https://theconversation.com/the-deadly-truth-about-loneliness-43785

The deadly truth about loneliness

Almost all of us have experienced loneliness at some point.

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It is the pain we have felt following a breakup, perhaps the loss of a loved one, or a move away from home. We are vulnerable to feeling lonely at any point in our lives. Loneliness is commonly used to describe a negative emotional state experienced when there is a difference between the relationships one wishes to have and those one perceives one has.

The unpleasant feelings of loneliness are subjective; researchers have found loneliness is not about the amount of time one spends with other people or alone. It is related more to quality of relationships, rather than quantity. A lonely person feels that he or she is not understood by others, and may not think they hold meaningful relationships.

For some people, loneliness may be temporary and easily relieved (such as a close friend moving away, or a spouse returning home after a work trip). For others, loneliness cannot be easily resolved (such as the death of a loved one or the breakup of a marriage) and can persist when one does not have access to people to connect with.

From an evolutionary point of view, our reliance on social groups has ensured our survival as a species. Hence loneliness can be seen as a signal to connect with others. This makes it little different to hunger, thirst or physical pain, which signal the need to eat, drink or seek medical attention. In affluent modern societies, however, turning off the alarm signals for loneliness has become more difficult than satisfying hunger, thirst or the need to see the doctor. For those who are not surrounded by people who care for them, loneliness can persist.

Researchers have found social isolation is a risk factor for disease and premature death. Findings from a recent review of multiple studies indicated that a lack of social connection poses a similar risk of early death to physical indicators such as obesity. Loneliness is a risk factor for many physical health difficulties, from fragmented sleep and dementia to lower cardiovascular output.

Some individuals may also be biologically vulnerable to feeling lonely. Evidence from twin studies found that loneliness may be partly heritable. Multiple studies have focused on how loneliness can be a result of certain gene types combined with particular social or environmental factors (such as parental support).

Loneliness has largely been ignored as a condition of concern in mental health. Researchers have yet to fully understand the extent of how loneliness affects mental health. Most studies of loneliness and mental health have focused solely on how loneliness relates to depression.

Although loneliness and depression are partly related, they are different. Loneliness refers specifically to negative feelings about the social world, whereas depression refers to a more general set of negative feelings.

In a study that measured loneliness in older adults over a five-year period, loneliness predicted depression, but the reverse was not true.

Addressing loneliness

Loneliness may be mistaken as a depressive symptom, or perhaps it is assumed that loneliness will go away once depressive symptoms are addressed. Generally, "lonely" people are encouraged to join a group or make a new friend, on the assumption that loneliness will then simply go away.

While creating opportunities to connect with others provides a platform for social interaction, relieving the social pain is not so straightforward. Lonely people can have misgivings about social situations and as a result show rejecting behaviours. These can be misconstrued as unfriendliness, and people around the lonely person respond accordingly. This is how loneliness can become a persistent cycle.

A study examined the effectiveness of different types of treatments aimed at addressing loneliness. The results indicated that treatments that focused on changing negative thinking about others were more effective than those that provided opportunities for social interaction.

Another promising way to tackle loneliness is to improve the quality of our relationships, specifically by building intimacy with those around us. Using a positive psychology approach that focuses on increasing positive emotions within relationships or increasing social behaviours may encourage deeper and more meaningful connections with others.

Indeed, even individuals who have been diagnosed with serious mental illness have reported improvements in their well-being and relationships after sharing positive emotions and doing more positive activities with others. However, research using a positive psychology approach to loneliness remains in its infancy.

We continue to underestimate the lethality of loneliness as a serious public health issue. Contemporary tools such as social media, while seeming to promote social connection, favour brief interactions with many acquaintances over the development of fewer but more meaningful relationships. In this climate, the challenge is to address loneliness and focus on building significant bonds with those around us.

The growing scientific evidence highlighting the negative consequences of loneliness for physical and mental health can no longer be ignored.

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http://www.eurekalert.org/pub_releases/2015-11/ntu-nsu110915.php

NTU scientists use dead bacteria to kill colorectal cancer

Scientists from Nanyang Technological University (NTU Singapore) have successfully used dead bacteria to kill colorectal cancer cells.

Harvesting the Clostridium sporogenes bacteria found commonly in soil, the NTU team was able to harness the bacteria in its dead form, and its secretions, to destroy colon tumours cells effectively.

Colorectal cancer is the number one cancer in Singapore and the foremost cancer amongst males as stated by Singapore's Health Promotion Board. It is also the third most common cancer in the world, with about 1.4 million new cases annually, estimated by the World Cancer Research Fund International.

Led by NTU Professor Teoh Swee Hin, this study was published last month in the peer-reviewed journal, Scientific Reports, under the prestigious Nature publishing group.

Traditional cancer treatments like chemotherapy and radiotherapy do not work well in the colon due to reduced blood flow and the lack of oxygen and nutrient flow in the tumour environment. This is because such therapies rely on oxygen molecules to damage the DNA of cancer cells and blood flow to transport therapeutic drugs to the tumour.

In contrast, the NTU team showed that dead C. sporogenes bacteria can kill tumour cells in an oxygen-starved tumour microenvironment.

Prof Teoh, who is Chair of NTU's School of Chemical and Biomedical Engineering said this discovery opens new doors for the treatment of colon cancer as bacteria therapy is recently gaining interest as an alternative to traditional treatments.

"We found that even when the C. sporogenes bacteria is dead, its natural toxicity continues to kill cancer cells, unlike the conventional chemotherapy drugs which need oxygen to work," explained Prof Teoh.

"While other research groups have experimented with bacteria therapy to destroy cancer cells, the biggest problem is that live bacteria will grow and proliferate, posing a high risk of infection and increased toxicity to patients.

"In the NTU study, as the bacteria were already killed by heat, there was no risk of the bacteria multiplying and causing more harm than the desired dose meant to kill colorectal cancer cells."

The NTU team conducted experiments in 3D cell culture which were artificially-created environments, resembling the inside of a human body, unlike most lab experiments which are done on a flat surface in a petri-dish.

In a 72-hour experiment, the inactive bacteria were able to reduce the growth of colon tumour cells by 74 per cent. In addition, the team tested the secretions harvested from a live bacteria culture and these secretions reduced growth of colon tumour cells by as much as 83 per cent.

Professor James Best, Dean of NTU's Lee Kong Chian School of Medicine, said: "This is a significant discovery that potentially opens a new avenue to tackle this very common cancer, which is difficult to treat after it has spread. While it is early days, this exciting research finding provides hope of a new treatment option for millions of people affected by bowel cancer each year."

Moving forward, the NTU team is looking to study the specific components of the bacteria which help to kill tumour cells and to develop them into usable therapy such as cancer drugs.

http://www.eurekalert.org/pub_releases/2015-11/uoq-tal110915.php

Temporary ambulance locations reduces response times and may save lives

Ambulances deployed at temporary locations that can be changed depending on the time of day and accident statistics can reduce response time and may save lives on the way to the hospital.

Researchers at Sahlgrenska University studied fluid deployment of ambulances in Shiraz, Iran.

While there is no doubt that rapid commencement of care saves lives, Emergency Medical Services are struggling to meet the predesignated response time, world-wide.

Compared ambulance services

Researchers at the Prehospital and Disaster Medicine Center in Gothenburg and the Shiraz University of Medical Sciences examined ambulance services in the Iranian city of Shiraz. Published in the International Journal of Emergency Medicine, the study compared ambulances deployed at temporary locations during peak traffic hours with those at permanent stations.

"Fluid deployment reduced response time by an average of two minutes," says Amir Khorram-Manesh, MD, PhD, at Sahlgrenska University. "Patients transported in ambulances dispatched from temporary locations were also less likely to die."

80,000 ambulance dispatches

The research team looked at almost 80,000 ambulance dispatches in 2012-2013. The findings were confirmed by a follow-up prospective study in 2015.

Given that the 1.7 million Shiraz population is roughly equivalent to that of Greater Gothenburg, the results are readily applicable to Sweden.

"The selection of temporary locations should be based on a risk analysis and statistics of previous dispatches," Dr. Khorram-Manesh says.

Topic of discussion

Fluid deployment has been a previous topic of discussion in Gothenburg. A project conducted at Chalmers University of Technology in 2013 identified the importance of deploying ambulances in a more conscious manner and contributed calculations to the choice of the new station at Gullbergsvass in Gothenburg.

According to Per Örninge, Senior Consultant at Prehospital and Disaster Medicine Center, the Ambu-Alarm unit at the Prehospital and Disaster Medicine Center in Gothenburg has been working for a while on analyzing movement and deployment patterns.

Facts:

The average Swedish county has approximately 20 ambulances. Stockholm has approximately 50, while Västra Götaland has the most - approximately 80

(Source: SOS Alarm).

8 of the 24 ambulances in Shiraz were deployed at temporary locations during the study. Choice of the locations was based on statistical data showing areas with peak incidents, as well as the distance to the closest hospital. The other 16 ambulances were deployed at permanent stations throughout the city. A follow-up prospective study in 2015 confirmed the findings.

http://www.eurekalert.org/pub_releases/2015-11/yu-ddr110915.php

Diabetes drug reduces risk of heart failure and may prevent it, study shows

For the first time, research shows that a type 2 diabetes drug significantly reduces hospitalizations and death from heart failure.

New Haven, Conn.-- The findings, from a large clinical trial known as EMPA-REG OUTCOME, were presented by Yale professor of medicine and clinical chief of endocrinology, Dr. Silvio E. Inzucchi, at the 2015 American Heart Association (AHA) Scientific Session in Orlando, Florida on Nov. 9.

Many individuals with type 2 diabetes also have heart failure, a condition in which the heart fails to pump blood effectively. Treatment for heart failure is limited and prior efforts to treat patients with type 2 diabetes drugs showed no benefit for heart failure. But a new class of type 2 diabetes drugs (SGLT2 inhibitors) that reduce blood sugar by increasing its excretion in the urine had not been studied.

In the EMPA-REG trial, patients with type 2 diabetes and risk factors for heart disease were randomized to receive once-daily doses of either the glucose-lowering drug empagliflozin (10 mg or 25 mg doses), or a placebo. The drug or placebo was given in addition to standard care.

At the end of the trial period, investigators found that patients treated with the drug experienced reductions in blood sugar and blood pressure, as well as weight loss, compared to those on placebo. They also found major significant reductions in hospitalizations for heart failure (35%); the combined result for heart failure hospitalization or dying from heart disease (34%); and the combined result for being hospitalized or dying from heart failure (39%).

Additionally, Inzucchi and his colleagues analyzed outcomes for subgroups of patients who had heart failure at the beginning of the trial and those who did not. "We found that reductions in the hospitalization outcomes were similar between the two subgroups," he said. "So, one conclusion that could be proposed is that the drug not only appeared to prevent deterioration in patients who already had heart failure but also appeared to prevent that condition from developing in patients who never had it before."

The findings reported Nov. 9 at the AHA session amplify results first presented at the annual meeting of the European Association for the Study of Diabetes in September and published by The New England Journal of Medicine.

http://www.eurekalert.org/pub_releases/2015-11/bf-nsl110915.php

New study: Leading cause of blindness could be prevented or delayed

BrightFocus-funded research shows Parkinson's drug could be repurposed to save sight of millions

Clarksburg MD - In a major scientific breakthrough, a drug used to treat Parkinson's and related diseases may be able to delay or prevent macular degeneration, the most common form of blindness among older Americans.

The findings, published in the American Journal of Medicine, are a groundbreaking effort in the fight against age-related macular degeneration (AMD), which affects as many as 11 million Americans. AMD hinders central vision, and even when it does not lead to blindness it can severely reduce the ability to read, drive, and recognize faces.

In the study, supported in part by BrightFocus Foundation, researchers discovered a biological connection between darker pigmented eyes, which are known to be resistant to AMD, and increased levels of a chemical called L-DOPA in those eyes. Since L-DOPA is frequently prescribed for Parkinson's patients, the researchers wanted to know whether patients who received the drug L-DOPA as treatment for Parkinson's or other diseases were protected from AMD. By combing through massive databases of medical chart data, they reported that patients receiving L-DOPA were significantly less likely to get AMD, and when they did, its onset was significantly delayed.

"Rather than looking at what might cause AMD, we instead wondered why certain people are protected from AMD. This approach had never been done before," says senior author Brian McKay of the University of Arizona.

The research findings are based off an analysis of the medical records of 37,000 patients at the Marshfield Clinic in Wisconsin. Because the average age of those given L-DOPA is 67, while the average age of AMD diagnosis is 71, scientists were able to effectively track patterns. These major findings were then confirmed by reviewing a data set of 87 million patients. In this large scale data set, L-DOPA also delayed or prevented AMD from progressing to its "wet" form, the most devastating form of the disease.

"This exciting breakthrough shows the power of scientific discovery to give hope to millions of people across the nation and the world. Their methodology is a reminder that 'big data' is not a buzzword - it is a bold and innovative new approach to science," said BrightFocus president and CEO Stacy Pagos Haller.

The next steps for the team of scientists is to launch a clinical trial to further test the ability of this drug to prevent AMD. The title of their research paper is "Mining Retrospective Data for Virtual Prospective Drug Repurposing: L-DOPA and Age-related Macular Degeneration."

http://nyti.ms/1iYZ24e

Good Talks Needed to Combat HPV Vaccine Myth

Doctors' half-hearted promotion of some vaccines contributes to low immunization rate

Aaron E. Carroll

When people hear about vaccine deniers — anti-vaxxers, to some — they most often think about parents who are refusing to vaccinate their children. But there's another type of vaccine refusal, and it's important that we not ignore that. Doctors sometimes promote the use of some vaccines with less enthusiasm than others. Sometimes, they don't talk about them at all.

This occurs most often with the human papillomavirus, or HPV, vaccine. The low immunization rates with this vaccine, and the behaviors of the physicians who might be contributing to that, have consequences.

HPV is a sexually transmitted infection that is very, very common, so much so that almost all sexually active people will get at least one of more than 40 types at some point in their lives. The C.D.C. estimates that almost 80 million Americans are currently infected with HPV, and that about 14 million people will become newly infected this year.

Most people don't suffer any real negative health consequences. But some do. About 1 percent of those infected will have genital warts at any given moment. More important, about 17,500 women and 9,300 men will be affected by cancers that HPV causes each year. These include cervical, oropharyngeal, anal, vaginal and penile cancers.

This is preventable. The C.D.C. recommends that all children, boys and girls, begin receiving the first of three vaccinations when they are 11 or 12 years old. The reason we start that young is that it's important that children be immune well before they become sexually active. Once they are exposed to the virus through sexual activity, the vaccine may be less effective.

Let's also be clear. Regardless of what some presidential candidates say, the vaccine is safe. The scary emails and Internet horror stories you might have read can easily be explained away. The vaccine works, and it's not dangerous.

Our immunization rates for HPV fall far short of other vaccine rates. Last year, less than 42 percent of those ages 13 to 17 received at least one dose of the HPV vaccine. Fewer receive all three shots.

Even this rate of vaccination has made a difference, though. A study published two years ago in The Journal of Infectious Diseases examined the prevalence of HPV infections in girls and women both before and after the vaccine was introduced. Among those 14 to 19, the prevalence of HPV decreased from 11.5 percent before 2006 to 5.1 percent after. This drop could not be accounted for by changes in demographics or sexual activity.

The remarkable reduction in HPV prevalence occurs even though only about a third of girls 13 to 17 received all three doses of the vaccine in 2010. The C.D.C. director, Tom Frieden, estimated then that if we could increase the vaccination rate to 80 percent, far lower than we see with most other vaccines, we could prevent 50,000 cases of cervical cancer in women. He argued that every year we did not achieve this goal would result in an additional 4,400 women getting cervical cancer at some point in their lives.

Policy is partly to blame here. Although states pretty much mandate all childhood vaccines as necessary for entry into school, fewer focus on diseases affecting adolescents. However, all states and the District of Columbia require immunity to chickenpox; 47 states and D.C. require vaccination against hepatitis B; and 29 states and D.C. require it for meningococcus.

Only two states, Rhode Island and Virginia, and the District of Columbia require vaccination against HPV.

Parental and adolescent beliefs certainly come into play. Myths about the safety of the HPV vaccine persist despite overwhelming evidence that the immunization is safe.

Doctors bear responsibility here as well. A recent study by Melissa Gilkey, a behavioral scientist at Harvard Medical School, surveyed pediatricians and family physicians to examine their communication practices around vaccines. She found that more than a quarter of doctors didn't endorse the vaccine strongly. About a quarter did not make timely recommendations for girls, and almost 40 percent

didn't make timely recommendations for boys. Only half recommended same-day vaccinations, and almost 60 percent used a risk-based approach, recommending the vaccine more often to patients they thought were at higher risk of HPV infection, such as those more likely to be sexually active.

This is, of course, a problem. If a child is already sexually active, it may be too late to protect them.

Ms. Gilkey's prior work found that physicians felt that talking to patients about the HPV vaccine took significantly more time than for other vaccines, which may make them less likely to engage. Further, some physicians believe many parents don't think HPV vaccination is important for their 11- and 12-year-olds. While three-quarters of doctors reported perceiving parental support for the Tdap vaccine, for instance, only 13 percent believed parents supported the HPV vaccine. That's not the case. A study published last year in the journal Vaccine found that doctors underestimated how important vaccines were to parents and overestimated parental concerns about how many shots their children were getting. Other research shows that the most common reason for adolescents not to receive the HPV vaccine isn't parental refusal; it's a lack of physician recommendation.

Even if there are parental concerns, it's up to the physician to address them. One of the nation's pre-eminent experts in HPV vaccine behavioral research, Greg Zimet, has an office downstairs from me at Indiana University School of Medicine. His research has also found physician communication to be a significant predictor of HPV coverage.

A point that Mr. Zimet has made repeatedly, however, is that the number of behavioral studies of the HPV vaccine is far, far greater than for any other vaccine. There's something about this vaccine that causes people to behave differently when discussing, considering and administering it.

The elephant in the room is, of course, sex. This vaccine prevents a sexually transmitted infection, and there is a pervasive belief that when parents, or even doctors, give the vaccine, they may be condoning sexual activity in young adolescents.

This is, of course, not true. Many engage in sexual activity with or without the vaccine. We administer the immunization to protect them regardless. Moreover, research is abundant in this domain. A 2012 study published in JAMA Pediatrics found that girls perceived no less need for safer sexual behaviors after getting the HPV vaccine. A 2014 cohort study of more than 260,000 girls found that those who received the HPV vaccine were no more likely to get pregnant or to contract a non-HPV-related sexually transmitted infection than girls who were unvaccinated. This confirmed findings from a smaller cohort study from 2012.

The good news is that this is all fixable. Research consistently shows that doctors have a lot of influence on parents' decision making about HPV vaccination. They should just talk about it as they do with all other vaccinations in a straightforward, unambiguous way. As Ms. Gilkey told me, "Just by letting parents know that HPV vaccination is very important for all 11- and 12-year-olds, physicians and other vaccine providers can do a lot to overcome the barriers that have kept coverage low in the U.S."

http://bit.ly/1SNJD3D

How Language Evolved from Climate and Terrain

Try shouting words into the wind, what sounds make it through?

By Marissa Fessenden

Speech may come with its own version of terroir—like the rounded, vowel-rich Hawaiian language or the clipped, consonant-heavy speech of the Republic of Georgia. Much like terroir, these differences might have risen from variations in the landscape from where they originated, according to new research presented last week at the Acoustical Society of America Meeting.

The researchers examined over 600 languages for their structure, including usage of consonants, vowels, and syllables and correlated these factors with climate and landscape features like precipitation and ruggedness, Zoë Schlanger reports for *Newsweek*. They omitted data from languages where speakers have spread beyond a single region and thus complicate the picture—such as English, Mandarin Chinese and Spanish.

Based on this analysis, the researchers suggest that high frequencies like consonants are interrupted by foliage and higher temperatures. So tree-covered areas tend to foster languages with fewer consonants and more simple syllables. Similarly, consonants spoken in windy or mountainous regions are often lost in the noise.

These warm, foliage-dense rainforests likely clipped words with multiple consonants jammed together. "Where a simple, steady vowel sound like "e" or "a" can cut through thick foliage or the cacophony of wildlife, these consonant-heavy sounds tend to get scrambled," Angus Chen writes for *NPR*.

Altogether, climatic and ecological factors can explain about one-quarter of the variation in how consonant-rich a language is, reports Emily Underwood for *Science*.

Yet other factors could muddy the picture, linguist Tecumseh Fitch of the University of Vienna in Austria tells Chen. People who live close to each other tend to have similar, related languages regardless of terrain and climate.

Even so, scientists have identified similar patterns in birds, who have previously given us great insight into how our language works. City-dwelling birds have

actually changed the pitch of their song to compete with the din of cars and people. In a way, they speak a different dialect than their country cousins.

"Say you're a bird in a forest, and some guy's going 'Stree! Stree! Stree!' But because of the environment, what you hear is 'Ree! Ree! Ree!' " linguist Tecumseh Fitch tells Chen. "Well, because you're learning the song, you'll sing 'Ree! Ree! Ree!' "

A similar process could have shaped human languages over time. And perhaps it still does. Though noisy urban dwellings are still relatively new in our past, Maddieson tells *Newsweek*, *"c*ome back in a few more years." Perhaps the speech of city-dwellers will go the way of urban bird song.

http://www.bbc.com/news/science-environment-34765789

'Twice-baked' model for Moon's origin

A new model of the Moon's formation suggests it developed in two distinct stages, producing inner and outer layers with different compositions.

By Jonathan Webb Science reporter, BBC News

Beginning with a massive impact that left a disc of material swirling around the proto-Earth, it predicts how our satellite clumped together over time. By splitting this process into two phases, it is the first model to account for some crucial differences between Moon and Earth rocks. The work appears in Nature Geoscience.

Rich filling

In general, the Earth and Moon are remarkably alike in their mineral make-up. This has led scientists to propose that the smash-up that eventually spawned the Moon was caused by a Mars-sized interloper made of surprisingly similar stuff to Earth. But there are some noteworthy differences, which Moon origin models have struggled to account for.

"One of the key differences, that's been known since the Apollo sample return, is that the Moon is much more depleted in so-called volatile elements - those that vaporise easily as you heat up material," said Dr Robin Canup, the new study's lead author, from the Southwest Research Institute in Colorado, US.

"And the origin of this depletion has been essentially unknown."

These volatile elements, it is worth noting, are not things we think of as wet and wispy here on Earth; Dr Canup and her colleagues were looking primarily at metals like zinc, potassium and sodium - which are volatile in the context of Solar System formation.

To address the problem of the Moon's missing volatiles, Dr Canup's team added temperature and chemical models to a framework they had already developed for the physical dynamics of how the Moon assembled from the magma disc.

In the very first months and years after the collision, about half the Moon's mass was crunched into a ball at the fringe of the disc, which at that stage surrounded the fledgling Earth like Saturn's rings. Because this early material came from the edge of the rings, it was cool and contained a good mix of volatile elements.

But subsequently, the outer half of the Moon was formed by molten material slapping on to the expanding satellite from the inner portion of the disc.

This stuff, according to Dr Canup's new model, was too hot for volatile elements to condense with it. So the Moon's outer layers - where all the rocks we've sampled come from - ended up "volatile-poor". "What we find," she told the BBC, "is that the initial half of the Moon, say 50% of its mass, may well have retained its volatile species. But for the last half, as that material accreted on to the Moon, it was consistently too hot to contain the volatile species."

After accumulating these two layers, the model suggests that the Moon swung further away from the Earth. This is a key aspect of the findings, Dr Canup explained, because it locks the discrepancy in place.

"The Moon's orbit expands enough to turn off its accretion, before the inner disc gets cool enough for the volatiles to condense. "So by the time they do condense, they're scattered on to the Earth rather than swept up by the Moon."

Missing pieces

Dr Mahesh Anand, a planetary scientist at the Open University in the UK, said the research was "very elegant" and thorough, and offered an excellent match for some - but not all - measurements of lunar chemistry.

"It is a good way of explaining a Moon that is volatile depleted," he told BBC News. "But I also feel that you need a number of other processes to have affected these volatiles afterwards - before the Moon completely solidified - in order to reconcile all of the observations that we are making in the laboratory."

For example, Dr Anand said, there are discrepancies in the isotopes of zinc found in Earth and Moon rock, as well as the question of how much water there is - and was - on the Moon. "But until now, nobody had tried to build so many aspects into one model," he said.

In a commentary for Nature Geoscience, Prof Steve Desch from Arizona State University said this latest view of the Moon's origin was one of the most complete yet. "No other model of the Moon's formation is as comprehensive, or is as capable of making such detailed predictions about the Moon's composition," he wrote.

Prof Desch also compared the new Moon model to Chinese "mooncakes" or yue bing, traditionally baked for an Autumn festival. These cakes have a moist filling baked inside a dry pastry. Just like these cakes, he suggested, the Moon may have required a "two-step recipe".

http://www.bbc.com/news/health-34766361

Change in sense of humour 'a sign of impending dementia'

An increasingly warped sense of humour could be an early warning sign of impending dementia, say UK experts.

By Michelle Roberts Health editor, BBC News online

The University College London study involved patients with frontotemporal dementia, with the results appearing in the Journal of Alzheimer's Disease. Questionnaires from the friends and family of the 48 patients revealed many had noticed a change in humour years before the dementia had been diagnosed. This included laughing inappropriately at tragic events. Experts say more studies are now needed to understand how and when changes in humour could act as a red flag for dementia.

There are many different types of dementia and frontotemporal dementia is one of the rarer ones. The area of the brain it affects is involved with personality and behaviour, and people who develop this form of dementia can lose their inhibition, become more impulsive and struggle with social situations.

Dr Camilla Clark and colleagues recruited 48 patients from their dementia clinic at University College London. And they asked the friends or relatives of the patients to rate their loved one's liking for different kinds of comedy - slapstick comedy such as Mr Bean, satirical comedy such as Yes, Minister or absurdist comedy such as Monty Python - as well as any examples of inappropriate humour.

Nearly all of the respondents said, with hindsight, that they had noticed a shift in the nine years before the dementia had been diagnosed.

Many of the patients had developed a dark sense of humour - for example, laughing at tragic events in the news or in their personal lives. The dementia patients also tended to prefer slapstick to satirical humour, when compared with 21 healthy people of a similar age.

Dr Clark said: "These were marked changes - completely inappropriate humour well beyond the realms of even distasteful humour. For example, one man laughed when his wife badly scalded herself."

'More and more erratic'

Lee Pearce, from Sheffield, was not involved in the study, but he can relate to the findings. He first noticed a change in his mum's behaviour when she was 55, but it took four years before she received the correct diagnosis of frontotemporal dementia. "She'd always been very loving and family-focused but became increasingly uninvolved and emotionless," he says.

"As she had a history of depression, we put it down to that, and her doctor agreed.

"Mum's behaviour became more and more erratic, and we began to question the diagnosis. "She'd forget family birthdays, laugh if someone had an accident or she heard someone was unwell and was even sacked from her job - all completely out of character."

Dr Simon Ridley, of Alzheimer's Research UK, said anyone concerned about changes in their behaviour should speak to their GP. "While memory loss is often the first thing that springs to mind when we hear the word dementia, this study highlights the importance of looking at the myriad different symptoms that impact on daily life and relationships," he said. "A deeper understanding of the full range of dementia symptoms will increase our ability to make a timely and accurate diagnosis."

http://www.bbc.com/news/health-34764693

Fit legs equals fit brain, study suggests

Older women who have strong legs are likely to fare better when it comes to ageing of the brain, a decade-long study of more than 300 twins suggests.

The King's College London team says leg power is a useful marker of whether someone is getting enough exercise to help keep their mind in good shape. Exercise releases chemicals in the body that may boost elderly brains, say the scientists, in the journal Gerontology.

But they say more research is needed to prove their hunch. It is difficult to untangle leg strength from other lifestyle factors that may have an impact on brain health and the study did not look specifically at dementia, experts say.

Leg power

The researchers tracked the health of more than 150 pairs of twin sisters aged between 43 and 73 at the start of the study. Leg power was measured (at the start of the study) using a modified piece of gym equipment that measured both speed and power of leg extension, while brain power was measured (at both the start and the end of the study) using computerised tasks that tested memory and mental processing skills.

Generally, the twin who had more leg power at the start of the study sustained their cognition better and had fewer brain changes associated with ageing measured after 10 years. And the finding remained when other known lifestyle and health risk factors for dementia were included.

Lead researcher Dr Claire Steves said: "When it came to cognitive ageing, leg strength was the strongest factor that had an impact in our study. "Other factors such as heart health were also important, but the link with leg strength remained even after we accounted for these. "We think leg strength is a marker of the kind of physical activity that is good for your brain."

Alzheimer's Society director of research Dr Doug Brown said the findings added to the growing evidence that physical activity could help look after the brain as well as the body. "However, we still don't fully understand how this relationship

works and how we can maximise the benefit," he said. "And we have yet to see if the improvements in memory tests actually translate into a reduced risk of dementia."

Alzheimer's Research UK director of research Dr Simon Ridley said: "We know that keeping active generally can help reduce dementia risk, and it's important to take into account strength training as well as aerobic exercise."

http://www.eurekalert.org/pub_releases/2015-11/uonc-nsv111015.php

New SARS-like virus can jump directly from bats to humans, no treatment available

Findings provide an opportunity to develop drugs and vaccines for coronaviruses before they emerges from animals to cause a human epidemic

Researchers from the University of North Carolina at Chapel Hill have discovered a new bat SARS-like virus that can jump directly from its bat hosts to humans without mutation. However, researchers point out that if the SARS-like virus did jump, it is still unclear whether it could spread from human to human.

The discovery, reported in the Nov. 9 issue of Nature Medicine, is notable not only because there is no treatment for this newly discovered virus, but also because it highlights an ongoing debate over the government's decision to suspend all gain of function experiments on a variety of select agents earlier this year. The move has put a substantial standstill on the development of vaccines or treatments for these pathogens should there be an outbreak.

"Studies have predicted the existence of nearly 5,000 coronaviruses in bat populations and some of these have the potential to emerge as human pathogens," said senior author Ralph Baric, a faculty member at the Gillings School of Global Public Health and world-renowned expert in coronaviruses. "So this is not a situation of 'if 'there will be an outbreak of one of these coronaviruses but rather when and how prepared we'll be to address it."

SARS first jumped from animals to humans in 2002-2003 and caused a worldwide outbreak, resulting in 8,000 cases, including one case in Chapel Hill. With nearly 800 deaths during that outbreak, SARS-CoV presents much like flu symptoms but then can accelerate, compromise breathing and bring on a deadly form of pneumonia. The outbreak was controlled through public health interventions and the original virus was thought to have been extinct since 2004.

Baric and his team demonstrated that the newly-identified SARS-like virus, labeled SHC014-CoV and found in the Chinese horseshoe bats, can jump between bats and humans by showing that the virus can latch onto and use the same human and bat receptor for entry. The virus also replicates as well as SARS-CoV in primary human lung cells, the preferred target for infection.

"This virus is highly pathogenic and treatments developed against the original SARS virus in 2002 and the ZMapp drugs used to fight Ebola fail to neutralize and control this particular virus," said Baric. "So building resources, rather than limiting them, to both examine animal populations for new threats and develop therapeutics is key for limiting future outbreaks."

http://www.eurekalert.org/pub_releases/2015-11/indl-cbb111015.php

Coronavirus breakthrough by INRS researchers

Protein mutation affects spread and virulence of respiratory virus

Quebec researchers have discovered that a mutation in a coronavirus protein slows the spread of the virus in the central nervous system and reduces its neurovirulence. It is the first time that this phenomenon has been observed in the coronavirus family, which is responsible for one-third of common colds and is also suspected of being associated with the development or aggravation of neurological diseases such as multiple sclerosis, Alzheimer's disease, and encephalitis. The discovery, which has just been published in the prestigious journal PLoS Pathogens, was achieved in the Laboratory of Neuroimmunovirology at INRS-Institut Armand-Frappier.

In analyzing more than 60 human respiratory tract samples from patients infected by the human coronavirus, researchers discovered an important mutation in the S protein that modifies the virus capacity to infect nerve cells. The mutation is associated with the degree of viral virulence.

"We noticed that the protein mutation did not affect the virus's ability to infect the central nervous system, but that the mutated virus was less pathogenic and neurovirulent, probably as a result of changes in the way it spread from neuron to neuron due to the action of cellular proteins known as proprotein convertases, which alter the structure of the viral protein," explained lead researcher Professor Pierre Talbot. "Under these conditions, the coronavirus could more easily cause a persistent central nervous system infection. In virology, this phenomenon is known to trigger certain slow-developing neurological conditions or aggravate neurological diseases"

These results make it possible to better understand how persistent coronavirus infections take hold and may help prevent the development of associated neurological diseases in humans.

This research was conducted by first co-authors Alain Le Coupanec, doctoral candidate, and Marc Desforges, research associate, and by Mathieu Meessen-Pinard, doctoral candidate, and Mathieu Dubé, postdoctoral fellow, all from the INRS Laboratory of Neuroimmunovirology; Robert Day, professor at Université de Sherbrooke; Nabil Seidah, professor at IRCM; and Pierre Talbot, professor and director of the Laboratoiy of Neuroimmunovirology at INRS-Institut Armand-Frappier, and corresponding author. The

results of their work have been published in the journal PLoS Pathogens under the title "Cleavage of a neuroinvasive human respiratory virus spike glycoprotein by proprotein convertases modulates neurovirulence and virus spread within the central nervous system" (DOI: 10.1371/journal.ppat.1005261). The research was supported by grants from the Canadian Institutes of Health Research, a Senior Canada Research Chair held by Pierre Talbot, and fellowships from Fonds de recherche Québec - Santé and Fondation universitaire Armand-Frappier de l'INRS.

http://www.eurekalert.org/pub_releases/2015-11/cums-cmr110915.php

Computer model reveals deadly route of Ebola outbreak

New method maps 2014 outbreak in Sierra Leone, can be used in real-time for future disease outbreaks elsewhere

Using a novel statistical model, a research team led by Columbia University's Mailman School of Public Health mapped the spread of the 2014-2015 Ebola outbreak in Sierra Leone, providing the most detailed picture to date on how and where the disease spread and identifying two critical opportunities to control the epidemic. The result, published in the Journal of the Royal Society Interface, matches with details known about the early phase of the Ebola outbreak, suggesting the real-time value of the method to health authorities as they plan interventions to contain future outbreaks, and not just of Ebola.

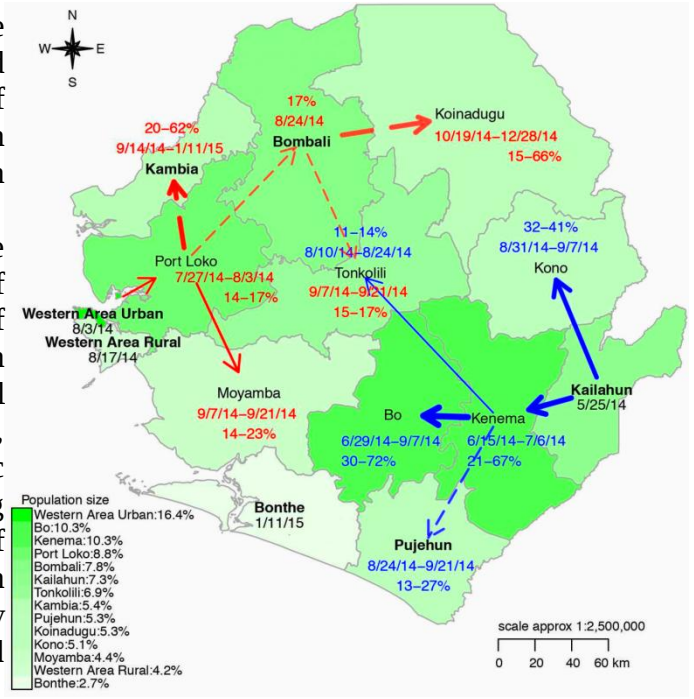
Their analysis uses data from the Sierra Leone Ministry of Health and Sanitation to chart the course of the Ebola outbreak, beginning with the arrival of the disease in the border district of Kailahun in late May 2014. By mid-June, Ebola spread west to nearby Kenema--a pathway consistent with a recent field investigation. At its peak, 67 percent of Ebola cases in Kenema were imported from Kailahun; by early July, the epidemic was firmly established in Kenema with most cases infected locally. From Kenema, the outbreak continued west, south, and north. Beginning in early July, a second path emerged in capital city, Freetown, spreading east to Port Loko by late July, then quickly east and south.

Because of their many connections to other districts, Kenema and Port Loko were critical junction points for the outbreak. At these points, windows of opportunity may have existed for controlling the spread of Ebola within Sierra Leone, the study suggests. The researchers estimate that first window, before Ebola reached Kenema, was approximately one month. The second window, before it reached Port Loko, was much shorter.

The method described in the paper uses three principal ingredients: the home district of the Ebola-positive patient, the population of that district, and geographic distance between districts--all information that was available during the outbreak.

"While this analysis is too late to be used for application to and intervention in the Ebola epidemic, the method we used could be useful for future disease outbreaks, and not just for Ebola," says Jeffrey Shaman, PhD, the study's senior author and associate professor of Environmental Health Sciences at the Mailman School.

"To be able to infer the spatial-temporal course of an outbreak and the rate of its spread between population centers in real time," Shaman continues, "may greatly aid public health planning, including the level and speed of deployment of intervention measures such as how many doctors and beds are needed and where to put them."



This graph shows the Ebola transmission network within Sierra Leone, inferred by the new method. The arrows denote the sources of infection, color-coded by different transmission paths. Transmission paths in red originated in Western Area Urban and those in blue originated in Kailahun. The width of the arrow is proportional to contribution from the source (percentage associated with the end of each arrow) during the dates indicated next to the percentages. A solid arrow indicates all 300 simulation runs inferred the same path; a dashed arrow indicates only a portion of runs inferred a particular path; the transparency of an arrow also indicates the level of agreement among all runs; greater transparency implies less consensus among runs. Districts labelled in bold are inferred as initial sources of infection by all runs (those attached to solid arrows or no arrows for districts with sporadic cases) or only a fraction of the 300 runs (those attached to dashed arrows). Districts are colored by their population sizes (indicated in the legend). **Columbia University Mailman School of Public Health**

The traditional method to track disease spread is contract tracing, in which health workers interview patients and everyone they came into contact with. "Contact tracing is highly labor intensive," says lead author Wan Yang, PhD, associate research scientist at the Mailman School. "Especially in resource-poor areas, an

epidemic like Ebola can easily outrun any such effort to track it. The minimal information needed in our method makes it a particularly valuable tool to aid public health efforts during a novel disease outbreak in these areas."

During the Ebola outbreak, there was a collapse of the healthcare system in Sierra Leone. Observational data were very limited and error-laden. "Having the ability to infer the course of the outbreak gives officials the ability to see what's happening rather than flying completely blind," Shaman says. "In a public health emergency, it's critical that they have as much information as possible so they can make informed decisions. "If you had perfect observation," Shaman adds, "you wouldn't need these methods, but you're never going to get that."

Previous work by Shaman and Yang has used computational methods to predict infectious disease spread. Beginning in the summer of 2014, they generated weekly estimates of countrywide Ebola incidence in Sierra Leone, Guinea, and Liberia. They also developed a prize-winning method to forecast seasonal influenza. Forecasts are available online at Columbia Prediction of Infectious Diseases.

Additional authors include co-first author Wenyi Zhang, Ruifu Yang, Yong Chen, Zeliang Chen, and Chao Liu of the China Mobile Laboratory Response Team for Ebola in Sierra Leone; David Kargbo, Abdul Kamara, and Brima Kargbo of the Sierra Leone Ministry of Health and Sanitation; Sasikiran Kandula of the Mailman School; and Alicia Karspeck of the National Center for Atmospheric Research.

The study was supported by grants from the National Institutes of Health (GM100467, GM110748, GM088558 and ES009089) and the Research and Policy for Infectious Disease Dynamics (RAPIDD) program of the Department of Homeland Security. Jeffrey Shaman discloses consulting for J. Walter Thompson and Axon Advisors, as well as partial ownership of SK Analytics.

http://www.eurekalert.org/pub_releases/2015-11/e-nvc111015.php

New vaccine could prevent high cholesterol

Vaccine is cheaper and appears to be more effective than alternative treatments

Amsterdam - A new cholesterol-lowering vaccine leads to reductions in 'bad' LDL cholesterol in mice and macaques, according to research published in Vaccine. The authors of the study, from the University of New Mexico and the National Institutes of health in the United States, say the vaccine has the potential to be a more powerful treatment than statins alone.

The body produces cholesterol to make vitamin D, some hormones and some of the molecules that help us digest food. Cholesterol is also found in foods. LDL cholesterol is a fat-like substance that circulates in the blood; if there is too much cholesterol, the arteries can become blocked, leading to heart disease and stroke.

According to the CDC, 73.5 million adults in the United States have high LDL cholesterol. Diet and exercise are key to keeping cholesterol down, but millions of people worldwide take statins to lower their cholesterol. Statins have some potentially serious side effects, such as muscle pain, an increased risk of diabetes and cognitive loss.

The new vaccine could provide an alternative to statins, by targeting a protein that controls cholesterol levels in the blood. A single vaccine has been shown to reduce cholesterol levels dramatically in mice and macaques, suggesting it could be an effective treatment in humans.

"One of the most exiting things about this new vaccine is it seems to be much more effective than statins alone," said Dr. Bryce Chackerian, one of the authors of the study from the University of New Mexico.

The new vaccine targets a protein called PCSK9, which regulates the cholesterol in the blood. The protein works by encouraging the body to break down receptors that cholesterol binds to when it's flushed out of the body. People who have a mutation in the protein often suffer from increased risk of heart disease, and people who do not produce the protein have a decreased risk. By targeting this protein, the vaccine can stop it from functioning, lowering the amount of cholesterol in the blood.

The researchers tested the vaccine in mice, which showed a reduced level of LDL cholesterol. They then tested it in a small group of macaques, along with statins, resulting in a dramatic decrease in cholesterol.

"Statins are still the most commonly prescribed medication for cholesterol. Although they are effective in many people, do have side effects and don't work for everyone," said Dr. Alan Remaley, one of the authors of the study from the National Heart, Lung and Blood Institute, National Institutes of Health. "The results of our vaccine were very striking, and suggest it could be a powerful new treatment for high cholesterol."

Several drug companies have been developing high cholesterol treatments that target PCSK9 - for example, Alirocumab and Evolocumab, which the FDA recently approved. Results have been positive, but their treatments, which use monoclonal antibodies, are prohibitively expensive; treatment costs upwards of $10,000 per year.

The new vaccine appears to be even more effective than these monoclonal antibody-based treatments, at a fraction of the cost. The researchers now plan to expand their studies in macaques and find commercial partners to move the technology forward.

"A cholesterol-lowering VLP vaccine that targets PCSK9" by Erin Crossey, Marcelo J.A. Amar, Maureen Sampson, Julianne Peabody, John T. Schiller, Bryce Chackerian and Alan T. Remaley (doi: 10.1016/j.vaccine.2015.09.044). The article appears in Vaccine, Volume 33 (October 2015), published by Elsevier.

http://www.medscape.com/viewarticle/854200

Off-Label Drug Use Linked to More Adverse Events

Off-label use of prescription drugs is associated with more adverse drug events (ADEs) in adults than on-label use

Diana Swift

The off-label use of prescription drugs is associated with more adverse drug events (ADEs) in adults than on-label use, especially when off-label indications are not backed by solid data, according to a study published online November 2 in *JAMA Internal Medicine*.

"This study is, to our knowledge, the first to systematically evaluate the association between off-label use of drugs and the risk for ADEs in an adult population," Tewodros Eguale, MD, PhD, an epidemiologist at McGill University, Montreal, Quebec, Canada, and associate professor in the School of Pharmacy at MCPHS University, Boston, Massachusetts, and colleagues write.

On the basis of their findings, Dr Eguale and colleagues suggest that "[c]aution should be exercised in prescribing drugs for off-label uses that lack strong scientific evidence."

The researchers used data from electronic health records from a community-based clinical information system to identify 46,021 adults (mean age, 58.2 years; 60.8% women) who received 151,305 prescribed drugs from primary care clinics in the province of Quebec from 2005 to 2009. The records documented treatment indications and outcomes.

Although the majority of the prescriptions (88.2%) were for approved use, 9.5% involved off-label use without strong supportive evidence, and 2.3% were off-label but had strong evidence to support the indication.

The authors identified 3484 ADEs in the cohort, for an overall ADE incidence rate of 13.2 per 10,000 person-months.

However, the ADE rate for off-label use was higher than for on-label use, at 19.7 per 10,000 person-months vs 12.5 per 10,000 person-months (adjusted hazard ratio [AHR], 1.44; 95% confidence interval [CI], 1.30 - 1.60).

When analyzed by strength of evidence supporting the off-label use, the researchers found that use unsupported by strong scientific evidence had a higher ADE rate, at 21.7 per 10,000 person-months (AHR, 1.54; 95% CI, 1.37 - 1.72), compared with on-label use. Off-label use indicated by solid scientific evidence had a rate of 13.2 per 10,000 person-months, which was virtually the same as its on-label counterpart (AHR, 1.10; 95% CI, 0.88 - 1.38).

The risk for adverse events rose with the number of prescription drugs individual patients used. In those receiving five to seven drugs, for example, the rate was 12.1 per 10,000 person-months (AHR, 3.23; 95% CI, 2.66 - 3.92). Those taking eight or more medications had a more than fivefold increased risk for ADEs compared with patients who used one or two drugs.

The most commonly reported ADEs related to drug classes targeting the gastrointestinal tract, as well as the nervous, respiratory, and musculoskeletal systems. ADEs associated with the most frequently used off-label drugs included the following: akathisia from taking gabapentin for neurogenic pain, agitation associated with amitriptyline hydrochloride for migraine, hallucinations with trazodone hydrochloride for insomnia, QT interval prolongation with the use of quetiapine fumarate for depression, and weight gain with olanzapine for depression.

The ADE risk was higher for drugs approved from 1981 to 1995, at 14.4 per 10,000 person-months (AHR, 1.62; 95% CI, 1.45 - 1.80). It was also greater for medications used by women (14.3 per 10,000 person-months; AHR, 1.17; 95% CI, 1.06 - 1.28) and cardiovascular drugs (15.9 per 10,000 person-months; AHR, 3.30; 95% CI, 2.67 - 4.08). Anti-infectives had the highest risk for adverse events (66.2 per 10,000 person-months; AHR, 6.33; 95% CI, 4.58 - 8.76), which was more than six times that of gastrointestinal drugs. Drugs approved after 1995 had ADE rates 55% higher than drugs approved before 1981 (AHR, 1.55; 95% CI, 1.39 - 1.73).

The authors note the potential for undocumented medication-related symptoms missed by physicians and unreported by patients. Furthermore, there was no measurement of the cost of ADEs, although the study estimated that the mean cost of treating an ADE in hospital would range from $759 to $1214.

"[P]hysicians and physician organizations should recognize the enormity of the problem and be active participants in the promotion of cautious prescribing of drugs for off-label uses lacking strong scientific evidence," Dr Eguale and colleagues write.

They conclude that well-designed electronic health records can ease problems relating to the postmarketing surveillance of drugs; "namely, the lack of an explicit link between prescribed drugs and their indication for use and the underreporting of ADEs."

They recommend that future records design incorporate such safety surveillance of indications and outcomes.

"Timely" and "Informative"

Calling the McGill study "particularly timely" in light of a federal judge's First Amendment–based decision in August 2015 ruling against the US Food and Drug Administration's restrictions on off-label drug promotion of a fish-oil supplement, two editorialists describe it as "the most extensive and informative study to evaluate the safety of off-label drug use in an adult population to date."

In an invited commentary, Chester B. Good, MD, MPH, and Walid F. Gellad, MD, MPH, from the Center for Health Equity Research and Promotion, Veterans Affairs Pittsburgh Healthcare System, Pittsburgh, Pennsylvania, point out that in 2001 to 2002, an estimated 21% of office-based prescriptions were off-label.

In addition, a 2003 Knight Ridder investigative news series documented ADEs in the off-label use of antipsychotics to treat behavioral issues in elderly patients with dementia, anticonvulsants to treat bipolar disorder, terbutaline for premature labor, and fluoxetine hydrochloride for pain.

Dr Good and Dr Gellad also note that France has passed a law to monitor off-label drug use and study the benefit–risk ratios of these uses in collaboration with the pharmaceutical industry.

However, in many clinical circumstances, off-label prescribing serves the patient's best interests, and such use may even be the standard of care.

"Digoxin is approved for rate control in atrial fibrillation, whereas use of metoprolol is off-label. However, metoprolol, but not digoxin, is first-line therapy for rate control in evidence-based clinical guidelines," they write.

But given that off-label prescribing can be inappropriate and harmful, they warn that the US Food and Drug Administration "and the courts must carefully consider [the study's] findings as they contemplate guidance that would relax regulations to permit promotion of drugs beyond their labeled indications."

The authors have disclosed no relevant financial relationships. Dr Good reported serving as an unpaid adviser to the FDA Drug Safety Oversight Board, and Dr Gellad reported serving as his alternate to this board.

http://www.scientificamerican.com/article/an-overreaction-to-food-allergies/

An Overreaction to Food Allergies

Many children are wrongly diagnosed with food allergies because of inaccurate tests

By Ellen Ruppel Shell | Oct 20, 2015

Just a few years ago a 15-month-old girl—her stomach, arms and legs swollen and her hands and feet crusted in weeping, yellow scales—was rushed to the emergency room at the University of Texas Southwestern Medical Center in Dallas. Laboratory tests indicated a host of nutrition problems.

The child's mother, during the previous year, had told doctors that standard infant formula seemed to provoke vomiting and a rash. The mother and her pediatrician assumed the girl was allergic to the formula and switched her to goat's milk. Symptoms persisted, though, and the baby was switched again, to coconut milk and rice syrup. At 13 months, the pediatrician noted yet another red, swollen rash and ordered an allergy test, the child's first. The test identified coconut as a so-called high-reaction class, and coconut milk was removed from her diet. Reduced to a diet of rice milk, the child's symptoms worsened.

In the ER, doctors determined the girl suffered from kwashiorkor, a nutritional disorder rarely seen in the developed world. She was fed intravenously and evaluated by a team that included pediatric allergist J. Andrew Bird, who used more sophisticated methods to test her response to coconut and cow's milk, wheat, soy, egg white, fish, shrimp, green beans and potatoes. To her mother's astonishment, the toddler showed no adverse reaction to any of them. After a few days of steady nourishment and a course of antibiotics to clear her skin of various infections, she was released from the hospital into a life free of food restrictions. (Her digestive upsets appeared to be caused by a variety of common ailments that would have almost certainly cleared on their own.)

The problem was not in the baby but in the tests. Common skin-prick tests, in which a person is scratched by a needle coated with proteins from a suspect food, produce signs of irritation 50 to 60 percent of the time even when the person is not actually allergic. “When you apply the wrong test, as was the case here, you end up with false positives,” says Bird, who co-authored a paper describing the Dallas case in 2013 in the journal Pediatrics. And you end up with a lot of people scared to eat foods that would do them no harm. Bird has said that he and a team of researchers found that 112 of 126 children who were diagnosed with multiple food allergies tolerated at least one of the foods they were cautioned might kill them.

Kari Nadeau, director of the Sean N. Parker Center for Allergy Research at Stanford University, says that many pediatricians and family physicians are not aware of these testing flaws. “When it comes to diagnosis, we've been in the same place for about 20 years,” she observes. To move forward, Nadeau and other researchers are developing more advanced and easily used methods.

Food allergies are real and can be deadly, but mistakenly slapping an allergy label on a patient can be a big problem as well. First, it does not solve the person's troubles. Second, a diagnosis of allergies comes with a high price: a few years ago Ruchi S. Gupta, a pediatric allergist affiliated with the Northwestern University Feinberg School of Medicine, estimated the annual cost of food allergy at nearly $25 billion, or roughly $4,184 per child, with some of that attributed to medical costs but even more to a decline in parents' work productivity.

There is a mental health price as well: children who believe they have a food allergy tend to report higher levels of stress and anxiety, as do their parents. Every sleepover, picnic and airplane ride comes fraught with worry that one's child is just a peanut away from an emergency room visit or worse. Parents and children must be ever armed with an injectable medicine that can stave off a severe allergic

reaction. The prospect of a lifetime of this vigilance can weigh heavily on parents, some of whom go so far as to buy peanut-sniffing dogs or to homeschool their children to protect them both from exposure to the offending food and from the stigmatization of the allergy itself.

Pediatric allergist John Lee, director of the Food Allergy Program at Boston Children's Hospital, has heard more than his share of horror stories. “Food allergies can be terribly isolating for a kid,” he says. “One parent told me his child was forced to sit all alone on a stage during lunch period. And siblings can feel resentful because in many cases parents don't feel they can take family vacations or even eat dinner in a restaurant.”

Diagnosing a food allergy usually begins with a patient history and the skin-prick test. If the scratch does not provoke a raised bump surrounded by a circle of red itchiness, the patient almost certainly is not allergic to the material. But positive tests can be harder to interpret because skin irritation does not necessarily reflect a true allergy, which is a hypersensitivity of the immune system that extends through the body. In a real allergy, immune components such as IgE antibodies in the blood are stimulated by an allergen. The antibody binds to immune cells called mast cells, which then triggers release of a cascade of chemicals that produce all kinds of inflammation and irritation. But levels of allergen-specific antibodies in the blood are quite low even in allergic people, so running a simple blood test is not an answer, either.

Most Common Food Allergies in Children

Based on self-reports of symptoms*

Peanuts	2.0%
Milk	1.7%
Shellfish	1.4%
Nuts from trees	1.0%
Eggs	0.8%
Fin fish	0.5%
Strawberries	0.4%
Wheat	0.4%
Soy	0.4%

*SURVEY OF 38,480 CHILDREN

The diagnostic “gold standard” for food allergy is a placebo-controlled test. A potential irritant is eaten, and the body's response (a rash, say, or swelling) is compared with what happens after eating something that looks like the irritant but is benign. For example, a patient who might be allergic to eggs is given a tiny amount of egg baked into a cake, along with a taste of egg-free cake. Ideally, the test is double-blind, meaning that neither the patient nor the allergist knows which cake contains egg. The accuracy rate of these tests, for both positive and negative results, is about 95 percent, according to Lee.

Unfortunately, this procedure is tricky, time-consuming, expensive and relatively uncommon; experts agree that few allergy sufferers have access to it.

James Baker, who is a physician and immunologist and CEO of the nonprofit Food Allergy Research & Education (FARE), says his organization is tackling this problem by setting up 40 centers around the country to administer food challenges with all the necessary precautions. “You have to be prepared to treat or transport people to the emergency room if they react,” he asserts.

Scientists are also looking for something easier to use. One promising newcomer to the diagnostic arsenal is the basophil-activation test (BAT). Basophils, a type of white blood cell, excrete histamines and other inflammatory chemicals in reaction to a perceived threat—such as an allergen. Nadeau and her colleagues have designed and patented a test that involves mixing just one drop of blood with the potential allergen and measuring the reaction in basophils. In pilot studies, the procedure diagnosed allergies with 95 percent accuracy in both children and adults, a rate similar to that of food-challenge tests.

BAT is still in the research phase and requires more studies with a larger, more varied population, but another approach—allergen-component testing—has already been approved by the U.S. Food and Drug Administration for peanut allergies. Lynda Schneider, a pediatric allergist and director of the Allergy Program at Boston Children's Hospital, says that some children have a mild sensitivity—but not a full-blown allergy—to one protein in peanuts. Rather than testing them with crude mixtures of lots of proteins found in nuts, Schneider's component tests isolate specific proteins and then challenge the patient with those. By sorting out which protein is prompting the negative reaction, physicians can determine with a high degree of accuracy whether the patient is truly allergic to peanuts.

Schneider wants to get beyond diagnosis and into treatment. Omalizumab is a monoclonal antibody that binds to IgE antibodies and prevents them from glomming on to mast cells, which triggers the allergic cascade. In a recent study, Schneider and her colleagues administered this so-called anti-IgE drug over the course of 20 weeks to 13 children who were known to have peanut allergies while giving them a gradually larger dose of peanuts. During the anti-IgE phase, none of the children developed an allergic reaction to peanuts, although two did have a recurrence once the anti-IgE regime ended. “The anti-IgE allowed their system to go through a desensitization process,” Schneider says.

Kids who are allergic to milk and eggs can be gradually desensitized by heating these foods for 30 minutes or so, Bird has found. The heat changes the shape of these proteins, which vastly reduces their tendency to provoke allergies. This is not a home remedy, and it is done under medical supervision, but studies of kids

who are fed small amounts of heated egg or milk show the children are far more likely to acquire a tolerance to these foods over time—that is, more likely to outgrow the allergy. A study called Learning Early About Peanut Allergy (LEAP) showed that exposing children to tiny amounts of peanut products early in their life dramatically reduced the incidence of allergy.

Scott H. Sicherer, a professor of pediatrics, allergy and immunology at the Icahn School of Medicine at Mount Sinai, takes the early desensitization idea a step further. He suggests children can best avoid food allergies if they eat a wide variety of foods at an early age, run in the open air and "play in the dirt." A little less protection from the world, he says, may be the best protection from allergies.

http://www.eurekalert.org/pub_releases/2015-11/hcfa-aet110615.php

Astronomers eager to get a whiff of newfound Venus-like planet

The collection of rocky planets orbiting distant stars has just grown by one, and the latest discovery is the most intriguing one to date.

The newfound world, although hot as an oven, is cool enough to potentially host an atmosphere. If it does, it's close enough (only 39 light-years away) that we could study that atmosphere in detail with the Hubble Space Telescope and future observatories like the Giant Magellan Telescope.

"Our ultimate goal is to find a twin Earth, but along the way we've found a twin Venus," says astronomer David Charbonneau of the Harvard-Smithsonian Center for Astrophysics (CfA). "We suspect it will have a Venus-like atmosphere too, and if it does we can't wait to get a whiff." "This planet is going to be a favorite target of astronomers for years to come," adds lead author Zachory Berta-Thompson of the Massachusetts Institute of Technology (MIT).

GJ 1132b, as the planet is known, orbits a red dwarf star only one-fifth the size of our Sun. The star is also cooler and much fainter than the Sun, emitting just 1/200th as much light. GJ 1132b circles its star every 1.6 days at a distance of 1.4 million miles (much closer than the 36-million-mile orbit of Mercury in our solar system).

As a result, GJ 1132b is baked to a temperature of about 450 degrees Fahrenheit. Such temperatures would boil off any water the planet may have once held, but still allows for the presence of an atmosphere. It is also significantly cooler than any other exoplanet confirmed to be rocky. In comparison, well-known worlds like CoRoT-7b and Kepler-10b possess scorching temperatures of 2,000 degrees F or more.

GJ 1132b was discovered by the MEarth-South array, which is dedicated to the hunt for terrestrial worlds orbiting red dwarf stars. MEarth-South consists of eight 40-cm robotic telescopes located at the Cerro-Tololo Inter-American Observatory in Chile.

MEarth-South monitors several thousand red dwarf stars located within 100 light-years of Earth. It looks for planets that transit, or cross in front of their host stars. When a planet transits its star, the star's light dims by a small but detectable amount. This dimming gives an indication of the planet's physical size.

After MEarth-South detected a transit in real time, additional observations were gathered by the array and the Magellan Clay telescope in Chile. The team also measured the host star's gravitational wobble using the HARPS spectrograph to determine the planet's mass.

They found that GJ 1132b is 16 percent larger than Earth, with a diameter of about 9,200 miles. It has a mass 60 percent greater than Earth. The resulting density indicates that the planet has a rocky composition similar to Earth.

The planet also has an Earth-like force of gravity. A person standing on the surface of GJ 1132b would weigh only about 20 percent more than they do on Earth.

Since the red dwarf star is small, the relative size of the planet to the star is larger than it would be for a Sun-like star. This, combined with the star's close distance, makes it easier to detect and study any planetary atmosphere, should one exist. The team has requested follow-up observations with the Hubble and Spitzer Space Telescopes. Future observatories like the James Webb Space Telescope also will undoubtedly take a close look at GJ 1132b.

A final intriguing possibility is that GJ 1132b has sister planets that have not yet been detected. The research team plans to examine this system closely for signs of siblings.

http://www.eurekalert.org/pub_releases/2015-11/m-sls111015.php

So long, stethoscope? New device and iPhone alter exams

Doctors develop device, app to conduct safer, more thorough exams with smartphones

The iconic stethoscope we've become accustomed to seeing draped around the necks of doctors and healthcare providers may someday be replaced by smartphones and a new portable device, called HeartBuds, that is slightly larger than a quarter.

"They not only detect sounds inside the body just as well - or better - than traditional stethoscopes, but they are more sanitary," said David Bello, MD, department chief of cardiology at Orlando Health, and developer of HeartBuds. "And because they incorporate smartphone technology, we can now record, store and share those sounds as well. This could change the way we approach patient exams in the future."

The stethoscope was invented in 1816 by French physician René La?nnec, and has essentially been unchanged since. But on the eve of its 200th anniversary, the

emergence of this new technology could mark the beginning of the end for this medical mainstay.

With HeartBuds, doctors use a small, portable plastic listening device shaped much like the head of a traditional stethoscope. Instead of being attached to a Y-shaped tube that feeds into the doctor's ears, however, this device is plugged into a smartphone.

When the app is activated, sounds from the hand-held device can be played through the smartphone speaker and images appear on the screen showing rhythmic blips that correspond with each sound. Until now, only those wearing the stethoscope could hear what was taking place inside the body, but with this technology health care providers can control the volume, listen to and discuss sounds with patients in real time, and record various sounds for future reference.

"The technology is great, but we wanted to see how our device actually fared against more traditional stethoscopes," said Julio Schwarz, a cardiologist at University of Florida Health who co-authored a recent clinical trial conducted at Orlando Health. "So we put them to the test."

The findings of the study, comparing the effectiveness of HeartBuds to three other stethoscope models, were presented in November at The American Heart Association's 2015 Scientific Sessions held in Orlando, Florida.

In all, doctors examined 50 patients and compared the performance of HeartBuds to two FDA-approved class I and class II stethoscopes, as well as a commonly used disposable model.

Results of the study showed that the HeartBuds smartphone-based device performed just as well as the more expensive and more commonly used class I and class II stethoscopes in detecting heart murmurs and carotid bruits, which are sounds in the neck that indicate moderate to severe blockage of the carotid artery.

However, experts found that the disposable stethoscope model they tested missed the presence of heart murmurs 43 percent of the time, and missed carotid bruits up to 75 percent of the time.

"That's very disconcerting," said Valerie Danesh, RN, PH.D, the research and clinical grants manager at Orlando Health and study author. "Many facilities have started using disposable models after several studies, particularly overseas, showed there can be a 30 to 40 percent potential risk for transmitting harmful bacteria through stethoscopes," she said. "These findings may cause some to reconsider that practice."

When they're not using disposable models, health care providers traditionally use the same, higher-quality, higher-priced stethoscope on dozens of patients every day, potentially hundreds of patients per week. Despite their best efforts to keep the head of the stethoscope clean, it's in the stethoscope's earpieces that bacteria often gathers and has the potential to be transmitted to patients.

"Because the HeartBuds device doesn't have earpieces, we no longer have to worry about that," said Arnold Einhorn, MD, cardiologist and co-medical director of Orlando Health Heart Institute and HeartBuds developer. "This device is much less expensive to produce and offers a safer alternative to both traditional and disposable models without sacrificing sound quality," Einhorn said.

Beyond patient exams, HeartBuds is proving to have other applications as well. "I'm involved in training many medical students and residents," said Schwarz. "Being able to listen to sounds with them, in real time, provides me with an invaluable teaching tool."

They can also be used at home. Athletes use HeartBuds to track their condition and performance, and pregnant women have recorded sounds of their babies from inside the womb and shared them with friends and family all over the world.

"Though trained health care providers are the only ones who can use HeartBuds as a diagnostic tool, they do have many other uses," said Bello. Patients with chronic illnesses like COPD and heart failure, for example, can use them to monitor their conditions at home. "They can take a recording of their heart and lungs at home, upload them and send them to their doctor, who can evaluate them without the patient ever leaving home if it's not necessary," said Bello. "Really, the possibilities are endless and the future of this technology is just now coming into view."

http://www.eurekalert.org/pub_releases/2015-11/uds-ano103015.php

A network of artificial neurons learns to use human language

A computer simulation of a cognitive model entirely made up of artificial neurons learns to communicate through dialogue starting from a state of tabula rasa

A group of researchers from the University of Sassari (Italy) and the University of Plymouth (UK) has developed a cognitive model, made up of two million interconnected artificial neurons, able to learn to communicate using human language starting from a state of "tabula rasa", only through communication with a human interlocutor. The model is called ANNABELL (Artificial Neural Network with Adaptive Behavior Exploited for Language Learning) and it is described in an article published in the international scientific journal PLOS ONE. This research sheds light on the neural processes that underlie the development of language.

How does our brain develop the ability to perform complex cognitive functions, such as those needed for language and reasoning? This is a question that certainly we are all asking ourselves, to which the researchers are not yet able to give a

complete answer. We know that in the human brain there are about one hundred billion neurons that communicate by means of electrical signals. We learned a lot about the mechanisms of production and transmission of electrical signals among neurons. There are also experimental techniques, such as functional magnetic resonance imaging, which allow us to understand which parts of the brain are most active when we are involved in different cognitive activities. But a detailed knowledge of how a single neuron works and what are the functions of the various parts of the brain is not enough to give an answer to the initial question.

We might think that the brain works in a similar way to a computer: after all, even computers work through electrical signals. In fact, many researchers have proposed models based on the analogy brain-is-like-a-computer since the late '60s. However, apart from the structural differences, there are profound differences between the brain and a computer, especially in learning and information processing mechanisms. Computers work through programs developed by human programmers. In these programs there are coded rules that the computer must follow in handling the information to perform a given task. However there is no evidence of the existence of such programs in our brain. In fact, today many researchers believed that our brain is able to develop higher cognitive skills simply by interacting with the environment, starting from very little innate knowledge. The ANNABELL model appears to confirm this perspective.

ANNABELL does not have pre-coded language knowledge; it learns only through communication with a human interlocutor, thanks to two fundamental mechanisms, which are also present in the biological brain: synaptic plasticity and neural gating. Synaptic plasticity is the ability of the connection between two neurons to increase its efficiency when the two neurons are often active simultaneously, or nearly simultaneously. This mechanism is essential for learning and for long-term memory. Neural gating mechanisms are based on the properties of certain neurons (called bistable neurons) to behave as switches that can be turned "on" or "off" by a control signal coming from other neurons. When turned on, the bistable neurons transmit the signal from a part of the brain to another, otherwise they block it. The model is able to learn, due to synaptic plasticity, to control the signals that open and close the neural gates, so as to control the flow of information among different areas.

The cognitive model has been validated using a database of about 1500 input sentences, based on literature on early language development, and has responded by producing a total of about 500 sentences in output, containing nouns, verbs, adjectives, pronouns, and other word classes, demonstrating the ability to express a wide range of capabilities in human language processing.

http://dx.plos.org/10.1371/journal.pone.0140866

http://www.eurekalert.org/pub_releases/2015-11/si-edt111215.php

Experimental drug targeting Alzheimer's disease shows anti-aging effects

Salk team finds molecule that slows the clock on key aspects of aging in animals

LA JOLLA--Salk Institute researchers have found that an experimental drug candidate aimed at combating Alzheimer's disease has a host of unexpected anti-aging effects in animals.

The Salk team expanded upon their previous development of a drug candidate, called J147, which takes a different tack by targeting Alzheimer's major risk factor--old age. In the new work, the team showed that the drug candidate worked well in a mouse model of aging not typically used in Alzheimer's research. When these mice were treated with J147, they had better memory and cognition, healthier blood vessels in the brain and other improved physiological features, as detailed November 12, 2015 in the journal Aging.

"Initially, the impetus was to test this drug in a novel animal model that was more similar to 99 percent of Alzheimer's cases," says Antonio Currais, the lead author and a member of Professor David Schubert's Cellular Neurobiology Laboratory at Salk. "We did not predict we'd see this sort of anti-aging effect, but J147 made old mice look like they were young, based upon a number of physiological parameters."

Alzheimer's disease is a progressive brain disorder, recently ranked as the third leading cause of death in the United States and affecting more than five million Americans. It is also the most common cause of dementia in older adults, according to the National Institutes of Health.

"While most drugs developed in the past 20 years target the amyloid plaque deposits in the brain (which are a hallmark of the disease), none have proven effective in the clinic," says Schubert, senior author of the study.

Several years ago, Schubert and his colleagues began to approach the treatment of the disease from a new angle. Rather than target amyloid, the lab decided to zero in on the major risk factor for the disease--old age. Using cell-based screens against old age-associated brain toxicities, they synthesized J147.

Previously, the team found that J147 could prevent and even reverse memory loss and Alzheimer's pathology in mice that have a version of the inherited form of Alzheimer's, the most commonly used mouse model. However, this form of the disease comprises only about 1 percent of Alzheimer's cases. For everyone else, old age is the primary risk factor, says Schubert. The team wanted to explore the

effects of the drug candidate on a breed of mice that age rapidly and experience a version of dementia that more closely resembles the age-related human disorder.

In this latest work, the researchers used a comprehensive set of assays to measure the expression of all genes in the brain, as well as over 500 small molecules involved with metabolism in the brains and blood of three groups of the rapidly aging mice. The three groups of rapidly aging mice included one set that was young, one set that was old and one set that was old but fed J147 as they aged.

The old mice that received J147 performed better on memory and other tests for cognition and also displayed more robust motor movements. The mice treated with J147 also had fewer pathological signs of Alzheimer's in their brains. Importantly, because of the large amount of data collected on the three groups of mice, it was possible to demonstrate that many aspects of gene expression and metabolism in the old mice fed J147 were very similar to those of the young animals. These included markers for increased energy metabolism, reduced brain inflammation and reduced levels of oxidized fatty acids in the brain.

Another notable effect was that J147 prevented the leakage of blood from the microvessels in the brains of old mice. "Damaged blood vessels are a common feature of aging in general, and in Alzheimer's, it is frequently much worse," says Currais.

Currais and Schubert note that while these studies represent a new and exciting approach to Alzheimer's drug discovery and animal testing in the context of aging, the only way to demonstrate the clinical relevance of the work is to move J147 into human clinical trials for Alzheimer's disease. "If proven safe and effective for Alzheimer's, the apparent anti-aging effect of J147 would be a welcome benefit," adds Schubert. The team aims to begin human trials next year.

Other authors on the paper include Oswald Quehenberger of the University of California, San Diego; and Joshua Goldberg, Catherine Farrokhi, Max Chang, Marguerite Prior, Richard Dargusch, Daniel Daugherty and Pamela Maher of the Salk Institute.

This study was supported by the Salk Institute Pioneer Fund Postdoctoral Scholar Award and the Salk Nomis Fellowship Award, fellowships from the Hewitt Foundation and Bundy Foundation, and grants from the Burns Foundation and NIH.

http://www.eurekalert.org/pub_releases/2015-11/cu-ced111215.php

Cornell engineers develop 'killer cells' to destroy cancer in lymph nodes

Cornell biomedical engineers have developed specialized white blood cells that seek out cancer cells in lymph nodes with only one purpose: destroy them

ITHACA, N.Y. - Cornell biomedical engineers have developed specialized white blood cells - dubbed "super natural killer cells" - that seek out cancer cells in lymph nodes with only one purpose: destroy them.

This breakthrough halts the onset of metastasis, according to a new Cornell study published this month in the journal Biomaterials.

"We want to see lymph node metastasis become a thing of the past," said Michael R. King, the Daljit S. and Elaine Sarkaria Professor of Biomedical Engineering and senior author of the paper, "Super Natural Killer Cells That Target Metastases in the Tumor Draining Lymph Nodes".

For tumor cells, the lymph nodes are a staging area and play a key role in advancing metastasis throughout the body.

In the study, the biomedical engineers killed the cancerous tumor cells within days, by injecting liposomes armed with TRAIL (Tumor necrosis factor Related Apoptosis-Inducing Ligand) that attach to "natural killer" cells -- a type of white blood cell -- residing in the lymph nodes.

King says these natural killer cells became the "super natural killer cells" that find the cancerous cells and induce apoptosis, where the cancer cells self-destruct and disintegrate, preventing the lymphatic spread of cancer any further.

"In our research, we use nanoparticles - the liposomes we have created with TRAIL protein - and attach them to natural killer cells, to create what we call 'super natural killer cells' and then these completely eliminate lymph node metastases in mice," said King.

In cancer progression, there are four stages. At stage I, the tumor is small and has yet to progress to the lymph nodes. In stages II and III, the tumors have grown and likely will have spread to the lymph nodes.

At the stage IV, the cancer has advanced from the lymph nodes to organs and other parts of the body.

Between 29 and 37 percent of patients with breast, colorectal and lung cancers are diagnosed with metastases in their tumor-draining lymph nodes - those lymph nodes that lie downstream from the tumor, and those patients are at a higher risk for distant-organ metastases and later-stage cancer diagnoses.

In January 2014, King and his colleagues published research that demonstrated by attaching the TRAIL protein to white blood cells, metastasizing cancer cells in the bloodstream were annihilated.

"So, now we have technology to eliminate bloodstream metastasis - our previous work - and also lymph node metastases," King said.

The study was funded by the nonprofit organization Lynda's Kause Inc., started by Lynda King, who died from cancer in July 2014. Lynda King is no relation to Michael King. The foundation funds metastatic cancer research and patient support, and Michael King's laboratory received the organization's first two research awards.

http://www.eurekalert.org/pub_releases/2015-11/uow-od111215.php

'Pale orange dot': Early Earth's haze may give clue to habitability elsewhere in space

An atmospheric haze around a faraway planet -- like the one which probably shrouded and cooled the young Earth -- could show that the world is potentially habitable, or even be a sign of life itself.

Astronomers often use the Earth as a proxy for hypothetical exoplanets in computer modeling to simulate what such worlds might be like and under what circumstances they might be hospitable to life. In new research from the University of Washington-based Virtual Planetary Laboratory, UW doctoral student Giada Arney and co-authors chose to study Earth in its Archean era, about 2 ½ billion years back, because it is, as Arney said, "the most alien planet we have geochemical data for."

The work builds on geological data from other researchers that suggests the early Earth was intermittently shrouded by an organic pale orange haze that came from light breaking down methane molecules in the atmosphere into more complex hydrocarbons, organic compounds of hydrogen and carbon.

"Hazy worlds seem common both in our solar system and in the population of exoplanets we've characterized so far," Arney said. "Thinking about Earth with a global haze allows us to put our home planet into the context of these other worlds, and in this case, the haze may even be a sign of life itself." Arney and co-authors will present their findings Nov. 11 at the American Astronomical Society's Division of Planetary Sciences conference in National Harbor, Maryland.

The researchers used photochemical, climate and radiation simulations to examine the early Earth shrouded by a "fractal" hydrocarbon haze, meaning that the imagined haze particles are not spherical, as used in many such simulations, but agglomerates of spherical particles, bunched together not unlike grapes, but smaller than a raindrop. A fractal haze, they found, would have significantly lowered the planetary surface temperature.

However, they also found the cooling would be partly countered by concentrations of greenhouse gases that tend to warm a planet. They saw that this combination would result in a moderate, possibly habitable average global temperature.

Such a haze, the researchers found, also would have absorbed ultraviolet light so well as to effectively shield the Archean Earth from deadly radiation before the rise of oxygen and the ozone layer, which now provides that protection. The haze was a benefit to just-evolving surface biospheres on Earth, as it could be to similar exoplanets.

The researchers also found that, based on the early Earth data, it's unlikely such a haze would be formed by abiotic, or nonliving means. So for exoplanets with Earthlike amounts of carbon dioxide in their atmospheres, Arney said, "organic haze might be a novel type of biosignature. However, we know these hazes can also form without life on worlds like Saturn's moon Titan, so we are working to come up with more ways to distinguish biological hazes from abiotic ones."

Co-author Shawn Domagal-Goldman of the NASA Goddard Space Flight Center in Greenbelt, Maryland, said, "Giada's work shows that the haze could have intertwined with life in more ways than we previously suspected."

Arney added that astronomers often think of Earthlike exoplanets as "pale blue dots" -- after a famous photo of Earth taken by the Voyager spacecraft -- "but with this haze, Earth would have been a 'pale orange dot.'"

The research was funded through the NASA Astrobiology Institute.

Arney's UW co-authors are Victoria Meadows, professor of astronomy and director of the Virtual Planetary Laboratory, and doctoral student Edward Schwieterman and postdoctoral researcher Benjamin Charnay. Other co-authors are Domagal-Goldman, Eric Wolf of the University of Colorado at Boulder and Mark Claire of the University of St. Andrews in the UK and Seattle's Blue Marble Space Institute of Science.

http://www.eurekalert.org/pub_releases/2015-11/aaft-med110915.php

Mass extinctions don't favor large vertebrates

A new study finds that, similar to the mass extinction that's underway now, the end-Devonian extinction resulted in the loss of most large-bodied vertebrates.

The results add support to the disputed Lilliput effect, which suggests a temporary size reduction in species occurs after mass extinction.

The Devonian mass extinction that occurred 359 million years ago is one of the most severe extinctions in history, resulting in the loss of more than 96% of species and the restructuring of whole ecosystems.

To gain more insights into patterns of survival and mortality, Lauren Sallan and Andrew Galimberti assembled a database of 1,120 body lengths for Devonian-Mississippian vertebrates.

They found that leading up to the mass extinction, vertebrates were consistently increasing in size; yet in the period following the extinction event, vertebrates consistently experienced reductions in body size.

Along with the dwarfing of surviving Devonian lineages, the reduced-size effect was found in news forms that evolved (e.g., ray-finned fishes and tetrapods), for the next 36 million years.

Large vertebrates tend to have lower reproductive rates and longer lifespans, which can make adaptation over a short period of time very difficult.

Thus, the authors suggest that the relatively fast reproductive rates and shorter lifespans of small vertebrates are major contributing factors to their success following mass extinction events. This research appears in the 13 November 2015 issue of Science.

http://bit.ly/1H20PkL

Origin of Earth's water traced back to the birth of our planet

Fragments of Earth's earliest rock, preserved unchanged deep in the mantle until they were coughed up by volcanic eruptions, suggest that our planet has had water from the very beginning.

If so, that raises the likelihood that water – one of the key prerequisites for life – could be native to other planets, too.

The origin of Earth's water has long been a mystery to planetary scientists, because the young sun would have burned hot enough to vaporise any ice that was present as dust coalesced to form our planet.

Scientists therefore assumed that newborn Earth must have formed from dry material and acquired its water through bombardment by objects from more distant, icy reaches of the solar system.

Geologists can track where water comes from within the solar system by studying the ratio of deuterium, also known as heavy hydrogen, to normal hydrogen in the water molecules, because different sources have different ratios.

To measure the ratios from early Earth's water, a team led by Lydia Hallis, a planetary scientist now at the University of Glasgow, UK, turned to volcanic basalt rocks on Baffin Island in the Canadian arctic. These rocks contain tiny glassy inclusions that appear to have been preserved deep in the mantle for about 4.5 billion years, making them almost as old as the planet itself.

The hydrogen in them originated from water molecules that were present very early in Earth's history. But we didn't know if they came from bombardment by meteorites soon after Earth's formation, or from the dust that formed the planet.

Rocky ratio

These early rocks contained surprisingly little deuterium: a ratio nearly 22 per cent less than in seawater today. This points to a source that's very deuterium-poor, says Hallis. That probably rules out bombardment by meteorites as the source of the water, since their hydrogen isotope ratio is usually higher than that found in the ancient inclusions, Hallis says. Instead, the ratio suggests that the water must have originated in the dust cloud from which the sun and planets originally condensed.

Recent theoretical studies have found that some water molecules could have clung tightly to the coalescing dust particles even in the hot conditions of Earth's formation, but Hallis's study is the first to provide firm factual evidence.

Some room for doubt remains because of the mixing in Hallis's ancient inclusions, says Horst Marschall, a geoscientist at Woods Hole Oceanographic Institution in Massachusetts.

But if Hallis is correct, then other planets in our solar system – and elsewhere in the galaxy – are likely to have formed with water present from the beginning. "That would make habitable worlds much more likely," says Marschall.

Journal reference: Science, DOI: 10.1126/science.aac4834

http://bit.ly/1MtE99N

Get Your Pickaxe and Spacecraft Ready, Space Mining Might be Legal Very Soon

The new Space Act would open up the potentially lucrative field of asteroid mining

By Danny Lewis

The United States Senate has given the go-ahead to space mining. Earlier this week, the Senate passed the U.S. Commercial Space Launch Competitiveness Act which, among other things, will make mining asteroids for profit officially legal.

Until now, space mining has been in a murky legal limbo. While the 1967 Outer Space Treaty doesn't explicitly say anything about mining asteroids for minerals, it does ban nations from owning any property in space.

Now, the Space Act defines clear regulations for how the growing commercial space industry can stake claim to whatever materials they might one day mine in deep space, Sarah Fecht writes for *Popular Science*.

"This bill provides the boost America's private space partners need as they lead the world into the future," Texas Representative Lamar Smith, who chairs the House Science, Space, and Technology Committee, said in a statement. "This bill will keep America at the forefront of aerospace technology, create jobs, reduce red tape, promote safety, and inspire the next generation of explorers."

At its core, the Space Act opens up a lot of opportunities for commercial spaceflight companies, a sector that has grown rapidly over the last 20 years. Under this bill, companies like Planetary Resources, SpaceX and Virgin Galactic will be able to own and sell most materials they mine in space. The Space Act also extends the "learning period" where new commercial space companies can test and operate their equipment without close scrutiny by the government, Eric Berger reports for *Ars Technica*.

"Many years from now, we will view this pivotal moment in time as a major step toward humanity becoming a multi-planetary species," Planetary Resources Co-Chairman Eric Anderson said in a statement. "This legislation establishes the same supportive framework that created the great economies of history, and it will foster the sustained development of space."

The Google-backed space mining company's president and chief engineer, Chris Lewicki, also praised the Senate's vote, comparing the Space Act to the Homestead Act of 1862, which distributed more than 400 million acres of land in the American West to miners, railroad companies and speculators.

The Space Act does implement some limits to what space miners can claim: While they can own anything they extract from an asteroid, for example, mining companies can't own the asteroid itself. The Senate also clarified that miners can only claim "abiotic" materials they find, meaning they will have to stick to minerals and elements—owning any form of alien life is off the table, Fecht reports.

The bill hasn't been signed into law yet, but it is expected to pass another round in the House of Representatives before being sent to President Obama. But while the Space Act may be popular with the U.S. government and businesses, handing out property rights to space miners might be seen as the U.S. claiming ownership over resources in space, K.G. Orphanides reports for Wired:

Handing out the right to exploit chunks of space to your citizens sounds very much like a claim of sovereignty, despite the Space Act's direct statement that "the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body."

As countries and companies around the world start eyeing the abundant resources locked in asteroids whizzing through our solar system, property rights in space might start getting tricky very soon.

http://www.bbc.com/news/health-34744858

Homeopathy 'could be blacklisted'

Ministers are considering whether homeopathy should be put on a blacklist of treatments GPs in England are banned from prescribing, the BBC has learned.

By James Gallagher Health editor, BBC News website

The controversial practice is based on the principle that "like cures like", but critics say patients are being given useless sugar pills. The Faculty of Homeopathy said patients supported the therapy. A consultation is expected to take place in 2016. The total NHS bill for homeopathy, including homeopathic hospitals and GP prescriptions, is thought to be about £4m.

How homeopathic pills are made

Homeopathy is based on the concept that diluting a version of a substance that causes illness has healing properties. So pollen or grass could be used to create a homeopathic hay-fever remedy.

One part of the substance is mixed with 99 parts of water or alcohol, and this is repeated six times in a "6c" formulation or 30 times in a "30c" formulation. The end result is combined with a lactose (sugar) tablet.

Homeopaths say the more diluted it is, the greater the effect. Critics say patients are getting nothing but sugar.

Common homeopathic treatments are for asthma, ear infections, hay-fever, depression, stress, anxiety, allergy and arthritis.

Source: British Homeopathic Association

But the NHS itself says: "There is no good-quality evidence that homeopathy is effective as a treatment for any health condition." The Good Thinking Society has been campaigning for homeopathy to be added to the NHS blacklist - known formally as Schedule 1 - of drugs that cannot be prescribed by GPs.

Drugs can be blacklisted if there are cheaper alternatives or if the medicine is not effective. After the Good Thinking Society threatened to take their case to the courts, Department of Health legal advisers replied in emails that ministers had "decided to conduct a consultation". Officials have now confirmed this will take place in 2016.

Debate

Simon Singh, the founder of the Good Thinking Society, said: "Given the finite resources of the NHS, any spending on homeopathy is utterly unjustifiable.

"The money spent on these disproven remedies can be far better spent on treatments that offer real benefits to patients."

But Dr Helen Beaumont, a GP and the president of the Faculty of Homeopathy, said other drugs such as SSRIs (selective serotonin reuptake inhibitors) for depression would be a better target for saving money, as homeopathic pills had a "profound effect" on patients. She told the BBC News website: "Patient choice is important; homeopathy works, it's widely used by doctors in Europe, and patients who are treated by homeopathy are really convinced of its benefits, as am I."

The result of the consultation would affect GP prescribing, but not homeopathic hospitals which account for the bulk of the NHS money spent on homeopathy.

Estimates suggest GP prescriptions account for about £110,000 per year. And any decision would not affect people buying the treatments over the counter or privately.

Health Secretary Jeremy Hunt was criticised for supporting a parliamentary motion on homeopathy, but in an interview last year argued "when resources are tight we have to follow the evidence".

Minister for Life Sciences, George Freeman, told the BBC: "With rising health demands, we have a duty to make sure we spend NHS funds on the most effective treatments.

"We are currently considering whether or not homeopathic products should continue to be available through NHS prescriptions.

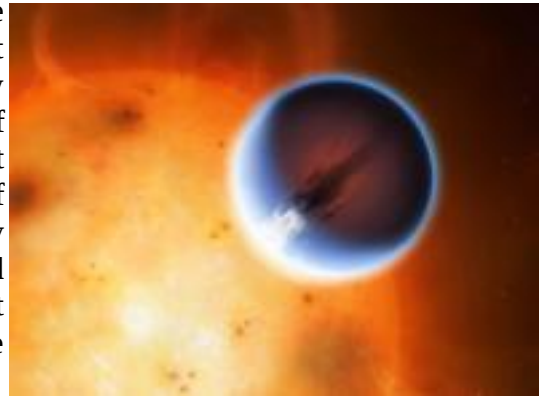
"We expect to consult on proposals in due course."

http://www.eurekalert.org/pub_releases/2015-11/uow-5wd111315.php

5400mph winds discovered hurtling around planet outside solar system

Research provides first ever weather map of a planet outside our solar system

Winds of over 2km per second have been discovered flowing around planet outside of the Earth's solar system, new research has found. The University of Warwick discovery is the first time that a weather system on a planet outside of Earth's solar system has been directly measured and mapped. The wind speed recorded is 20x greater than the fastest ever known on earth, where it would be seven times the speed of sound.



The planet HD 189733b is shown here in front of its parent star. A belt of wind around the equator of the planet travels at 5400mph from the heated day side to the night side. The day side of the planet appears blue due to scattering of light from silicate haze in the atmosphere. The night side of the planet glows a deep red due to its high temperature. **Mark A. Garlick/University of Warwick**

Commenting on the discovery lead researcher Tom Louden, of the University of Warwick's Astrophysics group, said: "This is the first ever weather map from outside of our solar system. Whilst we have previously known of wind on exoplanets, we have never before been able to directly measure and map a weather system."

Discovered on the exoplanet HD 189733b, the Warwick researchers measured the velocities on the two sides of HD 189733b and found a strong wing moving at over 5400mph blowing from its dayside to its night side. Mr Louden explains:

"HD 189733b's velocity was measured using high resolution spectroscopy of the Sodium absorption featured in its atmosphere. As parts of HD 189733b's atmosphere move towards or away from the Earth the Doppler effect changes the wavelength of this feature, which allows the velocity to be measured".

Explaining how this information was used to measure velocity Mr Louden says:

"The surface of the star is brighter at the centre than it is at the edge, so as the planet moves in front of the star the relative amount of light blocked by different parts of the atmosphere changes. For the first time we've used this information to measure the velocities on opposite sides of the planet independently, which gives us our velocity map."

The researchers say that the techniques used could help the study of Earth-like planets. Co-researcher, Dr Peter Wheatley of the University of Warwick's Astrophysics Group explains: "We are tremendously excited to have found a way to map weather systems on distant planets. As we develop the technique further we will be able to study wind flows in increasing detail and make weather maps of smaller planets. Ultimately this technique will allow us to image the weather systems on Earth-like planets. "

HD 189733b is one of the most studied of a class of planets known as 'Hot Jupiters'. At over 10% larger than Jupiter, but 180x closer to its star, HD 189733b has a temperature of 1800°C. Its size and relatively closeness to our solar system make it a popular target for astronomers. Past research has shown that the day side of the planet would appear a bright shade of blue to the human eye, probably due to clouds of silicate particles high in its atmosphere.

The data was collected by HARPS, the High Accuracy Radial velocity Planet Searcher, in La Silla, Chile.

The research, Spatially resolved eastward winds and rotation of HD 189733b, is published by The Astronomical Journal Letters.

http://nyti.ms/1X03EV8

Wary of Mainstream Medicine, Immigrants Seek Remedies From Home

Beyond the language barrier for Spanish-speaking patients, there is the perception that medical professionals frown upon herbal remedies

By RICHARD SCHIFFMAN NOV. 13, 2015

On a recent afternoon, Ina Vandebroek was poking around the shelves of La 21 Division Botanica on the Grand Concourse in the Bronx. Its narrow aisles were crammed with thousands of votive candles, herbal potions and brightly colored plaster statues of saints.

Dr. Vandebroek, a Belgian-born ethnobotanist, paused to gaze at herb-infused oils. The vials had names like Amor Prohibido (“Forbidden Love”), for those in search of adventure, and Conquistador, for the timid — both of them big sellers. Bendicion de Dinero Al Hogar (“A Blessing for Money in the House”), which comes in a spray, is also popular. But Dr. Vandebroek was not there to jump-start a flagging love life or curry the favor of spirits. La 21 Division is a regular stop for her, a mile or so from her laboratory at the New York Botanical Garden, where she is the assistant curator of economic botany.

She is conducting a multiyear study of the folk remedies sold in New York’s botanicas, more than 100 emporiums that offer products for all that ails the body, mind and soul to a clientele mainly consisting of Latino and Caribbean immigrants. She is compiling guides in English and Spanish describing the plants

and their uses. Her goal is to promote "culturally effective and sensitive health care" for a community that is chronically underserved by mainstream medicine.

"I came to NYC in 2005 and expected immigrants from the Caribbean to use very few plants for health care because most of the medicinal plants they know from their home countries don't grow here," she said in an email. Instead, she was amazed to find that Dominicans in New York, for example, use more than 200 plant species for medicinal purposes.

The guide, to be published next year by the Botanical Garden, will include precautions on potential side effects and toxicity. Dr. Vandebroek hopes that people will take the guide with them when they visit their doctors to help initiate a dialogue, and alert them to possible adverse interactions with pharmaceutical drugs.

Dr. Vandebroek has conducted field work in the Caribbean and consulted with local experts like Eliseo Trinidad, the owner of La 21 Division. Mr. Trinidad, 63, slim and youthful, attributed his health (and the fact that he does not have a single gray hair on his head) to his lifelong use of herbs. "People know a lot more about natural healing today than when I started the business 20 years ago," he said. "Our sales of plant products have tripled."

Mr. Trinidad, who was born in the Dominican Republic, pointed to packets containing dried herbs from Peru: There was horse tail (Equisetum giganteum) for bladder problems; palo de Brazil (Caesalpinia brasiliensis) for cleansing the kidney; and anamu (Petiveria alliacea) for fevers and arthritis. He said the botanica business is highly seasonal. With winter approaching, remedies containing bitter orange, lemongrass and guanabana, which are thought to ward off colds, are selling well.

In a narrow refrigerated room at the back of the shop, Dr. Vandebroek took down from a shelf a bag of plant stems with floppy banana-shaped leaves attached, flown in fresh from the Dominican Republic. "Insulina," she said, adding that the plant (Costus igneus), closely related to ginger, is used by people with diabetes to lower blood glucose levels. But does it work? One study involving rodents said yes; another study said no. And insulina has not yet been tested on human subjects. As with so many other plant-based medicines, questions remain about insulina's effectiveness.

Scientific uncertainty, however, need not depress sales: According to the World Health Organization, 80 percent of people in the developing world use medicinal plants as part of their own care.

"A lot of medical research still needs to be done," said Dr. Vandebroek, adding that until the 19th century, physicians were generally botanists as well. According to a 2012 study published by the National Institutes of Health, nearly half of all new drugs approved for use in the past 30 years were developed from natural sources, mainly plants.

Traditional knowledge of plants often fades as people move to cities. But the opposite is happening in New York's immigrant communities, where the latest wave of people from Mexico and Central America and Dominicans, Puerto Ricans and Jamaicans have been comparing notes on using herbs and foods as medicines.

"You go to a Latino grocery store," Dr. Vandebroek said, "and you overhear someone on the checkout line talking about, say, cucumber being good for hypertension."

But she added, "People are sometimes afraid to talk to doctors about their use of plants." Beyond the language barrier for Spanish-speaking patients, there is the perception that medical professionals frown upon herbal remedies.

Dr. Vandebroek asked botanica users if they believe there are conditions that doctors do not understand or cannot cure. Nearly 80 percent said yes. Caribbean therapies often target maladies that have no equivalents in conventional medical diagnosis, she said, like empacho (gastrointestinal blockage).

Dr. Vandebroek said many Dominicans believed that drugs merely hid the pain of disease but did not cure it. Herbs were thought to expel the root causes of illness.

Michele Dominguez, a 33-year-old Bronx resident who has worked at La 21 Division Botanica for five years, said many people came because of money problems. "They tell us, 'What can I use when I go to the casino?' We tell them, 'O.K., you can't just take an herb or burn a candle and get money. You need to pray, you need to cleanse your body, your spirit of negative auras, of anything that may be blocking you.'"

Eline Trinidad, a 32-year-old nurse from Orlando, Fla., who was visiting her family in the Bronx (and who is not related to the botanica's owner), has made such cleansing a part of her routine. When she is feeling stressed, she boils medicinal plants and bathes in the water.

Ms. Trinidad saw no contradiction between her use of herbs and her career in mainstream medicine. "I believe the two systems can work hand in hand," she said. "But not all doctors understand."

With the help of a $130,000 grant from the Cigna Foundation, the Botanical Garden offers training for doctors to help them better understand their patients' cultural beliefs. So far, 740 medical students and practicing physicians have gone to the garden's tropical conservatory to learn about medicinal plants and to participate in role-playing exercises. "It is all about promoting increased trust between health care providers and their patients," Dr. Vandebroek said.

Issues of trust and culture are not the only things that have made some immigrants leery of mainstream medicine. Doctors' visits are expensive, and herbs, selling for a few dollars a bag, are cheaper than prescription drugs.

According to a study by the Commonwealth Fund, 43 percent of Hispanics in the United States do not have a primary personal care physician or health provider. More than one-third lack health insurance, nearly double the rate for blacks and triple that for white Americans.

High costs and cultural differences have created a troubling disconnect between many Hispanics and the health care system. It is a rift that Dr. Roger Chirurgi, program director for the emergency medicine residency for the New York Medical College at Metropolitan Hospital Center in Manhattan, would like to heal. "There's a lot of people who we'll see at repeat visits, and they've never taken their medicine," Dr. Chirurgi said. "That's why I've been taking my residents to the Botanical Garden for the past three years, to try to become more culturally sensitive and to be able to break through that barrier."

Dr. Chirurgi now routinely asks patients if they are using herbals when he takes their medical history. He worries about the dangers of unregulated remedies that lack dosage guidelines and scientific evidence of their efficacy. "I want to make sure that they are safe, and don't interact with the drug that I am prescribing," he said. Still, he conceded that herbals may be helpful, if only as placebos. "If you believe that something will work," he said, "it may actually work in some cases."

http://www.medscape.com/viewarticle/853978

A Combo Therapy for Agitation in Alzheimer Disease

Efficacy of dextromethorphan hydrobromide/quinidine sulfate in reducing agitation in patients with probable Alzheimer's

Alan R. Jacobs, MD

This is the Medscape Neurology Minute. I'm Dr Alan Jacobs.

Researchers from the Cleveland Clinic have published a preliminary 10-week randomized trial assessing the efficacy of dextromethorphan hydrobromide/quinidine sulfate in reducing agitation in patients with probable Alzheimer disease. Of 220 total patients studied, 93 were assigned to dextromethorphan/quinidine and 127 were assigned to placebo. In a second stage, only those receiving placebo were rerandomized to drug or placebo.

88% of the patients completed the study. The results showed significantly reduced measures of agitation, including occurrence and severity of symptoms. Patients treated with only dextromethorphan/quinidine had an average of 51% reduction in the measure of agitation from baseline to week 10 compared with a 26% reduction in those treated only with placebo. The rate of adverse events was relatively low but included falls, diarrhea, and urinary tract infections. Dextromethorphan/quinidine was not associated with cognitive impairment or sedation.

The authors concluded that their preliminary findings require and warrant confirmation in additional trials with longer treatment duration.

This has been the Medscape Neurology Minute. I'm Dr Alan Jacobs.

References

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http://www.bbc.com/news/health-34798438

The hangover that led to the discovery of ibuprofen

Dr Stewart Adams knew he had found a potential new painkiller when it cured his hangover ahead of an important speech.

"I was first up to speak and I had a bit of a headache after a night out with friends. So I took a 600mg dose, just to be sure, and I found it was very effective."

Now 92, Dr Adams remembers the years of research, the endless testing of compounds and the many disappointments before he and his research team pinpointed ibuprofen as a drug with potential more than 50 years ago.

It has since become one of the world's most popular painkillers. No medicine cupboard in the modern home is complete without some ibuprofen.

Got a fever? Headache? Back pain? Toothache? Then ibuprofen is most likely to be the drug of choice because it's fast-acting and available over the counter.

Its popularity for treating aches and pains is not just a UK phenomenon however. In India, for example, it is the preferred treatment for fever and pain and in the US, it has been an over-the-counter drug since 1984. It is also used to treat inflammation in conditions like arthritis. And as Dr Adams himself discovered on a trip to Afghanistan in the 1970s, even remote village pharmacies along the Khyber Pass were selling his wonder drug. But, he says modestly, the discovery didn't change his life at all.

Search for a challenge

It all started with a 16-year-old boy from Northamptonshire, who'd left school with no clear plan for his future. He started an apprenticeship in retail pharmacy at Boots and the experience whetted Stewart Adams' appetite for a more challenging career. This led to a degree in pharmacy at Nottingham University followed by a PhD in pharmacology at Leeds University, before he returned to the research department at Boots Pure Drug Company Ltd in 1952.

His mission at that time was to find a new treatment for rheumatoid arthritis which was as effective as a steroid but without any of the side-effects. He started looking at anti-inflammatories and, in particular, the way aspirin worked, which

no-one else appeared to be doing. Aspirin was the first non-steroidal anti-inflammatory drug to be developed, in 1897. Although aspirin was commonly used as a painkiller at the time, it had to be given in very high doses so the risk of side-effects, such as an allergic reaction, bleeding and indigestion, was high. This meant that by the 1950s it was falling out of favour in the UK.

Ten years of research

In the search for an alternative, Dr Adams recruited chemist Dr John Nicholson and technician Colin Burrows to help him test the potency of more than 600 chemical compounds. The key was to find a drug that would be well tolerated.

From the front room of an old Victorian house in the suburbs of Nottingham, the small team patiently tested and re-tested compounds until they found something worth trying on patients in the clinic.

Dr Adams realised his chances of success were minimal but he and his staff persevered over 10 long years. "I did think we would succeed eventually - I always felt we would succeed." And he was always prepared to act as guinea pig, testing two or three compounds on himself. That would never be allowed now, he admits, but they were careful to carry out toxicity tests beforehand. "It was important to try them out and I was excited to be the first person to take a dose of ibuprofen," he remembers.

During that time, four drugs went to clinical trials and failed before, in 1961, they settled on one called 2-(4-isobutylphenyl) propionic acid, later to become ibuprofen. A patent for ibuprofen was granted to Boots in 1962 and it was approved as a prescription drug seven years later.

According to Dave McMillan, former head of healthcare development at Boots UK, ibuprofen was an extremely important drug to the company. "It saved Boots, helped it to expand into the US and all round the world. It was Boots' number one drug." An incredible 20,000 tonnes of ibuprofen are now made every year by a range of different companies under many different brand names. There are different forms of it too, including liquid forms specifically designed for children.

Dr Adams has been honoured for his research, with an honorary doctorate of science from the University of Nottingham, and two blue plaques from the Royal Society of Chemistry. He remained with Boots UK for the rest of his career, becoming head of pharmaceutical sciences. What he is most pleased about is that hundreds of millions of people worldwide are now taking the drug he discovered. It was a long road - but a very important one. And it all began with a sore head.

How does ibuprofen work?

It is a non-steroidal anti-inflammatory drug or (NSAID). Because it has a different chemical structure to steroids, it is not as toxic. It reduces pain by targeting compounds called prostaglandins which cause inflammation in the body.

Inflammation can bring on swelling, heat, redness, loss of function, fever and pain. The painkilling effect begins soon after a dose is taken, but it can take longer for the inflammation to reduce. Ibuprofen's success has been in treating minor aches and pains. NHS Choices says it should be taken at the lowest possible dose for the shortest possible time because it can cause side-effects such as nausea and vomiting.

TIMELINE FOR IBUPROFEN DISCOVERY

1950s - Work starts to find a drug to treat rheumatoid arthritis that has no side-effects

1958 - After hundreds of compounds are made and screened for activity, a compound called BTS 8402 is given a clinical trial but it is found to be no better than aspirin

1961 - A patent is filed for the compound 2-(4-isobutylphenyl) propionic acid - later called ibuprofen

1966 - Clinical trials of ibuprofen take place in Edinburgh and its anti-inflammatory effect is seen in patients

1969 - Ibuprofen is launched in the UK on prescription only

1983 - Ibuprofen becomes available over the counter because of its safety record