, Unni says, suggest it may be possible to design new therapies to replace or boost alpha-synuclein's function in people with neurodegenerative disorders.

http://bit.ly/2GQRxf1

Humans Interbred with Four Extinct Hominin Species, Research Finds

As anatomically modern* Homo sapiens *migrated out of Africa and around the rest of the world, they met and interbred with at least four different hominin species, according to new research from the University of Adelaide, Australia. Strikingly, of these hominins, only Neanderthals and Denisovans are currently known; the others remain unnamed and have only been detected as traces of DNA surviving in different modern populations.

"Each of us carry within ourselves the genetic traces of these past mixing events," said Dr. João Teixeira, co-author of a paper published in the *Proceedings of the National Academy of Sciences*.

"These archaic groups were widespread and genetically diverse, and they survive in each of us. Their story is an integral part of how we came to be."

"For example, all present-day populations show about 2% of Neanderthal ancestry which means that Neanderthal mixing with the ancestors of modern humans occurred soon after they left Africa, probably around 50,000 to 55,000 years ago somewhere in the Middle East."

Reconstruction of* Homo floresiensis*, an extinct hominin species that lived on the Indonesian island of Flores between 74,000 and 18,000 years ago.
Image credit: Elisabeth Daynes.

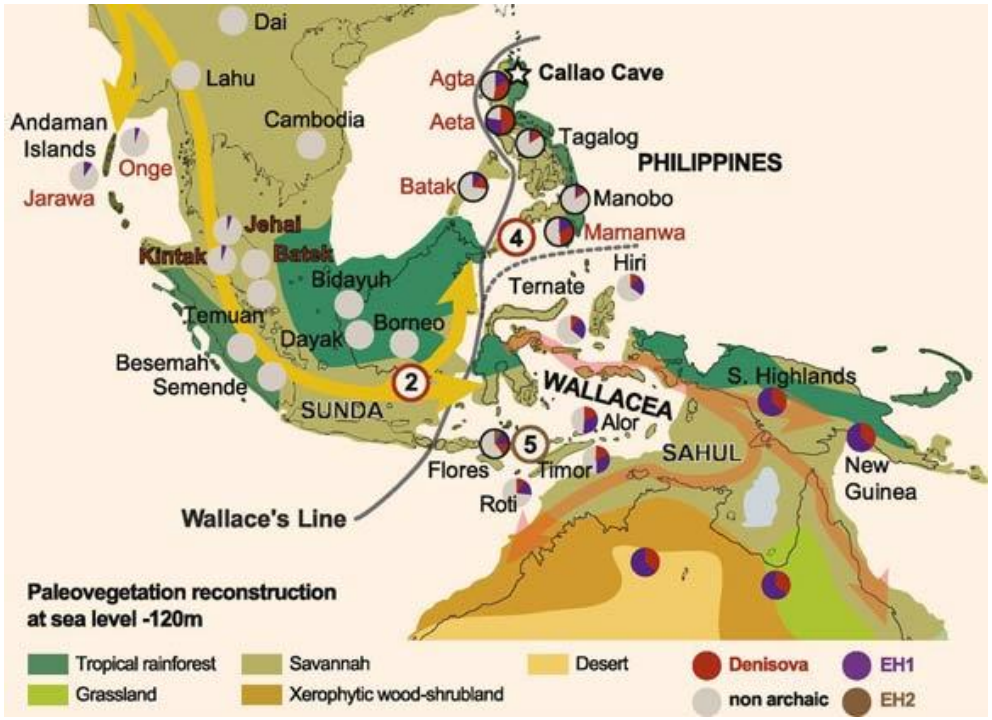
But as the ancestors of modern humans traveled further east they met and mixed with at least four other groups of archaic humans.

"Island Southeast Asia was already a crowded place when what we call modern humans first reached the region just before 50,000 years ago," Dr. Teixeira said.

"At least three other archaic human groups appear to have occupied the area, and the ancestors of modern humans mixed with them before the archaic humans became extinct."

In their new research, Dr. Teixeira and his colleague, Professor Alan Cooper, analyzed genetic, archaeological and fossil evidence as well as additional information from reconstructed migration routes and fossil vegetation records.

The scientists found there was a mixing event in the vicinity of southern Asia between anatomically modern humans and a group they named Extinct Hominin 1 (EH1).



The inferred route of the movement of anatomically modern humans through Island Southeast Asia around 50,000 years ago (yellow and red arrows): modern-day hunter-gatherer populations with genetic data are shown in red, and farming populations are shown in black; the estimated genomic content of EH1 (purple), Denisovan (red), EH2 (brown), and nonarchaic (gray) in modern-day populations is shown in pie charts, as a relative proportion to that seen in Australo-Papuans (full circles); gray all populations containing large amounts of Denisovan genomic content are found east of Wallace's Line; independent introgression events with Denisovan groups are inferred for both the common ancestor of Australo-Papuan, Philippines, and ISEA populations (red circled 2) and, separately, for the Philippines (red circled 4); the signal for a separate introgression with an unknown hominin on Flores, recorded in genomic data from modern-day populations, remains less secure (brown-circled 5); the precise location of introgression events 2, 4, and 5 currently remains unknown.
Image credit: Teixeira & Cooper, doi: 10.1073/pnas.1904824116.

Other interbreeding occurred with Denisovans in Island Southeast Asia and the Philippines, and with another group — named Extinct Hominin 2 (EH2) — in Flores, Indonesia.

"We knew the story out of Africa wasn't a simple one, but it seems to be far more complex than we have contemplated," Dr. Teixeira said. "The Island Southeast Asia region was clearly occupied by several archaic human groups, probably living in relative isolation from each other for hundreds of thousands of years before the ancestors of modern humans arrived." "The timing also makes it look like the arrival of modern humans was followed quickly by the demise of the archaic human groups in each area."

João C. Teixeira & Alan Cooper. Using hominin introgression to trace modern human dispersals. PNAS, *published online July 12, 2019; doi: 10.1073/pnas.1904824116*

https://go.nature.com/2Zlzwg3

Alarming surge in drug-resistant HIV uncovered

The drug-resistant form of the virus has been detected at unacceptable levels across Africa, Asia and the Americas.

Emiliano Rodríguez Mega

Health authorities have uncovered an alarming surge in resistance to crucial HIV drugs.

Surveys by the World Health Organization (WHO) reveal that, in the past 4 years, 12 countries in Africa, Asia and the Americas have surpassed acceptable levels of drug resistance against two drugs that constitute the backbone of HIV treatment: efavirenz and nevirapine.

People living with HIV are routinely treated with a cocktail of drugs, known as antiretroviral therapy, but the virus can mutate into a resistant form.

The WHO conducted surveys from 2014 to 2018 in randomly selected clinics in 18 countries, and examined the levels of resistance in people who had started HIV treatment during that period.

More than 10% of adults with the virus have developed resistance to these drugs in 12 nations (see 'Resistance rises'). Above this threshold, it's not considered safe to prescribe the same HIV medicines to the rest of the population, because resistance could increase. Researchers published the findings this month in WHO report.

"I think we have kind of crossed the line," says Massimo Ghidinelli, an infectious-disease specialist at the Pan American Health Organization in Washington DC.

Overall, 12% of women surveyed had a drug-resistant form of HIV, compared with 8% of men. Particularly concerning, says the report, is the high level of resistance in infants with HIV in sub-Saharan Africa. Between 2012 and 2018, about one-half of newly diagnosed infants in nine of the countries in this region had a form of HIV that was resistant to efavirenz, nevirapine or both.

The causes of drug resistance remain elusive, says Silvia Bertagnolio, an infectious-disease physician at the WHO in Geneva, Switzerland, and co-author of the report. But drug-resistant HIV might develop when people interrupt treatment, she suggests.

For example, many women living with the virus might have taken antiretrovirals during pregnancy to prevent their babies from becoming infected, but stopped after delivery. The WHO recommended this practice until 2015, when it suggested that pregnant and breastfeeding women use the drugs for life.

The prevalence of resistance in people who restarted efavirenz and nevirapine after interrupting treatment was much higher (21%) than in first-time users (8%).

People living with HIV might go on and off the drugs for several reasons. Stigma plays a huge part, says Bertagnolio; they might not want to be seen picking up their medicines. Drug shortages at clinics could also contribute, the report noted.

In response to the evidence, the WHO has recommended that countries use dolutegravir, which is more effective and tolerable than other therapies, as the go-to HIV drug. The likelihood that the virus will develop mutations and, eventually, resistance is lower with dolutegravir than with other antiretrovirals, says Roger Paredes, an infectious-disease physician at the Germans Trias i Pujol University Hospital in Barcelona, Spain. "We have to encourage a worldwide transition to dolutegravir," he adds.

Bertagnolio agrees, but calls for caution. If treatment delivery is poor or patchy, resistance could emerge. "We don't want to find ourselves in the same situation we're in."

doi: 10.1038/d41586-019-02316-x

http://bit.ly/2STGJBu

Brand-brand competition is unlikely to reduce list prices of medicines

Brand-brand competition alone will likely not lower list prices of brand-name drugs in the US

Greater brand-brand competition alone will likely not lower list prices of brand-name drugs in the US, according to a study published July 30 in the open-access journal *PLOS Medicine* by Ameet Sarpatwari of Brigham and Women's Hospital and Harvard Medical School, and colleagues.

US prescription drug spending has increased sharply over the last decade, with higher launch prices of new brand-name drugs and routine price increases on older brand-name drugs. Promoting greater brand-brand competition, which occurs between brand-name drugs indicated for the same condition, has been proposed to address high drug prices. Yet many examples exist of price increases following the introduction of brand-name competition, casting doubt on its effectiveness in the pharmaceutical market. To better understand the economic impact of brand-brand competition, Sarpatwari and colleagues systematically reviewed the peer-reviewed literature for studies of how new drug market entry affects prices of drugs within the same class for patients with the same indications. They searched PubMed and EconLit for original studies on brand-brand competition in the US market published in English between 1990 and April 2019, and found 10 studies evaluating a wide range of drug classes.

None of the 10 studies found that brand-brand competition lowered the list price of existing brand-name drugs within a class. The findings of two studies suggested that such competition may help restrain how new drug prices are set, however. Other studies found evidence that brand-brand competition was mediated by the relative quality of competing drugs and the extent to which they are marketed, with safer or more effective new drugs and greater marketing associated with higher intra-class list prices. According to the authors, the findings suggest that policies to promote brand-brand competition in the US pharmaceutical market, such as accelerating approval of non-first-in-class drugs, will probably not result in lower drug list prices in the absence of additional structural reforms.

Research Article

Funding:

This project was funded by the Anthem Public Policy Institute. AS and ASK's research is also supported by the Arnold Ventures, the Harvard-MIT Center for Regulatory Science, and the Engelberg Foundation. The funder provided comments on an earlier draft and had no role in the design and conduct of the study; the collection, management, analysis, and interpretation of the data; the approval of the final manuscript; or the decision to submit the manuscript for publication.

Competing Interests:

I have read the journal's policy and the authors of this manuscript have the following competing interests: ASK is a member of the Editorial Board of PLOS Medicine.

Citation:

Sarpatwari A, DiBello J, Zakarian M, Najafzadeh M, Kesselheim AS (2019) Competition and price among brand-name drugs in the same class: A systematic review of the evidence. PLoS Med *16(7): e1002872. https://doi.org/10.1371/journal.pmed.1002872*

http://bit.ly/2Osjqsl

How a Woman's Birth Control Implant Ended Up in Her Lung

A woman's birth control implant that went missing from its proper place in her arm turned up in her lung, according to a new report of the case.

By Rachael Rettner, Senior Writer

The 31-year-old woman, who lives in Portugal, had a birth control implant inserted into her upper arm in 2017, according to the report, published July 9 in the journal BMJ Case Reports.

This small, rod-shaped device is placed under the skin and releases a steady dose of hormones into the bloodstream to prevent pregnancy. The device lasts up to five years, after which it needs to be replaced, according to Planned Parenthood.

The woman had previously used birth control implants without any problems — she'd received her first device in 2010 and a replacement in 2013. But with her most recent implant, she started to experience abnormal vaginal bleeding. Because of this, doctors planned to remove the implant; but when they tried to find the device in her arm, they realized it wasn't where it should have been, the report said.

An X-ray revealed that the implant had traveled from the woman's arm into her left lung.

Such "migration" of a birth control implant is very rare, the authors said. But it has been reported before. In a 2017 report published in the journal Obstetrics & Gynecology Science, doctors in Korea described the case of a 37-year-old woman whose birth control implant also migrated from her arm to her lung, according to Business Insider.

Women may be at higher risk for implant migration if the device isn't placed properly in their arm. For example, if the implant is placed too deeply under the skin, it may move into a vein and travel to the lung, according to the authors of the new report. Vigorous exercise after placement of the device may also increases the risk of migration, they said.

Procedures to insert the device "should only be undertaken by those with relevant training," the authors of the 2017 report wrote. "Complications ... are rare in the hands of medical professionals familiar with the [insertion] techniques."

In the current case, the woman underwent surgery to remove the implant from her lung. The surgery was successful, and she didn't experience any complications, the report said.

Birth control implants are not the only contraceptive devices that may "travel" in the body in rare cases. In 2017, doctors in China reported the case of a woman whose IUD traveled from her uterus to her bladder.

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As If Ticks Weren't Terrifying Enough, This Giant Bloodsucker Will Hunt You Down

Giant, invasive ticks have been spotted in the Netherlands, and they do something that's frankly horrifying: They run after their hosts.

An unusually large adult tick was found on July 13 in Drenthe, a province in the northeastern part of the Netherlands. The arthropod, *Hyalomma marginatum*, is not native to the country. Another of these ticks had been discovered in the region one week earlier, officials with the National Institute for Public Health and the Environment (RIVM) said in a statement on July 24.

The invasive newcomers can measure up to 0.2 inches (6 millimeters) long — about twice the length of the more common sheep tick (*Ixodes ricinus*) — and grow to 0.7 inches (2 centimeters) when engorged with blood.

And while *Ixodes* ticks sit and wait for animal hosts to wander close by, *Hyalomma* ticks actively pursue their hosts, hiding on the ground and then scuttling toward them, according to the European Centre for Disease Prevention and Control (ECDC).

Ticks in the Hyalomma genus are nearly twice the size of sheep ticks (Ixodes ricinus). **Credit: Adam Cuerden**

Certain signals broadcast to *Hyalomma* ticks that a likely meal is near, among them body heat, vibrations or scents. Ticks can visually identify a target from a distance of 30 feet (9 meters) away. Once the host is spotted, ticks may track them for upward of 10 minutes and over hundreds of feet, the ECDC says.

As adults, the ticks prefer feeding on large mammals, while nymphs target smaller victims for their blood meals. Birds are also on the menu; the parasites are thought to travel far and wide by hitchhiking on their hosts — especially when those hosts are migrating birds, said Alicja Buczek, a tick researcher with the Department of Biology and Parasitology at the Medical University of Lublin in Poland.

"The transfer of *H. marginatum* larvae and nymphs by long-distance migratory birds, including intercontinental migrations, takes place during seasonal bird migrations and breeding," Buczek told Live Science in an email. Meanwhile, climate change is altering ecosystems and reshaping birds' migration patterns,

enabling ticks to colonize geographic areas where they haven't lived before, Buczek said.

Hyalomma ticks are widespread in Northern Africa and Asia and are also found in Southern and Eastern Europe. There have been sporadic sightings in parts of Northern Europe and in Russia, but these are not thought to represent established populations, the ECDC reported.

The Dutch tick sighting raised public health concerns because *Hyalomma* ticks are known vectors for Crimean-Congo hemorrhagic fever, a serious illness that causes fever, joint pain, vomiting and uncontrolled bleeding, according to the U.S. Centers for Disease Control and Prevention (CDC).

Tests showed that neither of the ticks carried the pathogen for hemorrhagic fever. However, the tick from Drenthe carried the microbe *Rickettsia aeschlimannii*, which causes spotted fever. The first sign of spotted fever is usually a dark scab forming at the site of the bite; symptoms include rash, fever, muscle pain and headaches, but the disease is treatable with antibiotics, the CDC says.

Future suspected *Hyalomma* sightings in the Netherlands should be reported to the Netherlands Food and Consumer Product Safety Authority, RIVM representatives said in the statement.

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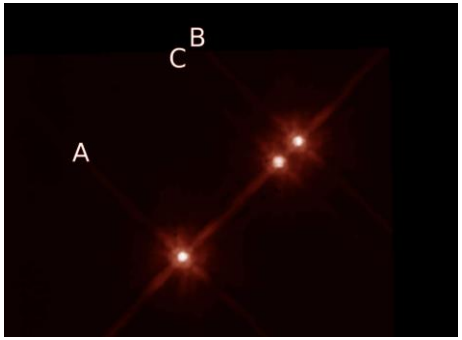
Newly-Discovered, Nearby Alien World Has 3 Blazing-Red Suns

Astronomers have discovered a planet in our galactic neighborhood that has three red suns.

By Rafi Letzter, Staff Writer

LTT 1445Ab, a rocky world a bit bigger than Earth, zips in a tight orbit around the biggest star in a triple-star system just 22.5 light-years from Earth, "transiting" between Earth and its host star on each pass. The stars in the system are M dwarfs — reddish, active stars smaller than our sun — that whirl around each other in a complex dance. That makes LTT 1445Ab the second-closest known transiting exoplanet to Earth, and the closest one orbiting an M dwarf. (Other non-transiting exoplanets may exist even closer to Earth, but they're more difficult to study.)

Standing on the surface of the planet, which orbits its star at just one-tenth the distance between the sun and Mercury, "you'd see one big orange sun and two much smaller orangey-red suns in the distance," said Jennifer Winters, lead author on the study and an astronomer at the Harvard-Smithsonian Center for Astrophysics. "The primary star would look really big in the sky. It's really close. The other two are much farther away. They'd look about 100 times brighter than Venus, and about the same … size in the sky."



We don't know exactly when or how these different suns would rise on the planet, because from this distance astronomers can't see at what angle or speed it's spinning.

A Hubble Space Telescope image shows the three-star system. The new planet was discovered orbiting the star labelled 'A.' (Note: Live Science adjusted the color of this image for illustrative purposes. The original Hubble data appeared in the paper with a white background and black stars.)

Credit: Hubble Space Telescope

Of course, all of that is true as of 2019. But as the three stars drift closer together and farther apart over the course of their orbits — orbits that scientists have studied for decades without ever noticing the exoplanet — that picture of the sky could change.

"The reason we probably haven't found [the exoplanet] before is because it's in this triple system, and a lot of these planet-search surveys avoid these kinds of systems," Winters said.

Past studies of the three-star system didn't look for signs of an exoplanet, and exoplanet hunts rarely look at multiple-star systems.

That's because researchers detect transiting exoplanets by watching for flickers in the starlight as the planet passes between its host star and Earth. But having other stars in the same system can "contaminate" those delicate measurements, Winters told Live Science. Extra light from the extra stars can get mixed into the data. The studies scientists undertake to determine the mass, size and position of exoplanets rely on careful measurements of motion in the system; triple systems just move in more complicated ways.

Winters and her colleagues were able to figure out the puzzle of LTT 1445Ab using data from the Transiting Exoplanet Survey Satellite (TESS), NASA's next-generation exoplanet-hunter that launched in 2018. This system was particularly interesting to her, she said, because of her research interest in M dwarfs — a group of stars that, until recently, haven't been the focus of much exoplanet research.

M dwarfs, Winters said, go through a long "adolescence" period during which they are very active and emit a large amount of radiation.

"We don't know yet if planets' atmospheres are able to survive the high-radiation environment of an M dwarf when it's really young, so this is going to be an amazing opportunity to study that," she said. "As it passes in front of its host star, it's backlit by the light from its host star and we can study… the types of molecules that are in its atmosphere – if it has an atmosphere."

Live Science asked whether the planet would ever jump over to one of the other stars in its system and orbit it for a while, but Winters said such a scenario is unlikely. Past theoretical research has shown that exoplanets closer than one-third the distance between their host star and other stars in their systems probably have very stable orbits. And this planet is well within that stability zone. Still, Winters added, this is a very new discovery, and it's difficult to know what the exoplanet's past or future holds.

Winters and her colleagues' paper has not yet been published in a peer-reviewed journal, but is available as a preprint on the server arXiv.

https://wb.md/2KoR6ti

Findings Fortify Low Riboflavin, Migraine Link

Riboflavin supplementation may decrease headache severity in patients with migraine who are deficient in vitamin B2 and other micronutrients, new research suggests.

Damian McNamara

PHILADELPHIA — In a small study, all participants experienced a 50% or greater reduction in both headache severity and frequency following nutritional supplementation.

In addition, a majority of the patients were migraine-free 2 years post treatment.

"Nutritional deficiencies could play an integral role in migraine," investigator Madhureeta Achari, MD, a neurologist in the Department of Physical Medicine and Rehabilitation, the University of Texas Medical School, Houston, told *Medscape Medical News*.

She added that in her experience in clinical practice, "I'm surprised how many micronutrient deficiencies I see."

The findings were presented here at the American Headache Society (AHS) Annual Meeting 2019.

Nutritional Neurology

"Previous research showed a link between riboflavin and migraine," said study coauthor César Escamilla-Ocanas, MD, Section of Vascular Neurology and Neurocritical Care, Department of Neurology, Baylor College of Medicine, Houston.

In a prior trial, 59% of people with migraine who were randomly assigned to receive high-dose riboflavin for 3 months experienced

at least 50% fewer headache days compared with 15% of those who received placebo.

In this and other clinical trials, 200-mg to 400-mg supplementation with riboflavin appeared effective in reducing both migraine frequency and severity. However, researchers did not assess vitamin B2 levels at study entry.

"It's important to look at baseline levels. This is a very data driven, not survey driven, study," Escamilla-Ocanas said.

In the current case series, the researchers assessed 42 patients (84% women; mean age, 35.5 years) with migraine whose serum riboflavin levels were in the deficient range. The cohort included patients who experienced migraine with aura and those who had migraine without aura, as well as other patients with chronic migraine.

The investigators provided supplements to increase serum riboflavin to a high level. They monitored complete vitamin and micronutrient levels through serial laboratory measurements over 2 years. "I practice 'nutritional neurology' by doing blood levels of micronutrients," Achari said.

The researchers also assessed CoQ10, zinc, and vitamin C levels, but in the study presented at the AHS conference, their focus was on riboflavin levels.

"Inexpensive, Easy to Implement"

In total, 35 of the 42 participants did well on nutritional therapy alone, Achari noted. The remaining seven required additional prophylactic medications to treat their migraines.

Rescue medications were allowed, including over-the-counter treatments and triptans.

Results showed that the number of migraine days per month was reduced from an average of 14.4 at baseline to 3.4 after riboflavin treatment. In addition, 81% of the participants were migraine free at 2 years.

The findings suggest that a subset of patients with migraine could benefit from supplementation, Achari said.

"This could work for many people with migraine," she added. "Riboflavin is important for cellular function and influences the mitochondria of the cell."

Nutritional supplementation is inexpensive, easy to implement, and is well tolerated by people with migraine, she said.

Asked if the level of riboflavin is the only factor involved, Achari answered, "We don't know that. There could be other confounders."

"We are hoping this study leads to more research," Escamilla-Ocanas added.

Gives Reason for Benefits?

Commenting for *Medscape Medical News*, Huma Sheikh, MD, a neurologist who specializes in headache medicine and who is assistant clinical professor of neurology at Mount Sinai Beth Israel, New York City, noted that the study findings were particularly striking.

"This is interesting because it may be able to provide a reason that B2 supplementation is sometimes helpful in migraine and works as a migraine preventive," said Sheik, who was not involved with the research.

She pointed out that an advantage of vitamin B2 is that it is water soluble, so "extra is usually excreted out.

"It is also rare to have a vitamin B2 deficiency, since it is found in many common foods, but still, this is an interesting finding," added Sheikh, who is also co-chair of the special interest section on migraine and vascular disease at the AHS and is a member of the AHS committee to develop guidelines for vascular issues and headache.

Achari, Escamilla-Ocanas, and Sheikh have disclosed no relevant financial relationships.

American Headache Society (AHS) Annual Meeting 2019: Abstract P42. Presented July 12, 2019.

http://bit.ly/2LZy9Ax

People use sauna for well-being, but its medical benefits are not widely understood

Why do people use sauna? Despite centuries of anecdotal evidence which says the practice is relaxing and healthy, researchers have never actually asked this question. Until now.

Joy Hussain * Jack Tsonis

With increasing evidence pointing to the health benefits of sauna, Australian researchers decided to conduct an online global sauna survey to start to understand why people regularly subject themselves to extreme heat.

They found the overwhelming motivation for sauna bathing was relaxation and stress reduction, alongside other health benefits such as pain relief and improved sleep.

But the results highlighted that sauna does not appear to be widely recognised as a health intervention for a range of chronic conditions it has been shown to benefit. This suggests more education is needed for both medical professionals and the wider community.

At the same time, we need continued scientific research to better understand the health benefits of sauna bathing.

What the survey found

The survey received 472 responses from 29 countries (with Finland, the United States, and Australia making up the top three).

The average age of participants was 45, and respondents used a sauna on average once or twice per week. Bathers used both traditional and infrared saunas, although infrared use was much higher in Australia and the US (both 30%, compared to only 2% in Finland).

All respondents selected "relaxation/stress reduction" as a highly important reason for sauna bathing. The results showed using sauna five to 15 times per month was associated with higher mental well-being scores compared to those using sauna less frequently. But more evidence is needed to establish a link between thermal therapy and mental health.

Other leading motivations for using sauna included "to relieve aches and pains" (88%), "social – to meet and talk with friends" (85%), "to improve circulation" (85%), "detoxification" (83%), and "professional – to meet and talk with business colleagues" (50%).

The top three activities reported as occurring inside the sauna were relaxation (100%), talking with others (79%), and meditation (68%) – again highlighting the function of sauna as a space for mental regeneration.

Some 84% of respondents reported improved sleep, lasting for one to two nights after sauna use. Given the importance of sleep for general health, sauna seems to hold promise as an enjoyable and non-pharmacological tool to promote better rest.

One-third of respondents were overweight or obese, which suggests regular sauna bathing is well tolerated by this population.

While the precise mechanisms are still not understood, the physical effects of sauna – including heart rate, blood pressure, and cellular responses – correspond to similar benefits seen with moderate intensity physical exercise.

Sauna use doesn't reflect knowledge of recent evidence

The survey revealed two important broader points. Firstly, people are using sauna in ways not fully backed up by medical evidence yet. One-third of respondents reported having a medically diagnosed health condition, with the most common being back pain, followed by musculoskeletal problems. Interestingly, two-thirds of these respondents reported sauna bathing improved their condition, at least temporarily.

But there is little evidence on sauna for these specific health issues, and sauna is rarely part of conventional treatment plans for such conditions. The same applies to reports about improved sleep.

Secondly, and by contrast, high blood pressure and heart conditions were not among the top medical conditions of respondents, despite the benefits sauna has demonstrated for cardiovascular health. Recent observational and experimental studies have shown people who regularly use sauna experience fewer incidents of high blood pressure and have fewer heart attacks and strokes.

But the fact sauna users are not commonly bathing with these benefits in mind suggests many health professionals may not yet be aware of the scientific literature surrounding the potential preventive health benefits of sauna use.

Given the evidence for stress reduction shown in this survey, sauna also shows promise as an intervention for a range of chronic diseases where psychological stress is considered to be strongly associated with the mechanisms behind the disease (for example, depression, heart disease, and arthritis).

From sauna research to sauna treatment

Sauna has potential benefits for a range of major health challenges facing today's population. To maximise these benefits, a few key steps lie ahead.

The most important thing is more attention from researchers. The health outcomes demonstrated so far all need further evidence, and we need continued social science to understand more about how the technology might be spread at a community level. Increased access to community bathing facilities will require public support and entrepreneurial vision.

The other key step is for sauna researchers to engage with health professionals, so sauna may become recognised alongside other evidence-based treatments for chronic conditions in both clinical and community settings.

GP Researcher, RMIT University
**Lecturer, Graduate Research School, Western Sydney University*

Disclosure statement
Joy Hussain has received PhD scholarship funding from the Jacka Foundation and RMIT University.
Jack Tsonis is president of the Australian Sweat Bathing Association, a national not-for-profit that represents Australia in the International Sauna Association.

https://wb.md/2KixQii

Vascular Death Tops Suicide After Psychiatric Inpatient Discharge

Vascular disease is the "major" cause of death in patients after psychiatric discharge over the medium- and long-term

Megan Brooks

Suicide may be the largest single cause of death in the short-term following psychiatric discharge, but vascular disease is the "major" cause of death in this patient population over the medium- and long-term, new research shows.

"The study places the suicide and natural mortality in context" and shows that the physical health of psychiatric patients needs to be taken "seriously," professor Matthew Large, MBBS, University of New South Wales School of Psychiatry, Sydney, Australia, told *Medscape Medical News*.

"While psychiatrists worry a lot about suicide outcomes, the need to address vascular risk factors such as smoking and blood pressure, and the metabolic side effects of medication that include raised cholesterol, obesity, and diabetes is as, or even more important," said Large. The study was published online July 20 in *Acta Psychiatrica Scandinavica*.

Premature Death

To quantify causes of death after inpatient psychiatric care, the researchers combined 71 studies published over 50 years with data on 982,558 patients over almost 15 million person-years.

The pooled natural death rate of 1128 per 100,000 person-years exceeded the pooled unnatural deaths of 479 per 100,000 person-years among studies with varying periods of follow-up.

There was no significant difference in cumulative natural and unnatural death rates at 2 years, but natural deaths significantly exceeded unnatural deaths after that.

Table 1. Natural vs Unnatural Deaths Per 100,000 Person-Years

Years After Discharge	Natural Death	Unnatural Death	*P* value
0-2	537	634	.74
2-5	1493	643	< .001
5-10	1008	467	< .001
+10	1110	362	< .001

Most natural deaths were vascular and most unnatural deaths were suicide. There were nonsignificant differences between cumulative vascular death and suicide rates at 0 to 2 years or 2 to 5 years, but vascular deaths significantly exceeded suicide deaths by 5 to 10 years and over periods of follow-up of more than 10 years.

Table 2. Vascular and Suicide Deaths Per 100,000 Person-Years

Years After Discharge	Vascular Death	Suicide	*P* value
0-2	273	354	.7
2-5	591	462	.4
5-10	676	313	.001
+10	647	209	.001

Among studies reporting separate mortality among men and women, men had higher unnatural, suicide, accidental, and gastrointestinal mortality but lower natural mortality than did women.

Overall, the researchers note the findings are in line with other research that found physical health conditions contribute to the majority of premature deaths in patients with severe mental illness.

Opportunity to Intervene

"Our results suggest that there may be opportunities to decrease psychiatric mortality outside of suicide prevention, particularly in the reduction in cardio-metabolic risk factors and treatment of vascular disease," Large and colleagues write.

While the focus of an acute psychiatric admission will "necessarily be on mental wellbeing and safety," a psychiatric admission presents "an opportunity for general medical assessment and cardiovascular risk assessment leading to potentially lifesaving health preventative measures," they add.

"This is an important article," David Roane, MD, chairman, Department of Psychiatry, Lenox Hill Hospital in New York City, told *Medscape Medical News*.

"It is well known that rates of suicide after psychiatric hospitalization are far higher than in the general population. It is also well known that individuals with severe mental illness (who often require hospitalization) have higher rates of co-morbid medical illness and mortality than is seen in the general population," Roane said.

"This article points to the importance of managing medical conditions in psychiatric patients as intensively as the underlying psychiatric condition," he noted. "As vascular causes of death were the highest, long-term, attention to metabolic syndrome (high blood pressure, elevated blood sugar, cholesterol and triglycerides, obesity) is critical, especially since some psychiatric medications, such as antipsychotics, can contribute to metabolic syndrome," said Roane.

He also noted that studies of inpatient psychiatric facilities specializing in the care of the geriatric population were excluded from the study "reducing the likelihood that the high rate of natural deaths was a function of advanced age."

The study received no funding. Large and Roane have declared no relevant financial relationships.

Acta Psychiatr Scand. Published online July 20, 2019. Abstract

https://bbc.in/33aEY7I

The 'dual stigma' of alcohol-related brain damage

Alcohol-related brain damage, a condition similar to dementia, is poorly understood and often missed by health professionals, a study by charity Alcohol Change UK says.

By Michael Buchanan Social affairs correspondent, BBC News

And patients struggling with the "double stigma" of brain impairment and alcohol addiction often end up in accident and emergency units because of a lack of community services.

The condition affects balance and makes it difficult for patients to process new information. They can also become confused and experience memory loss.

At its most basic, the injury is caused by damage to brain cells from alcohol, which causes them to shrink and die or deprives them of vital vitamins.

Heavy drinking

A man who drinks more than 50 units of alcohol a week, or a woman drinking more than 35 units, for five years or more is at risk of the disease, Alcohol Change says. "You're talking about a condition that's the result of long-term heavy drinking, which a lot of people are going to say, 'Well someone's done that themselves, it's his own fault,'" Andrew Misell, from Alcohol Change UK, said.

"And then you're talking about a condition which makes someone's behaviour difficult to manage - people can be aggressive, inappropriate, confused and confusing to others"

Last year, the alcohol care team at the Royal Liverpool Hospital treated 79 patients with alcohol-related brain disease.

Patients are asked to sit a test used to diagnose dementia, which has been adapted for this condition. A low score can lead to scans to see if the patient's alcohol intake has shrunk their brain.

If it has, an occupational therapist is then brought in to find out how the brain damage has affected that person's daily life.

"I can assess them getting washed and dressed, cooking some basic food, look at road safety awareness, their ability to manage finances," senior occupational therapist Jenna Simons said.

"If we do a kitchen assessment and they're cooking, and the doorbell rings, they might forget about the cooking and go back to watching TV, so that's then a fire risk."

'Two glasses of wine became a bottle'

Mark Jones, 55, who was diagnosed last November, had been a functioning alcoholic for years but his alcohol intake had become problematic about four years ago.

"I've always enjoyed a glass of wine," he said, "but the glass became two glasses, two glasses became a bottle and it was maybe one and a half, two bottles of wine a day."

By the time he came in to hospital, his short term memory had deteriorated, he had lost his balance and needed a walking frame to move around - all a consequence of his alcohol intake.

Most rehab centres don't accept people with an alcohol-related brain injury. But the team at the Royal Liverpool managed to find Mr Jones a place at the Merseycare NHS Foundation Trust in the city, which treats people who've had traumatic brain injuries, where he has received help for his short-term memory loss.

"While I don't believe I will get it fully back 100%, it has improved an awful lot since I've been in here," he said.

For his continuing rehabilitation, however, Mr Jones, who is due to be discharged in the next few days, will have to rely on his family - as there are no community services geared up to support his brain injury.

Mr Misell said: "One thing we are very clear about is that, unlike other forms of dementia, such as Alzheimer's disease for example, the progress of the condition is not inevitable," says Andrew Misell.

"It can be reversed. And people can be taught, in a sense, to recover themselves, to re-learn things they've forgotten how to do."

http://bit.ly/2OItZPy

Hidden chemistry in flowers shown to kill cancer cells

Researchers at the University of Birmingham have shown that it's possible to produce a compound with anti-cancer properties directly from feverfew (ナツシロギク) - a common flowering garden plant.

The team was able to extract the compound from the flowers and modify it so it could be used to kill chronic lymphocytic leukaemia (CLL) cells in the laboratory. Feverfew is grown in many UK gardens, and also commonly sold in health food shops as a remedy for migraine and other aches and pains.

The compound the Birmingham team were investigating is called parthenolide and was identified by scientists as having anti-cancer properties several years ago. Although available commercially, it is extremely expensive with poor "drug-like" properties and has not progressed beyond basic research.

The Birmingham team were able to show a method not only for producing the parthenolide directly from plants, but a way of modifying it to produce a number of compounds that killed cancer cells in in vitro experiments. The particular properties of these compounds make them much more promising as drugs that could be used in the clinic.

The parthenolide compound appears to work by increasing the levels of reactive oxygen species (ROS) in cells. Cancer cells already have higher levels of these unstable molecules and so the effect of the parthenolide is to increase levels of these to a critical point, causing the cell to die.

The study, published in MedChemComm, was a multidisciplinary programme, drawing together researchers from the University's Institute of Cancer and Genomic Studies, the School of Chemistry and the drug discovery services companies, Sygnature Discovery and Apconix. The University of Birmingham's Winterbourne Botanic Garden oversaw the cultivation of the plants in sufficient volume for the drug screen to take place.

It was initiated by Dr Angelo Agathanggelou, of the Institute of Cancer and Genomic Studies, who is investigating new ways to treat chronic lymphocytic leukaemia (CLL), a type of cancer which typically affects older people.

Dr Agathanggelou explains: "There are several effective treatments for CLL, but after a time the disease in some patients becomes resistant. We were interested in finding out more about the potential of parthenolide. With expertise from colleagues in the School of Chemistry we've been able to demonstrate that this compound shows real promise and could provide alternative treatment options for CLL patients."

Professor John Fossey, of the University's School of Chemistry, says: "This research is important not only because we have shown a way of producing parthenolide that could make it much more accessible to researchers, but also because we've been able to improve its "drug-like" properties to kill cancer cells. It's a clear demonstration that parthenolide has the potential to progress from the flowerbed into the clinic."

Lee Hale, Head of Winterbourne Botanic Garden and Abigail Gulliver, Winterbourne's Horticultural Adviser oversaw the cultivation and harvesting of the plants. Hale explains: "After trials on related plant species within the Asteraceae family it soon became apparent that Tanacetum parthenium - feverfew - provided the optimum levels of parthenolide."

"Feverfew is a short lived perennial plant which we sowed on an annual basis for the trial to ensure continuity of supply. This was necessary as winter weather can result in plant losses," adds Abigail Gulliver.

Li et al (2019). 'Derivatisation of parthenolide to address chemoresistant chronic lymphocytic leukaemia'. MedChemCom

http://bit.ly/2MJ0rPr

Higher vitamin A intake linked to lower skin cancer risk

17 percent reduction in risk for getting the second-most-common type of skin cancer

PROVIDENCE, R.I. [Brown University] -- People whose diets included high levels of vitamin A had a 17 percent reduction in risk for getting the second-most-common type of skin cancer, as compared to those who ate modest amounts of foods and supplements rich in vitamin A. That's according to researchers from Brown University, who unearthed that finding after analyzing data from two long-term observational studies.

Cutaneous squamous cell carcinoma is the second-most-common type of skin cancer among people with fair skin. Vitamin A is known to be essential for the healthy growth and maturation of skin cells, but prior studies on its effectiveness in reducing skin cancer risk have been mixed, said Eunyoung Cho, an associate professor of dermatology and epidemiology at Brown.

"Our study provides another reason to eat lots of fruits and vegetables as part of a healthy diet," said Cho, who is also an associate epidemiologist at Brigham and Women's Hospital. "Skin cancer, including squamous cell carcinoma, is hard to prevent, but this study suggests that eating a healthy diet rich in vitamin A may be a way to reduce your risk, in addition to wearing sunscreen and reducing sun exposure."

The findings were published on Wednesday, July 31, in the Journal of the American Medical Association Dermatology.

The research team led by Cho looked at the diet and skin cancer results of participants in two large, long-term observational studies: the Nurses' Health Study, which followed 121,700 U.S. women from 1984 to 2012, and the Health Professionals Follow-Up Study, which followed 51,529 U.S. men from 1986 to 2012.

Between the two studies, some 123,000 participants were white (and thus had significant risk of developing skin cancer), had no prior history of cancer and completed the dietary reports multiple times. Among these individuals included in the team's subsequent analysis, a total of 3,978 cases of squamous cell carcinoma were reported and verified within the 24- or 26-year follow-up periods.

Both studies also asked the participants about hair color, the number of severe sunburns they had received in their lifetime and any family history of skin cancer, and the researchers adjusted for these and other factors. The studies did not, however, ask participants about their avoidance of mid-day sun, known to be a major risk factor for skin cancer.

After grouping the study participants into five categories by vitamin A intake levels, the researchers found that people in the category with the highest average daily total vitamin A intake were 17 percent less likely to get skin cancer than those in the category with the lowest total vitamin A intake.

Those in the highest category reported eating on average the amount of vitamin A equivalent to one medium baked sweet potato or two large carrots each day. Those in the lowest category reported eating a daily average amount of vitamin A equivalent to one-third cup of sweet potato fries or one small carrot, which is still above the U.S. Recommended Dietary Allowance of vitamin A.

The team also found that the majority of vitamin A came from the participants' diets, particularly from fruits and vegetables, rather than from animal-based foods or vitamin supplements. Plant-based sources of vitamin A include not only sweet potatoes and carrots, but leafy green vegetables and fruits like apricots and cantaloupe. Milk, some types of fish and liver are rich sources of animal-based vitamin A.

Cho cautioned that too much vitamin A, particularly from supplements and animal sources, can lead to nausea, liver toxicity,

increased risk of osteoporosis and hip fracture, and even birth defects. Side effects from high levels of plant-based vitamin A are minimal, she added.

The researchers also found that eating high levels of other plant-based pigments similar to vitamin A -- such as lycopene, commonly found in tomatoes and watermelon -- was associated with decreased risk of skin cancer.

Because the analysis was based on studies surveying a large number of people about the foods they ate and observing whether or not they got skin cancer, rather than a randomized clinical trial, it cannot establish cause and effect. It's possible that another factor may have led to the differences -- such as the fact that people who consumed more vitamin A also tended to drink less alcohol.

As a next step, Cho would like to conduct a clinical trial to see if vitamin A supplements can prevent squamous cell carcinoma. However, she added, conducting a dietary clinical trial is quite challenging on a technical level, as is ensuring that participants actually stick to the diet.

"If a clinical trial cannot be done, then a large-scale prospective study like this is the best alternative for studying diet," Cho said.

Other authors on the paper from Brown University include Dr. Jongwoo Kim, now at Inje University Sanggye-Paik Hospital in South Korea; Min Kyung Park; Wen-Qing Li and Dr. Abrar Qureshi.

The research was supported by the National Institutes of Health (grant numbers CA186107, CA87969, CA167552 and CA198216) as well as a research career development award from the Dermatology Foundation.

http://bit.ly/2MzZLM9

'Sniff-cam' to detect disease

Having bad breath can mean someone ate a smelly lunch, but it could indicate that the person is sick.

Various scent compounds have been linked to illnesses such as diabetes, lung cancer and Parkinson's disease, leading scientists to develop technology that measures these substances. However, the challenge is creating instrumentation that can detect low, diagnostic levels of these disease biomarkers. Now, scientists report in ACS' *Analytical Chemistry* a highly sensitive "sniff-cam" that fits the bill.

Before the advent of modern technology, ancient medical practitioners used breath and body odor to diagnose disease. But healthy people also emit smelly volatile organic compounds (VOCs), and the levels of these substances can vary depending on other factors, such as sex and body mass, so analysis can be complicated. Over the years, researchers have developed several different types of instruments to detect VOCs, such as ethanol (EtOH), a metabolite of the microbiome in humans that can provide an indication of glucose levels. But current systems to detect VOCs typically require large, expensive equipment and trained professionals. Previously, Kohji Mitsubayashi and colleagues developed a "bio-sniffer" that measured VOCs, such as acetone, a product of lipid metabolism. More recently, they reported the first generation sniff-cam, which could visualize EtOH emissions from the skin of someone who had consumed alcohol. However, the researchers wanted to refine the device so it could detect diagnostic levels of biomarkers.

The researchers constructed a new version of the sniff-cam, which now consists of an ultraviolet ring light, filters and a camera. An enzyme mesh, already used in the previous device, reacts EtOH with oxidized nicotinamide adenine dinucleotide (NAD), producing the fluorescent reduced form of NAD, which the camera records. A new imaging analysis method improved the sensitivity of the system so that low amounts of EtOH could be measured. The updated sniff-cam was then tested on a group of male subjects who had not consumed food or drink, and the device detected miniscule levels of EtOH in their breath. These results show that the sniff-cam can visualize a broader range of VOC levels than previous devices,

and its versatility may aid in the further study of the relationship between scent and disease.

The authors acknowledge funding from the Japan Society for the Promotion of Science, the Japan Science and Technology Agency and the Ministry of Education, Culture, Sports, Science and Technology-Japan.

The abstract that accompanies this study is available here.

http://bit.ly/2OH3hH7

Encapsulated Indian medicinal herb shows anti-diabetic properties in mice

Researchers find that herbal extracts packaged in polymers can reduce blood glucose levels in diabetic mice

Extracts of the herb *Withania coagulans*, or Paneer dodi, are used in traditional Indian medicine. Although some healers claim that *W. coagulans* can help treat diabetes, the bitter-tasting plant hasn't been studied extensively by scientists. Now, researchers have found that herbal extracts packaged in polymers derived from natural substances can reduce blood glucose levels in diabetic mice. They report their results in *ACS Omega*.

Alternative medicines are becoming increasingly popular for the treatment of chronic illness, primarily because of people's perception that plant-based medicines are less toxic and have fewer side effects. However, this is not always the case, and even so-called "natural" therapies must be carefully tested for efficacy, dose-related toxicity and interactions with other drugs. In addition, scientists must find ways to effectively deliver the medicines into the body in controlled ways. Many plant extracts, like *W. coagulans*, are bitter and unpalatable at the doses needed to have beneficial effects. Also, when taken orally, the medicinal components in plant extracts are often destroyed by the acidic conditions of the stomach. That's why Say Chye Joachim Loo and colleagues wanted to find a way to encapsulate *W. coagulans* extract in a delivery system based on natural components that could safely transport the extract to the small intestine, where the cargo would be released and absorbed.

From the berries of *W. coagulans*, the team extracted plant steroid compounds that increased insulin secretion by mouse pancreatic cells in a dish. The researchers encapsulated the steroids in chitosan nanoparticles made from shellfish exoskeletons and coated the particles with starch, which delayed release of the herbal extract under acidic conditions. Finally, diabetic mice that were fed the nanoparticles for 5 days showed about 40% lower blood glucose levels compared to their starting amounts. Surprisingly, even 5 days after the treatment ended, the mice showed a 60% reduction in blood glucose compared to their starting levels. This effect could arise from the ability of the delivery system to prolong the release of extract over an extended period of time, the researchers say.

The authors acknowledge funding from Singapore Center for Environmental Life Sciences Engineering, the Ministry of Education of Singapore, the NTU-HSPH grant, the Bill and Melinda Gates Foundation and the Office of the Higher Education Commission of Thailand.

The study is freely available as an ACS AuthorChoice article here.

https://bbc.in/2YK6hpZ

Kidney condition detected in minutes by app

A mobile phone app has speeded up the detection of a potentially fatal kidney condition in hospital patients.

By Hugh Pym Health editor

Staff describe the technology as a "potential lifesaver", providing diagnoses in minutes instead of hours.

Acute kidney injury is caused by serious health conditions, including sepsis, and affects one in five people admitted to hospital.

The condition is more common in older patients and, if not treated quickly, can affect other organs.

It accounts for around 100,000 deaths every year in the UK.

During a trial at London's Royal Free Hospital, doctors and nurses received warning signals via a mobile phone app in an average of 14 minutes, when patients' blood tests indicated the condition.

Normally, this would have taken several hours.

The new alerting system, known as Streams, developed by the Royal Free with technology firm DeepMind, sends results straight to front-line clinicians in the form of easy-to-read results and graphs.

One of the blood tests looks for high levels of a waste product called creatinine, which is normally filtered out by the kidneys.

Information on other blood markers which can help treat patients is also made available quickly to specialists via the app.

DeepMind is owned by Alphabet and shares the same parent company as Google. Hospital managers said there had been a knock-on reduction in the cost of treatment.

Mary Emerson, lead nurse specialist at the Royal Free, told the BBC the system had made a big difference to her job. "It's a huge change to be able to receive alerts about patients anywhere in the hospital," she said. "Healthcare is mobile and real time, and this is the first device that has enabled me to see results in a mobile real-time way." She said it was the first system that "fits with the way we work".

What is acute kidney injury?

It is when the kidneys stop working properly, normally as a result of complications of another serious illness

It can lead to anything from minor loss of kidney function to complete kidney failure

This type of kidney damage has to be detected and treated quickly

If not, abnormal levels of salt and chemicals can build up in the body, making people very ill

Source: NHS UK - Acute kidney injury

Data from around 12,000 alerts on acute kidney injury using the new system was evaluated by University College London. The findings, published in the journal Nature Digital Medicine, found there was "no step change" in patient recovery rates but there had been "significant improvement" in recognising acute kidney injury rapidly.

The report authors have called for further evaluation of the system across a range of hospitals. They note that old technology, such as pagers, is commonly used in the NHS for sharing this type of important data.

Consultant Dr Sally Hamour, a kidney specialist at the Royal Free, said the project was "potentially lifesaving." "We need to gather a lot more information about this technology and we need to look at it over a longer time frame," she said. "But it is certainly the case that some patients are very unwell, information comes to the correct team very quickly, and then we can put measures in place to try to make that patient safe and reverse the impact on their kidney function."

One step further

The Royal Free was rapped over the knuckles over its relationship with DeepMind by the Information Commission (ICO) in 2017, saying it had not done enough to protect patient data.

The ICO has now given the hospital a clean bill of health after managers said they would tackle shortcomings in handling of data.

The publication of the new research was timed to coincide with a report on another piece of research involving DeepMind and published in the journal Nature.

Records of more than 700,000 patients from the US Department of Veterans Affairs were analysed retrospectively by an artificial intelligence system, which goes one step further than the app.

Using hundreds of thousands of pieces of data, including blood tests and heart rate, it was able to work out whether a patient would develop acute kidney injury up to 48 hours in advance of it actually being diagnosed.

The company argued that this represented a "significant change in how medicine is practised".

http://bit.ly/2GHxKyr

Chennai dentists extract 526 teeth from mouth of seven-year-old boy

Though there is no problem in the growth of other teeth in the boy, the growth of molar teeth is permanently affected and he requires molar teeth implant in after 16 years of age, the dentists said

CHENNAI: Dentists at Saveetha Dental College and Hospital extracted a whopping 526 teeth from the mouth of a seven-year-old boy from Tiruvallur district in a rare surgery recently.

On Wednesday, dentists said the cause of the condition could be either genetic or environmental.

P Ravindran, a class II student, was brought to the Saveetha Dental College and Hospital with a growing swelling in the right lower jaw. "The tumour-like growth prevented permanent molar teeth growth in the boy in the affected side. X-Ray and CT scan showed multiple, rudimentary teeth in a bag-like tissue. It took five hours to remove all the minute teeth from the bag-like structure. The weight of the growth was 200 gms," said P Senthilnathan, Professor, Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospital.

Dentists said that since the boy was brought at an early stage, it didn't affect much of the tissue in his mouth and they could remove the sac-like structure in a conventional method. "We gave general anaesthesia to the patient and removed the complete growth in a one-and-half-hour procedure. He did not require jaw reconstruction," added Dr Senthilnathan.

Dr Pratibha Ramani, Professor and Head of Department of Oral and Maxillofacial Pathology, said, "Though the cause of the condition is not known, genetics could be one of the reasons. The environment could also play an important role. We have taken up a study to see if radiation from mobile phone towers is a factor in such conditions."

Though there is no problem in the growth of other teeth in the boy, the growth of molar teeth is permanently affected and he requires molar implants after turning 16, the dentists said.

"The surgery was performed free of cost on July 11. We were doubtful about the success of the procedure when they showed us the CT scan. Then somehow we gained courage and went ahead with it," said S Prabhudoss, father of the boy.

http://bit.ly/2OCfvRl

Blood test is highly accurate at identifying Alzheimer's before symptoms arise

When combined with age and genetic risk factor, test is 94% accurate

Up to two decades before people develop the characteristic memory loss and confusion of Alzheimer's disease, damaging clumps of protein start to build up in their brains. Now, a blood test to detect such early brain changes has moved one step closer to clinical use.

Researchers from Washington University School of Medicine in St. Louis report that they can measure levels of the Alzheimer's protein amyloid beta in the blood and use such levels to predict whether the protein has accumulated in the brain. When blood amyloid levels are combined with two other major Alzheimer's risk factors - age and the presence of the genetic variant APOE4 - people with early Alzheimer's brain changes can be identified with 94% accuracy, the study found.

The findings, published Aug. 1 in the journal Neurology, represent another step toward a blood test to identify people on track to develop Alzheimer's before symptoms arise. Surprisingly, the test may be even more sensitive than the gold standard - a PET brain scan - at detecting the beginnings of amyloid deposition in the brain.

Such a test may become available at doctors' offices within a few years, but its benefits will be much greater once there are treatments to halt the disease process and forestall dementia. Clinical trials of preventive drug candidates have been hampered by the difficulty of identifying participants who have Alzheimer's brain changes but no cognitive problems. The blood test could provide a way to efficiently screen for people with early signs of disease so they can participate in clinical trials evaluating whether drugs can prevent Alzheimer's dementia.

"Right now we screen people for clinical trials with brain scans, which is time-consuming and expensive, and enrolling participants takes years," said senior author Randall J. Bateman, MD, the Charles F. and Joanne Knight Distinguished Professor of Neurology. "But with a blood test, we could potentially screen thousands of people a month. That means we can more efficiently enroll participants in clinical trials, which will help us find treatments faster, and could have an enormous impact on the cost of the disease as well as the human suffering that goes with it."

The test, an earlier version of which first was reported two years ago, uses a technique called mass spectrometry to precisely measure the amounts of two forms of amyloid beta in the blood: amyloid beta 42 and amyloid beta 40. The ratio of the two forms goes down as the amount of amyloid beta deposits in the brain goes up.

The current study involved 158 adults over age 50. All but 10 of the participants in the new study were cognitively normal, and each provided at least one blood sample and underwent one PET brain scan. The researchers classified each blood sample and PET scan as amyloid positive or negative, and found that the blood test from each participant agreed with his or her PET scan 88 percent of the time, which is promising but not accurate enough for a clinical diagnostic test.

In an effort to improve the test's accuracy, the researchers incorporated several major risk factors for Alzheimer's. Age is the largest known risk factor; after age 65, the chance of developing the disease doubles every five years. A genetic variant called APOE4 raises the risk of developing Alzheimer's three- to fivefold. And gender also plays a role: Two out of three Alzheimer's patients are women.

When the researchers included these risk factors in the analysis, they found that age and APOE4 status raised the accuracy of the blood test to 94%. Sex did not significantly affected the analysis.

"Sex did affect the amyloid beta ratio, but not enough to change whether people were classified as amyloid positive or amyloid negative, so including it didn't improve the accuracy of the analysis," said first author Suzanne Schindler, MD, PhD, an assistant professor of neurology.

Further, the results of some people's blood tests initially were considered false positives because the blood test was positive for amyloid beta but the brain scan came back negative. But some people with mismatched results tested positive on subsequent brain scans taken an average of four years later. The finding suggests that, far from being wrong, the initial blood tests had flagged early signs of disease missed by the gold-standard brain scan.

There is growing consensus among neurologists that Alzheimer's treatment needs to begin as early as possible, ideally before any cognitive symptoms arise. By the time people become forgetful, their brains are so severely damaged no therapy is likely to fully heal them. But testing preventive treatments requires screening thousands of healthy people to find a study population of people with amyloid build-up and no cognitive problems, a slow and expensive process.

As part of the study, the researchers analyzed the enrollment process for a prominent Alzheimer's prevention trial called the A4

study that used PET scans to confirm the presence of early Alzheimer's brain changes in potential participants. They concluded that prescreening with a blood test followed by a PET scan for confirmation would have reduced the number of PET scans needed by two thirds. Unlike blood tests, which cost a few hundred dollars, each PET scan costs upward of $4,000. A single site can only run a few dozen PET brain scans a month, because PET scanners are primarily reserved for patient care, not research studies.

"If you want to screen an asymptomatic population for a prevention trial, you would have to screen, say, 10,000 people just to get 1,500 or 2,000 that would qualify," Bateman said. "Reducing the number of PET scans could enable us to conduct twice as many clinical trials for the same amount of time and money. It's not the $4,000 per PET scan that we're worried about. It's the millions of patients that are suffering while we don't have a treatment. If we can run these trials faster, that will get us closer to ending this disease."

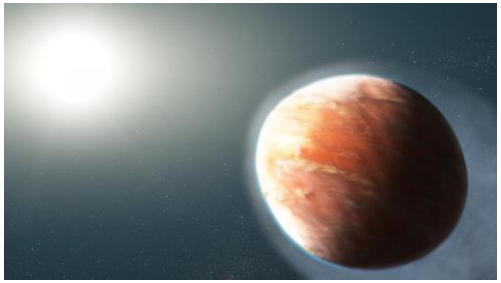
http://bit.ly/2YLTuDr

Hubble uncovers a 'heavy metal' exoplanet shaped like a football

How can a planet be "hotter than hot?" The answer is when heavy metals are detected escaping from the planet's atmosphere, instead of condensing into clouds.

Observations by NASA's Hubble Space Telescope reveal magnesium and iron gas streaming from the strange world outside our solar system known as WASP-121b. The observations represent the first time that so-called "heavy metals"--elements heavier than hydrogen and helium--have been spotted escaping from a hot Jupiter, a large, gaseous exoplanet very close to its star.

Normally, hot Jupiter-sized planets are still cool enough inside to condense heavier elements such as magnesium and iron into clouds. But that's not the case with WASP-121b, which is orbiting so dangerously close to its star that its upper atmosphere reaches a blazing 4,600 degrees Fahrenheit. The temperature in WASP-121b's upper atmosphere is about 10 times greater than that of any known planetary atmosphere. The WASP-121 system resides about 900 light-years from Earth.



This artist's illustration shows an alien world that is losing magnesium and iron gas from its atmosphere. The observations represent the first time that so-called "heavy metals" -- elements more massive than hydrogen and helium -- have been detected escaping from a hot Jupiter, a large gaseous exoplanet orbiting very close to its star.The planet, known as WASP-121b, orbits a star brighter and hotter than the Sun. The planet is so dangerously close to its star that its upper atmosphere reaches a blazing 4,600 degrees Fahrenheit, about 10 times greater than any known planetary atmosphere. A torrent of ultraviolet light from the host star is heating the planet's upper atmosphere, which is causing the magnesium and iron gas to escape into space. Observations by Hubble's Space Telescope Imaging Spectrograph have detected the spectral signatures of magnesium and iron far away from the planet.The planet's "hugging" distance from the star means that it is on the verge of being ripped apart by the star's gravitational tidal forces. The powerful gravitational forces have altered the planet's shape so that it appears more football shaped.The WASP-121 system is about 900 light-years from Earth. **NASA, ESA, and J. Olmsted (STScI)**

"Heavy metals have been seen in other hot Jupiters before, but only in the lower atmosphere," explained lead researcher David Sing of the Johns Hopkins University in Baltimore, Maryland. "So you don't know if they are escaping or not. With WASP-121b, we see magnesium and iron gas so far away from the planet that they're not gravitationally bound."

Ultraviolet light from the host star, which is brighter and hotter than the Sun, heats the upper atmosphere and helps lead to its escape. In addition, the escaping magnesium and iron gas may contribute to the temperature spike, Sing said. "These metals will make the

atmosphere more opaque in the ultraviolet, which could be contributing to the heating of the upper atmosphere," he explained.

The sizzling planet is so close to its star that it is on the cusp of being ripped apart by the star's gravity. This hugging distance means that the planet is football shaped due to gravitational tidal forces.

"We picked this planet because it is so extreme," Sing said. "We thought we had a chance of seeing heavier elements escaping. It's so hot and so favorable to observe, it's the best shot at finding the presence of heavy metals. We were mainly looking for magnesium, but there have been hints of iron in the atmospheres of other exoplanets. It was a surprise, though, to see it so clearly in the data and at such great altitudes so far away from the planet. The heavy metals are escaping partly because the planet is so big and puffy that its gravity is relatively weak. This is a planet being actively stripped of its atmosphere."

The researchers used the observatory's Space Telescope Imaging Spectrograph to search in ultraviolet light for the spectral signatures of magnesium and iron imprinted on starlight filtering through WASP-121b's atmosphere as the planet passed in front of, or transited, the face of its home star.

This exoplanet is also a perfect target for NASA's upcoming James Webb Space Telescope to search in infrared light for water and carbon dioxide, which can be detected at longer, redder wavelengths. The combination of Hubble and Webb observations would give astronomers a more complete inventory of the chemical elements that make up the planet's atmosphere.

The WASP-121b study is part of the Panchromatic Comparative Exoplanet Treasury (PanCET) survey, a Hubble program to look at 20 exoplanets, ranging in size from super-Earths (several times Earth's mass) to Jupiters (which are over 100 times Earth's mass), in the first large-scale ultraviolet, visible, and infrared comparative study of distant worlds.

The observations of WASP-121b add to the developing story of how planets lose their primordial atmospheres. When planets form, they gather an atmosphere containing gas from the disk in which the planet and star formed. These atmospheres consist mostly of the primordial, lighter-weight gases hydrogen and helium, the most plentiful elements in the universe. This atmosphere dissipates as a planet moves closer to its star.

"The hot Jupiters are mostly made of hydrogen, and Hubble is very sensitive to hydrogen, so we know these planets can lose the gas relatively easily," Sing said. "But in the case of WASP-121b, the hydrogen and helium gas is outflowing, almost like a river, and is dragging these metals with them. It's a very efficient mechanism for mass loss."

The results will appear online today in The Astronomical Journal.

http://bit.ly/2M0Y0YK

Jogging Is the Best Weapon Against 'Obesity Genes'

A new study suggests that jogging is one of the best exercises to counteract so-called "obesity genes."

By Rachael Rettner, Senior Writer

People who are genetically prone to obesity may gain weight more easily than others. But having so-called "obesity genes" does not make a person destined to pack on the pounds.

Case in point: A new study suggests that certain types of exercise may help ward off obesity, even for those who are genetically predisposed to the condition.

The study researchers analyzed information from more than 18,000 people in Taiwan ages 30 to 70 who provided blood samples and had their genomes sequenced. Participants reported whether they exercised regularly, and if so, what type of exercise they typically did.

The researchers then scanned participants' genomes, looking for genes that were tied to an increased risk of obesity. Next, the investigators examined whether certain exercises seemed to counteract this risk. (The researchers used several measures of obesity, including body mass index, or BMI; body fat percentage; and waist and hip circumference.)

Overall, people who reported engaging in any type of regular exercise tended to have a lower BMI than those who didn't engage in regular exercise. This was true even among people who were genetically prone to obesity.

But one tried-and-true exercise stood out as the one with the strongest anti-obesity effect: jogging.

Participants with obesity genes who jogged tended to have a lower BMI, lower body fat percentage and a smaller hip circumference than people with similar genetic risk who did not jog.

But for those who loathe jogging, fear not: Five other types of exercise were also tied to a lower BMI among individuals at risk for obesity. These included mountain climbing, walking, power walking, certain types of dancing (such as ballroom dancing) and lengthy yoga sessions.

The benefits of these exercises were biggest among those with the greatest genetic risk of obesity.

These findings indicate that "although hereditary factors are critical to obesity, performing different kinds of exercise can modify this relationship," the authors wrote in their paper, which was published Aug. 1 in the journal PLOS Genetics. In other words, your genes aren't your destiny.

Interestingly, several other types of exercise failed to counteract the genetic risk of obesity. These included cycling, stretching exercises and swimming, as well as the video game "Dance Dance Revolution" — to the disappointment of "DDR" fans everywhere.

The findings don't mean that these latter exercises can't help with weight control. It's just that they didn't seem to offset the genetic propensity to gain weight.

There could be several reasons for this. The researchers noted that, for the average Joe or Jane, cycling and stretching exercises tend to require less energy expenditure than the six exercises that were tied to a lower obesity risk. In addition, exercising in relatively cold water, as happens with swimming, may stimulate appetite and increase food consumption, the authors said. And "DDR" is not a formal exercise that requires consistent training, as is the case with ballroom dancing, the researchers noted.

Because few participants in this study reported engaging in weight training, badminton, tennis or basketball, the study could not determine whether these exercises offset the risk of obesity genes.

It's important to note that most of the participants in the study were of Han Chinese descent, so it's not clear that the results would apply to other populations.

https://wb.md/2T7Ot2F

Most Surgical Adverse Events Result From Human Error

Over 50% of adverse events occurring during surgical procedures resulted from human error

Tara Haelle

More than half of adverse events occurring during surgical procedures resulted from human error, and just over half of these errors were cognitive in nature, according to a quality improvement study published online yesterday in *JAMA Network Open*.

The researchers developed a tool for classifying human error and applied the tool on a weekly basis at three affiliate hospitals concurrently: a level I municipal trauma center, a quaternary care university hospital, and a US Veterans Administration hospital.

They aimed to better understand behavioral drivers by examining both individuals' and teams' errors that led to adverse events.

"These findings could provide a basis for new approaches to cognitive training for surgeons and other health care practitioners to enhance the safety of surgical care delivery, approaches similar to those used in other high-risk industries, such as the aerospace industry," write James W. Suliburk, MD, of Baylor College of Medicine in Houston, Texas, and colleagues.

The investigators developed and implemented a new tool that classified human performance deficiencies (HPDs) into five cognitive, technical, or team dynamic functions-related categories. The categories included execution; planning or problem solving; communication; teamwork; and rules violation.

Each week, a morbidity and mortality conference at the hospital brought together all attending faculty, residents, and surgical trainees to discuss and categorize the previous week's adverse events from general surgery, acute care surgery, surgical oncology, cardiothoracic surgery, vascular surgery, and abdominal transplantation services. Before these meetings began, surgeons received training in using the HPD classifier tool.

Among 5365 patients, 3.4% (182 patients) experienced an adverse event during a surgical operation. Adverse events occurred in another six patients during nonoperative treatment.

Human error was responsible for more than half of these adverse events (56.4%). Most of the errors (51%) were related to execution whereas 29.3% were related to planning or problem solving, 12.8% to communication, 4.8% to teamwork, and 3.2% to rules violation.

Most of the human errors occurred during the surgery itself (54.8%) whereas 8% occurred preoperatively and 26.6% postoperatively.

Among the adverse events arising from human performance deficiencies, 51.6% of the errors were cognitive, "most commonly presented as cognitive errors in execution of care or in case planning or problem solving," the authors report.

Common cognitive errors in execution included lack of attention, memory lapses, or lack of recognition of a problem, which together comprised nearly one third (31.8%) of the cognitive errors. Another 19.8% resulted from cognitive bias in care planning or problem solving.

"Given that we and others report a current surgical adverse event rate of nearly 5%, our data suggest that more than 400,000 potentially preventable adverse events associated with HPDs occur among the nearly 17 million inpatient and ambulatory operative procedures performed in the United States annually," the authors write. "Similarities between adverse event rates in our study compared with previous studies suggest that human error remains a significant unresolved cause of adverse events in health care delivery."

Half the errors occurred in isolation whereas the other half clustered with other HPDs. Among clustered HPDs, cognitive errors again occurred most often, frequently paired with technical errors, and most of the errors were categorized as relating to planning or problem solving.

"These findings suggest the dominant role of cognitive error as a root cause of surgical adverse events, even those that would appear to be technical rather than cognitive in nature," the authors write. Consequently, they say, quality-improvement interventions to reduce errors need to go beyond existing systems-based strategies, particularly to address the large proportion of cognitive errors.

"It is interesting that lack of recognition was the most prevalent cognitive error and was classified in 19% of the HPD subclassifications, potentially reflecting the paradox that the most common dangers to patient safety are those that are initially

unrecognized," the authors note. "This paradox raises important challenges for cognitive training."

Another challenge is burnout from increasing use of checklists (the authors refer to it as a "checklist burnout syndrome"). The investigators promote more cognitive training, such as exercises that "could involve simulated playbacks of real-life scenarios taken from our situation, background, assessment and recommendation anthology, similar to training performed in the aviation and aerospace industries," they write.

The authors have disclosed no relevant financial relationships.

JAMA Network Open. Published July 31, 2019. Full text

http://bit.ly/2YwlLyN

Paradoxical outcomes for Zika-exposed tots

The reality for Zika-exposed infants is much more complicated

In the midst of an unprecedented Zika crisis in Brazil, there were a few flickers of hope: Some babies appeared to be normal at birth, free of devastating birth defects that affected other Brazilian children exposed to the virus in utero. But according to a study published online July 8, 2019, in Nature Medicine and an accompanying commentary co-written by a Children's National clinician-researcher, the reality for Zika-exposed infants is much more complicated.

Study authors led by Karin Nielsen-Saines at David Geffen UCLA School of Medicine followed 216 infants in Rio de Janeiro who had been exposed to the Zika virus during pregnancy, performing neurodevelopmental testing when the babies ranged in age from 7 to 32 months. These infants' mothers had had Zika-related symptoms themselves, including rash.

Although many children had normal assessments, 29% scored below average in at least one domain of neurological development, including cognitive performance, fine and gross motor skills and expressive language, Sarah B. Mulkey, M.D., Ph.D., and a colleague write in a companion commentary published online by Nature Medicine July 29, 2019.

The study authors found progressively higher risks for developmental, hearing and eye abnormality depending on how early the pregnancy was at the time the infants were exposed. Because Zika virus has an affinity for immature neurons, even babies who were not born with microcephaly remained at continued risk for suffering abnormalities.

Of note, 24 of 49 (49%) infants who had abnormalities at birth went on to have normal test results in the second or third year of life. By contrast, 17 of 68 infants (25%) who had normal assessments at birth had below-average developmental testing or had abnormalities in hearing or vision by age 32 months.

"This work follows babies who were born in 2015 and 2016. It's heartening that some babies born with abnormalities tested in the normal range later in life, though it's unclear whether any specific interventions help to deliver these positive findings," says Dr. Mulkey, a fetal-neonatal neurologist in the Division of Fetal and Transitional Medicine at Children's National in Washington, D.C. "And it's quite sobering that babies who appeared normal at birth went on to develop abnormalities due to that early Zika exposure."

It's unclear how closely the findings apply to the vast majority of U.S. women whose Zika infections were asymptomatic.

"This study adds to the growing body of research that argues in favor of ongoing follow-up for Zika-exposed children, even if their neurologic exams were reassuring at birth," Dr. Mulkey adds. "As Zika-exposed children approach school age, it's critical to better characterize the potential implications for the education system and public health."

In addition to Dr. Mulkey, the perspective's senior author, William J. Muller, Northwestern University, was the commentary's lead author.

http://bit.ly/33qDRn9

Caterpillars of the peppered moth perceive color through their skin

Twig-mimicking caterpillars change their color depending on the background and move to color-matching backgrounds

Cephalopods, chameleons and some fish camouflage themselves by adapting their color to their surroundings. These animals have a system to perceive color and light independently of the eyes. Some insects, such as caterpillars of the peppered moth (Biston betularia), also match their body color to the twig color of their food plant; although this color change is rather slow compared to other animals. Until now, scientists have not known how insect larvae can perceive the color of their environment and how the color change occurs. Two theories dating back more than 130 years proposed that the color change could be caused by the diet or by the animal seeing the color.

Twig-mimicking caterpillars change their color depending on the background and move to color-matching backgrounds. Arjen van't Hof, University of Liverpoool

As some insects are known to be able to perceive light - but not color - by the skin, researchers from Liverpool University and the Max Planck Institute for Chemical Ecology pursued three different approaches to finally solve the riddle of how caterpillars of the peppered moth match the color of their surroundings.

First, they tested if caterpillars of the peppered moth, whose eyes were painted over with black acrylic paint, could still adjust their color to the background. The blindfolded caterpillars were raised on white, green, brown and black branches and their body color observed. Even without being able to see, the caterpillars changed color to resemble the background to the same extent as caterpillars whose eyes were not covered. "It was completely surprising to me that blindfolded caterpillars could still change their color and match it to the background. I don't think my supervisor, Ilik Saccheri, believed me until he saw it by himself", says Amy Eacock, one of the lead authors of the new study and currently a postdoc at the Max Planck Institute for Chemical Ecology.

In behavioral experiments, blindfolded caterpillars had the choice to move to differently colored twigs. Consistently the caterpillar rested on the twig most similar to their own color.

In a third approach, the researchers examined in which parts of the body genes related to vision were expressed. They found them not only in the head of the caterpillars, where the eyes are, but also in the skin of all body segments. One visual gene was expressed even more in the skin than in the heads of the caterpillars. "We assume that this gene is involved in the perception of background color by the skin," notes Hannah Rowland, second lead author and leader of the Max Planck Research Group, Predators and Toxic Prey.

"One of the major challenges animals face is how to avoid being eaten by predators. Numerous species have evolved camouflage to avoid being detected or recognised. A considerable problem, however, is how prey animals can match the range of visual backgrounds against which they are often seen. Color change enables animals to match their surroundings and potentially reduce the risk of predation," says Hannah Rowland, highlighting the study's ecological context. Amy Eacock adds: "We constructed a computer model that can 'see' the same way birds do, so we are able to conclude that these adaptations - color change, twig-mimicking, behavioral background-matching - likely evolved to avoid visual detection by predators." Caterpillars with better color sensing may have been eaten less by birds, while birds with improved vision

may prey more upon these larvae, continuing the evolutionary predator-prey arms race.

The study expands our understanding of how lepidopteran larvae protect themselves from predation.

https://nyti.ms/31k7iCY

Got Impossible Milk? The Quest for Lab-Made Dairy

With advances in synthetic biology, researchers and entrepreneurs strive to create cows' milk without cows.

By Knvul Sheikh

In recent years, the alternatives to conventional cows' milk have proliferated. The local grocery store is likely to offer any number of plant-based options: milks made from soy, almonds, oats, rice, hemp, coconuts, cashews, pea plants and more.

But most nondairy milks pale in comparison to cows' milk. Plant-based milks are made by breaking down plants and reconstituting their proteins in water to resemble the fluid from a lactating bovine. These proteins differ fundamentally from true dairy proteins, and the results — milks, cheeses and yogurts in name only — often fail to measure up in color, taste or texture. Inja Radman, a molecular biologist and a founder of New Culture, a food company, put it plainly.

"Vegan cheese is just terrible," she said. "As scientists, we know why it doesn't work. It doesn't have the crucial dairy proteins."

Dairy tastes like dairy thanks to two key proteins, casein and whey protein.

Researchers at several start-up companies, including New Culture, have begun producing these proteins in the lab, with the aim of creating a new grocery store category: cow-free dairy.

Their process is loosely comparable to the way Impossible Foods or Beyond Meat makes meatless burgers. Microbes, such as yeast, are given the genetic instructions to produce the dairy proteins. The microbes are then cultivated en masse, with nutrients added and the temperature adjusted. Eventually the organisms start churning out large quantities of the proteins, and these are isolated and added to various recipes.

For the Impossible Burger, the essential protein is a molecule called heme, which is abundant in animal muscles and gives the burger its meaty flavor, and even makes it appear to bleed. New Culture is focusing on producing casein, a protein that coagulates to give mozzarella cheese its stretchy texture.

Ms. Radman said the company had conducted double-blind tests to see if people could tell the difference between the proof-of-concept cheese and store-bought mozzarella. "We've had really positive results," she said.

The quest for cow-free dairy is expanding. In Oakland, scientists at a community science lab are trying to make their own open-source recipe for lab-made cheese. And a start-up in Boston called Motif Ingredients is engineering a variety of ingredients to replace traditional dairy, eggs and meat proteins.

Another company, Perfect Day (originally Muufri), may be the furthest along in perfecting a recipe for lab-made dairy. The company produces whey protein and mixes them with other ingredients found in traditional dairy — fats, carbohydrates, calcium and phosphates.

In early July, a limited-edition batch was released, with flavors including chocolate, vanilla salted fudge and vanilla blackberry toffee; it quickly sold out.

Hundreds of thousands of metric tons of whey and casein are consumed in the United States each year, virtually all of it produced by dairy farms.

Proponents of lab-made milk see the product appealing to dairy lovers broadly, while satisfying concerns about animal welfare and environmental sustainability. But to make a real impact on the

planet, and eliminate the carbon emissions from all those belching cows, a great many microbes will need to be corralled.

The challenge is scaling up. Perfect Day plans to sell its lab-made whey to ice cream-makers, dairy companies and restaurants rather than directly to consumers. It has also partnered with agriculture giant Archer Daniels Midland, with its industrial-scale fermentation infrastructure, to try to meet market demand and reduce the cost of producing proteins.

"That's what the two of us spend the most of our time on now," said Perumal Ghandi, a founder of Perfect Day. "Sure, we have A.D.M., but even if we max them out, it's still just a drop in the bucket."

And there is already stiff competition from plant-based dairy alternatives, which offer similar environmental benefits and have gained popularity among consumers.

Sales of plant-based milks jumped 6 percent last year, and now make up 13 percent of the entire milk category, according to data from the Plant Based Foods Association and The Good Food Institute. Sales of plant-based ice cream and frozen desserts grew 27 percent; plant-based cheese grew 19 percent, and plant-based yogurt grew 39 percent.

"All of a sudden people are realizing that they don't have to depend on cows for milk," said Cheryl Mitchell, head of research and development at Elmhurst 1925, once one of New York State's largest dairy companies, which switched to making nut milks in 2017.

Technology has also improved the taste of plant-based milks and decreased the amount of water needed to produce several of them. "We want to be increasing our agricultural diversity to help environmental sustainability, not just relying on one source," Dr. Mitchell said.

Beyond Meat and Impossible Burger have been popular with consumers. Whether lab-made milk can replicate that success is an open question.

"What helped the Impossible Burger was their lab-made heme, which had a tremendous impact on both the flavor and visual appearance of the burger," said Sam Alcaine, a food scientist at Cornell University.

"I don't know if lab-made dairy can make that leap and make consumers notice a difference in their dairy products."

Labeling also has a big impact. The Food and Drug Administration has a legal standard for what can be called "ice cream," Dr. Alcaine said. Officially, ice cream must contain no less than 10 percent milk fat (or cream) from a cow. Perfect Day products have none; they contain coconut oil and sunflower oil instead, to remain animal-free, and must be labeled "frozen dairy dessert," not "ice cream."

Dairy farmers are also likely to push back, lobbying for stronger laws governing the labeling of lab-made products, as they have done for plant-based milks. Cattle ranchers have already introduced bills in 24 states that, if passed, would make it illegal to use the word "meat" to describe burgers and sausages made from plants or grown in labs.

But the founders of Perfect Day are not concerned. They say that their dairy products will prove more popular than plant-based alternatives, to vegans, vegetarians, dairy lovers and everyone in between.

"We've spoken to folks from dairy before," Mr. Pandya said. "By and large there's a feeling that this could help, because there are so many consumers leaving dairy to consume plant alternatives, whereas we are making something that is still dairy at heart." He added, "There's an opportunity here for a whole new category of food."

http://bit.ly/2KfAPrs

Why the 'Brain-Eating' Amoeba Is So Deadly

The digestive power of amoeba is the stuff of nightmares when it plays out in a human brain

By Bill Sullivan, Indiana University

***An artistic representation of the amoeba* Naegleria fowleri*, which causes deadly brain infections.* Shutterstock**

Composed of a single cell, amoeba seem harmless enough: They look like playful critters waltzing under the spotlight of a microscope until they come upon a group of bacteria.

Then, these previously innocuous amoeba suddenly morph into sinister blobs, engulfing the bacteria and slowly ripping them apart with a bevy of digestive enzymes. It's hard to cry over murdered bacteria, but the digestive power of amoeba is the stuff of nightmares when it plays out in a human brain.

Infections with *Naegleria fowleri*, the so-called brain-eating amoeba, are extremely rare, but also extremely deadly. Only 146 cases have been reported in the U.S. since 1962, with only four surviving the infection; so there is a 97% chance of death. Sadly, on July 22, a 59-year-old North Carolina man became the first person to die of the infection this year after swimming in a lake at a water park.

I study parasites and have a particular interest in those that target the brain, which is why this amoeba captured my interest.

How *N. fowleri* gets into the brain

N. fowleri dwells in warm bodies of fresh water where it dines on bacteria in the sediment. As such, most infections with this amoeba in the U.S. have occurred in southern states, especially Texas and Florida, during the summer. When the sediment of a lake is disrupted, amoeba get stirred into the water. Swimmers can then inhale the parasite through their nose. From there, *N. fowleri* invades the olfactory nerves and migrates to the brain, where it causes a dangerous condition called primary amoebic meningoencephalitis.

While swimming in fresh water is the most likely source of this amoeba, this same organism and other species of amoeba can cause brain infections in people who use tap water instead of sterile water or saline when using the nasal-flushing Neti pot.

The brain is moist and warm, just like the lakes and hot springs where the amoeba thrives. But the brain doesn't have bacteria for the amoeba to eat, so the organism attacks brain cells for nutrients.

The immune system does not sit idly by, however, while the parasite eats its way through the brain. It unleashes a massive swarm of immune cells to the infected zone, which causes inflammation and brain swelling. Unfortunately for the person whose brain is infected, this battle is being waged inside a sturdy skull, which cannot expand to accommodate a swelling brain. The increase in cranial pressure disrupts the brain's connection to the spinal cord, compromising communication with other parts of the body like the respiratory system.

A stealthy and quick assassin

Symptoms can appear as early as two days, or as late as two weeks, following inhalation of *N. fowleri*. The first symptoms include headache, fever, nausea and vomiting, and a change in the sense of smell or taste (due to damaged olfactory nerves mentioned above). The infection rapidly progresses through the central nervous system, producing stiff neck, confusion, fatigue, loss of balance, seizures and hallucinations. Patients usually succumb to the infection within five to seven days after the onset of symptoms.

There are several reasons why *N. fowleri* is so deadly. First, the presence of the parasite leads to rapid and irrevocable destruction of critical brain tissue. Second, the initial symptoms can easily be

mistaken for a less serious illness, costing valuable treatment time. Third, there is no quick diagnostic test for *N. fowleri*, and patients are often mistreated for viral or bacterial meningitis.

Finally, there are no established medications with proven efficacy against the amoeba, although miltefosine is showing promise. Compounding the problem is the fact that most drugs have trouble penetrating the brain and, as primary amoebic meningoencephalitis is a rare disease, very little research is being conducted.

It is important to keep in mind that millions of people are exposed to *N. fowleri* and never fall ill. Those who study this amoeba don't know why a tiny subset of exposed individuals develop primary amoebic meningoencephalitis; they may have a genetic difference that makes them more vulnerable to the infection, or may have forcefully inhaled an overwhelming amount of the parasite.

So if you're going swimming in warm freshwater lakes or streams, especially if you like diving or going under water, consider wearing a nose clip to help keep amoeba parasites out of your brain. Experts also advise that people avoid stirring up the sediment at the bottom of these bodies of water where the amoeba live.

http://bit.ly/31qIFH3

The Reciprocal Transit

Look who might be watching

By Caleb A. Scharf

Since the first detected exoplanetary transit in 1999, use of this technique of looking for tiny dips in light as planets pass in front of their parent stars has surged. On paper it is simplicity itself, in practice it requires exquisite precision in measuring the brightness of stars, along with a deep knowledge of the intrinsic behavior of stellar photospheres (the outer layer of stars where the majority of light is emitted), orbital mechanics, and statistical techniques for eking out detections and characterizations of other worlds.

To date the most prolific transit detection experiment has been NASA's Kepler space telescope. But newer instruments, like NASA's Transiting Exoplanet Survey Satellite, or TESS, are hot on its heels – albeit with a different set of science goals.

Kepler's primary accomplishment was to stare at a single patch of sky from 2009 to 2013, monitoring around 150,000 stars out of the half-million in its field of view. That effort paid off with over 5,000 candidate exoplanets detected as they transited their stars, blocking a minute fraction of the light.

Despite failing reaction wheels onboard the spacecraft, compromising its ability to point at targets, Kepler was ingeniously repurposed to perform what became known as its 'K2' mission starting in 2014. By using solar radiation pressure on its solar panels, the spacecraft could be kept stable – as long as it pointed at locations along the ecliptic plane, the plane of Earth's orbit around the Sun. As a result, Kepler kept gathering data all the way until 2018 when it finally ran out of fuel to maneuver the spacecraft.

The K2 science bounty has been significant. But one of the most recent analyses of the data caught my eye in particular. In a research paper by Kruse, Agol, Luger, and Foreman-Mackey the authors apply a set of analysis tools that look to improve the level of detection sensitivity possible in the K2 data. As a result, they claim detections of over 800 transiting exoplanets, with over 370 of those not previously discovered.

But another notable piece of this lengthy and neat paper is that they report that 154 of these transiting exoplanet candidates "reciprocally transit with our Solar System".

What that means is that from the point of view of those other worlds, our own solar system will exhibit planetary transits. If anyone was monitoring our Sun they would, in principle, be able to detect at least one of our planets. This is precisely because the K2

data is in the ecliptic plane – it is looking at the only parts of the sky where reciprocal transits are geometrically possible.

The idea that we might want to pay particular attention to places that could, in turn, be staring back at us, is not new in itself. There has even been intriguing work done by my colleagues David Kipping and Alex Teachey positing that advanced civilizations might use knowledge of reciprocal transits to signal or cloak their presence. But the Kruse et al. work is the first that I'm aware of to present a substantial list of candidates and to run the numbers on what the reciprocal transits might look like. This accounts for the small differences in orbital tilt of the planets around our Sun. For example, only one of the studied exoplanetary systems could witness the transits of three Solar System worlds – Jupiter, Saturn, and Uranus - due to the extremely close, 2 in a million, angular alignment required.

The most provocative candidate is a star with four detected exoplanets that, if anyone is looking, would be able to detect a single planet around the Sun. That planet is Earth, with a 365-day orbital period in the nominal habitable zone.

With the renewed interest in SETI these days, and the idea of looking for technosignatures, it seems that we're starting to find some of the prime targets for proper scrutiny. Simply because these might be the places where there's somebody, or something, already scrutinizing us.