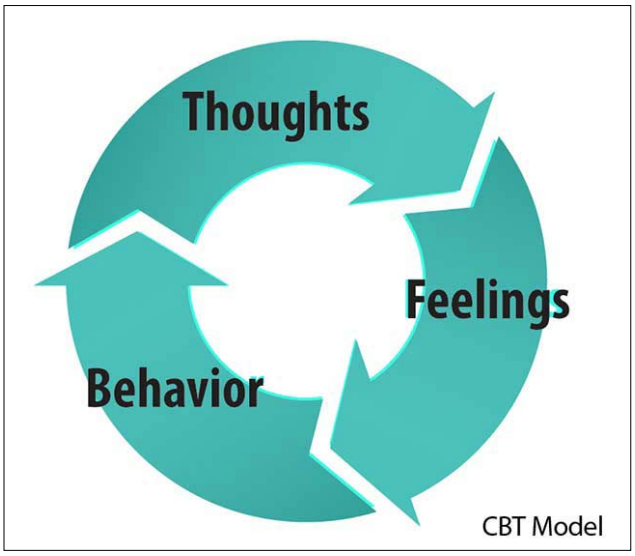
## Cognitive Therapy Likely to be Better than Behavioural Therapy for Severe Depression

A new therapy developed at The University of Manchester, UK is better at treating depression than cognitive-behavioural therapy. The study, published in *Frontiers in Psychology*, is the first full-scale randomized trial of metacognitive therapy (MCT), developed by Professor Adrian wells at Manchester, and compared with CBT.

In the trial conducted in Copenhagen, CBT led to 52% recovery at the end of treatment while MCT led to 74% of patients recovered. At a six-month follow-up, 56% of patients receiving CBT were recovered; the figure was 74% in those who received MCT. The findings could have major implications for the treatment of depression, which have remained unchanged for 40 years: only about 50% of people respond and a one-third recover at follow-up, according to published reviews.

Professor Wells said, "CBT has been the therapy of choice for many years in treating patients with major depression- with varying degrees of success. We don't know for sure why MCT might be more effective, but it is a method that has a solid scientific basis, grounded in the latest cognitive psychology. The focus of the two treatments is different: MCT aims to change basic mental regulation processes that have become biased, whilst CBT aims to modify thought content and is based much more on clinical observation."

The patients in the trial were allocated to receive



CBT Model

up to 24 sessions of CBT or 24 sessions of MCT; 174 patients were randomized to either CBT or MCT with 89 assigned to CBT and 85 assigned to MCT. Treatment was delivered face to face with trained clinical psychologists. The average number of sessions delivered was 6.7 for CBT and 5.5 for MCT. Professor Wells added, "MCT appears to give results more quickly so fewer sessions may be required. We do think MCT may be easier to use because it has a core set of principles that can be applied to many types of disorders and does not depend on the reality-testing of different negative thoughts."

## Nano-Propellers Likely to Deliver Drugs Directly into Individual Cells

Researchers at the Max Planck Institute for Intelligent Systems in Germany have developed powerful nanopropellers that can be steered into the interior of cells to deliver gene therapy. The magnets for these devices were created for the first time for this task.

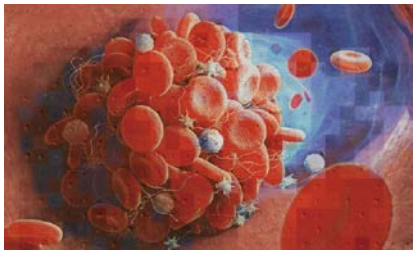
To overcome the powerful properties of magnets, the team created magnets using an iron platinum "L10" alloy that has magnetic properties than most powerful micromagnets (neodymium), yet are non-toxic and can be easily manufactured into tiny devices such as propellers. The team from the Max Planck Institute for Intelligent Systems partnered with scientists from the Francis Crick Institute and the Max Planck Institute for Medical Research to coat nanopropellers, made using the new magnets, with DNA that codes for the production of green fluorescent protein inside cells. The researchers then used a magnetic field to drive the propellers into lung carcinoma cells.

After some time, the carcinoma cells began to glow green, demonstrating that the technique has great potential for highly accurate delivery of gene therapy and even drugs into specific parts of the body. The researchers also believe that the new magnetic nanodevices can be used to deliver antibiotics at much lower doses and more precisely where needed, thereby reducing the chances of antibiotic resistance. Additionally, the team has tested the material for toxicity in living cells and believes that it produces little or no cytotoxicity.

## New Tool Helps Determine Cause of Blood Clots

A new tool using cutting-edge technology can distinguish different types of blood clots based on what caused them, according to a study published in *eLife*. The tool could help physicians diagnose what caused a blood clot and help them select a treatment that targets to break it up.

"Different types of blood clots are caused by different molecules, but they all look very similar," explains lead author Yuqi Zhou, a Ph.D. student at the Department of Chemistry, University of Tokyo, Japan. To develop a more effective approach to identifying different types of blood clots, Zhou and her colleagues took blood samples from a healthy individual and then exposed them to different clotting agents. The team captured thou-



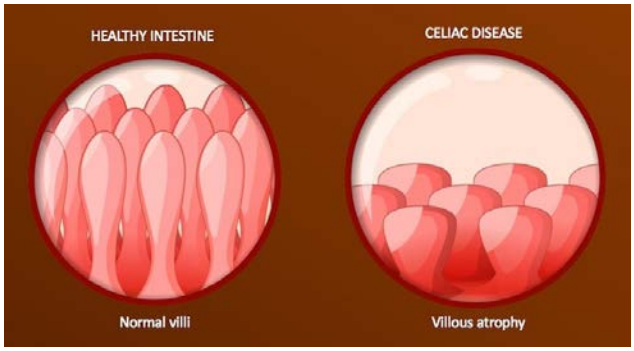
sands of images of the different types of clots using a technique called high-throughput imaging flow cytometry. They used convolutional neural network to train a computer to identify subtle differences in the shape of different types of clots caused by different molecules. They tested this tool on 25,000 clot images that the computer had never seen before and found it was also able to distinguish most of the clot types in the images. Finally, they tested whether this new tool, which they named the intelligent platelet aggregate classifier (iPAC), can diagnose different clot types in human blood samples. They took blood samples from four healthy people, exposed them to different clotting agents, and showed that iPAC could tell the different types of clots apart.

"We showed that iPAC is a powerful tool for studying the underlying mechanism of clot formation," Zhou says. "Using this new tool, we can uncover the characteristics of different types of clots that were previously unrecognized by humans, and enable the diagnosis of clots caused by combinations of clotting agents," says senior author Keisuke Goda, Professor at the Department of Chemistry, University of Tokyo.

## Increased Use of Common Chemical Pollutants Linked to Celiac Disease

Elevated blood levels of toxic chemicals found in pesticides, non-stick cookware, and fire retardants have been tied to an increased risk for celiac disease in young people, a new research shows. According to NYU Grossman School of Medicine, USA researchers who led the study, people with immune disorder have severe gut reactions, including diarrhoea and bloating, to foods containing gluten. The only treatment is a gluten-free diet, with no bread, pasta, or cake, says lead investigator and doctoral student Abigail Gaylord, MPH. The results of their study are published in the journal *Environmental Research*.

The NYU Langone team found that children and young adults with high blood levels of pesticides—and with high levels of pesticide-related chemicals




called dichlorodiphenyldichloroethylenes (DDEs) were twice as likely to be newly diagnosed with celiac disease as those without high levels. The study also found that gender differences existed for celiac disease related to toxic exposures. For females, higher-than-normal pesticide exposure meant they

were at least eight times more likely to become gluten intolerant. Young females with elevated levels of non-stick chemicals, such as perflouoroalkyls (PFAs) were five to nine times more likely to have celiac disease. Young males were twice as likely to be diagnosed with the disease if they had elevated blood levels of fire-retardant chemicals, polybrominated diphenyl ethers (PBDEs).

"Our study establishes the first measurable link between environmental exposure to toxic chemicals and celiac disease," says senior study investigator and pediatric gastroenterologist Jeremiah Levine, MD.

For the study, researchers analyzed levels of toxic chemicals in the blood of 30 children and young adults, ages 3 to 21, which were newly diagnosed with celiac disease at NYU Langone Hassenfeld Children's Hospital. Test results were compared with those from 60 other young people of similar age, gender, and race. People with genes HLA-DQ2 and HLA-DQ8 are known to be at greater risk of being diagnosed with celiac disease.

## Scientists Detect Throat Cancer with Saliva Test

A simple saliva test developed by Australian QUT biomedical scientists has detected early throat cancer in a person who had no symptom and clinical signs of cancer. World's first, non-invasive test picked up HPV-DNA in a saliva sample from an infected healthy person. "The series of saliva tests raised the alert and detected an early cancer before the person had any symptoms," said QUT Faculty of Health's Associate Professor Chamindie Punyadeera, who, with Dr. Kai Tang, developed the test. This enabled removal of the tonsil which had a 2mm cancer in it.

Professor Punyadeera said the discovery was made during an HPV-prevalence study which

included 665 healthy individuals. "To take the test, the person has to give a salivary oral rinse sample. When the test shows HPV-16 DNA, it is repeated and if the presence of HPV-16 is persistent over some time we would be suspicious that there may be underlying cancer. The person whom we reported in this study had been consistently HPV-16 DNA positive for 36 months, with a steadily rising count of HPV-16 DNA after testing at 6, 12, and 36 months. The patient was found to have a 2mm squamous cell carcinoma in the left tonsil, treated by tonsillectomy. This has given our patient a high chance of cure with treatment. Since the surgery, the patient has had no evidence of HPV-16 DNA in his saliva."

Professor Punyadeera said this was the first-ever case of a histological confirmed diagnosis of an asymptomatic, hidden throat cancer, diagnosed with a saliva screening test and that wider validation studies were required to confirm this finding. The presence of this pattern of elevated salivary HPV-DNA must be fully evaluated, as it may provide the critical marker for early cancer detection.

## Researchers Show a Different Approach to Snakebite Treatment

Snakebite victims in rural settings are greatly delayed in receiving treatment because existing anti-venom therapies have to be delivered in clinical settings due to their requirement to be given intravenously and because of their high risk of adverse reactions.

LSTM's Dr. Laura-Oana Albulescu and colleagues looked at various compounds that bind to metal ions as potential pre-hospital therapeutics for the treatment of snakebite. Among the tested compounds, dimercaprol and its derivative 2, 3-dimercapto-1-propanesulfonic acid (DMPS) were found to inhibit the in-vitro activity of snake venom enzymes that rely on zinc ions to function. Using animal models mimicking snakebite, the team demonstrated that DMPS protected against the lethal effects of venom from saw-scaled vipers. The

oral administration of DMPS also provided protection against venom, and its effect was further enhanced when used in combination with much later doses of conventional anti-venom.

The team's paper suggests that DMPS could be repurposed as an oral medicine for treating snakebite victims soon after a bite, and before they travel to a healthcare facility. While anti-venom may still be needed once the patient arrives at a clinical setting, early treatment with DMPS has the potential to save lives and limbs by removing treatment delays. Professor Nicholas Casewell said: "The advantages of using a compound like DMPS is that it is already a licensed medicine that has been proven to be safe and affordable. That it can effectively neutralize saw-scaled viper venoms in models of envenoming highlights the promise of this drug as an early, pre-hospital, therapeutic intervention for life-threatening bites by snakes like the saw-scaled viper." Lead author Dr. Laura-Oana Albulescu added "Because DMPS is an oral drug; it can be easily administered in the community by trained volunteers immediately after snakebite. This would be a tremendous advantage in helping to reduce the onset of pathology, as snakebite victims currently take many hours to reach a healthcare facility".

## Scientists Develop 'Sniff Test' To Predict Recovery of Unconsciousness Patients

Scientists have developed a simple and inexpensive test that can aid doctors in accurately diagnosing and determining treatment protocols that will accurately reflect the patients' degree of brain injury. According to findings published in the journal *Nature*, 100% of the unconscious, brain-injured patients who showed a response to a "sniff test" regained consciousness during the four-year study. They say this method works because the integrity of the olfactory system provides an accurate measure of overall brain integrity.

"Misdiagnosis can be critical. And if physicians deem a patient completely unconscious and insensitive, they may not prescribe painkillers for other injuries," says Dr. Anat Arzi, who led the research. The "consciousness test" developed by the researchers in

collaboration with Dr. Yaron Sacher, Head of the Department of Traumatic Brain Injury Rehabilitation at Loewenstein Rehabilitation Hospital, Israel is based on the understanding that our nasal airflow changes in response to odour.

The study was conducted with 43 brain-injured patients in the Loewenstein Rehabilitation Hospital. The researchers briefly placed tubes of various odorants under the patients' noses, some emitting a pleasant scent like shampoo, others an unpleasant smell of rotten fish, and for comparison, some with no odour at all. At the same time, the scientists precisely measured the volume of air inhaled through the nose as each odour was presented. This was repeated several times in random order, and over several sessions. "Surprisingly, all of the patients who were classified as being in a 'vegetative state,' responded to the sniff test, later regained consciousness, even if only minimally. In some cases, the result of the sniff test was the first sign that these patients were about to recover consciousness and this reaction was observed days, weeks, and even months prior to any other signs," says Arzi. The researchers found that the sniff response not only predicted who would regain consciousness, it also predicted with 92% accuracy who would survive for at least three years.

## Atrial Fibrillation Risk Can Be Reduced by Intensive Blood Pressure Control

Researchers have found that lowering systolic blood pressure to less than 120 resulted in a 26% lower risk of AFib compared to systolic blood pressure of less than 140. The study was published in the *American Heart Association journal Hypertension.*

"This is the first evidence from a randomized controlled trial that showed benefit in reducing the risk of atrial fibrillation as a result of aggressive blood pressure control to a target of less than 120 mm Hg," said the study's lead author, Elsayed Z. Soliman, M.D., professor of epidemiology and prevention at Wake Forest School of Medicine, part of Wake Forest Baptist Health, USA. This analysis, using data from the National Institutes of Health Systolic Blood Pressure (SPRINT) trial, included 8,022 study participants who were randomized into one

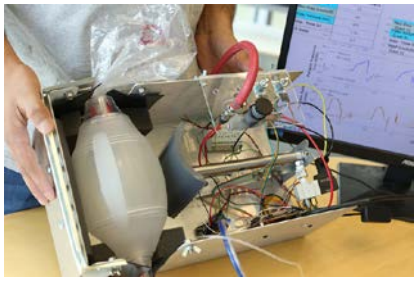
of two groups: 4,003 participants in an intensive blood pressure control group (target less than 120 mm Hg) and 4,019 participants in a standard lowering group (target less than 140 mm Hg).

Participants were followed for up to five years. During that time, only 88 AFib cases occurred in the intensive blood pressure lowering group while 118 cases occurred in the standard blood pressure lowering group. Soliman's team showed that the benefit of intensive blood pressure lowering on reducing the risk of AFib was similar in all groups of the participants regardless of sex, race, or levels of blood pressure.

## Smart, Low Cost Ventilator Tunes to Patient's Breathing

A Georgia Tech, USA team has unveiled a prototype, portable, emergency ventilator that provides clinicians with the ability to manage the respiration rate, tidal volume, inspiration and expiration ratio, and pressure applied to the lungs. Patients' breath can trigger the device to help ventilate at the same natural rate, hopefully improving outcomes.

"Our primary goal is to give the clinicians control over key parameters to ensure patient safety and improve ventilator functionality," said Devesh Ranjan,



a professor and associate chair in Georgia Tech's George W. Woodruff School of Mechanical Engineering. "Once the system is initialized, a small onboard computer operates to maintain the setpoints governing respiration in an unattended way. The sensors and computer provide more control and real-time monitoring for doctors and other medical staff." The new device, called Open-AirVentGT, is designed to be manufactured using commonly available electronic, mechanical, and computer components. The core of the system is a Raspberry Pi computer connected to several sensors and a motorized system to squeeze the bag valve mask. "We wanted to have easily sourced materials and use components that can be substituted where necessary," said Gokul Pathikonda, a postdoctoral fellow and a lead on the project.

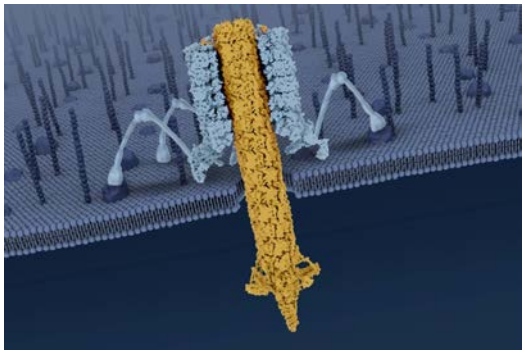
## Researchers Develop Smart Contact Lens to Diagnose and Treat Diabetes

A team from Pohang University of Science and Technology (POSTECH) in South Korea developed a wireless powered smart contact lens that can diagnose and treat diabetes by controlling drug delivery with electrical signals. The smart contact lens was able to effectively monitor blood sugar or glucose levels. The contact lenses are made of biocompatible polymers and integrate biosensors and drug delivery and data communication systems, according to the study, published in the journal *Science Advances*. "We expect that this research will greatly contribute to the advancement of related industries by being the first in developing wireless-powered smart contact lenses equipped with a drug delivery system for diagnosis and treatment of diabetes, and treatment of retinopathy," said study lead researcher Sei Kwang Han from POSTECH.

According to the findings, the research team verified that the glucose level in tears of diabetic rabbits analyzed by smart contact lenses matched their blood glucose level using a conventional glucose sensor that utilizes drawn blood. The team additionally confirmed that the drugs encased in smart contact lenses could treat diabetic retinopathy. The research team expects this development of self-controlled therapeutic smart contact lenses with real-time biometric analysis to be quickly applied to wearable healthcare industries.

## Designing Precision Antibiotics with Inspiration from Bacteria's Survival Strategy

Widely prescribed broad-spectrum antibiotics such as amoxicillin can kill off many types of bacteria indiscriminately, including harmless strains. But that can lead to resistance that bugs can pass on to other pathogenic bacteria. Compounds that target specific bacterial infections instead could help combat the problem of antibiotics resistance.

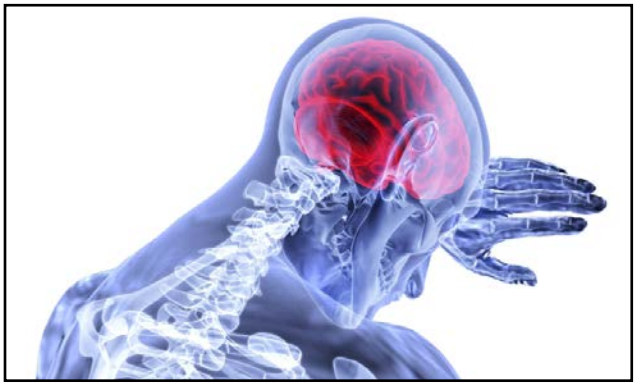


In a new study published in *Nature*, a team led by scientists at the University of California, Los Angeles, described the key structural mechanism of action for a class of naturally occurring bacteria-killing proteins called R-type pyocins. They believe their findings could aid in the development of more precise antibacterial agents. R-type pyocins are "nanomachines" that are released by *Pseudomonas aeruginosa*, the researchers explained. The proteins kill other bacteria that are competing for the resources that *Pseudomonas aeruginosa* needs to survive. Using X-ray crystallography and cryo-electron microscopy, the researchers imaged pyocin and determined how its killing power is triggered.

A pyocin consists of a cylindrical trunk made of an outer sheath that surrounds an inner tube. Below the trunk is a baseplate with six tendrils, which recognize and bind to specific structures on the target cell's surface as the inner tube punctures and kills the cell. In the new study, the researchers found that the bacterium is recognized when at least three of the six tendrils bind to its surface. This causes the baseplate to detach from the main body, triggering a cascade of events that forces the inner tube across the bacterial cell surface. In a study published in *Science Translational Medicine*, the company helped demonstrate that a protein called SlpA on C. difficile's surface acts as the attachment site for engineered pyocins. That team also found that the rare genetic loss of SlpA that renders C. difficile resistant to the Avidocin-based drugs makes the bacteria unable to cause a life-threatening infection.

## Alzheimer's Researchers Link Glucose Metabolism to Disease Pathology, Uncovering New Drug Targets

A new study, born a collaborative effort among different research centres, suggests that other proteins likely to play a role in Alzheimer's, and they could offer new druggable targets. The team, led by the Emory School of Medicine, USA discovered that the cognitive impairment associated with Alzheimer's is associated with proteins that regulate glucose metabolism. They reported the findings in the journal *Nature Medicine.*



The researchers discovered by studying brain tissue from 2,000 Alzheimer's patients and 400 cerebral spinal fluid samples that were collected by the Emory Goizueta Alzheimer's Disease Research Centre and several other research institutions. They analyzed the expression patterns of more than 3,000 proteins. Previous research from Emory and the National Institutes of Health's National Institute on Aging (NIA) found that abnormalities in the process by which the brain breaks down glucose were associated with amyloid plaques in the brain and the onset of memory loss. This study built on that finding by showing the proteins that govern how cells derive energy from glucose are elevated in the cerebral spinal fluid of patients with Alzheimer's. There was also an uptick of those proteins in people whose brains show signs of the disease but who are not yet showing symptoms.

"We've been studying the possible links between

abnormalities in the way the brain metabolizes glucose and Alzheimer's-related changes for a while now," said co-author Madhav Thambisetty, M.D., Ph.D., an investigator at the NIA, in a statement. They concluded that Alzheimer's kicks off processes in the brain that are designed to protect nerve cells. The discovery of glucose-related proteins in cerebral spinal fluid boosts that hypothesis, they said in the study.

## New Staining Technique to Visualize Whole Organs & Bodies

A RIKEN research team has established an optimized three-dimensional (3-D) tissue-staining and observation technique based on existing tissue clearing technology. The study published in *Nature Communications*, details how the new technique can be used to stain tissue and label cells in mouse brains, human brains, and whole marmoset bodies. This technique allows detailed anatomical analysis and whole-organ comparisons between species at the cellular level.

Tissue clearing allows 3-D observation of organs using an optical microscope. In 2014, a research team led by Etsuo Susaki and Hiroki Ueda at the RIKEN Centre for Biosystems Dynamics Research (BDR) in Japan developed a 3-D tissue clearing

technology called CUBIC, which can image the whole body at the single-cell level by making tissue transparent.

Based on the tissue properties they discovered, they constructed a screening system to examine a series of conditions using artificial gels that can mimic biological tissues. By analyzing the staining and antibody labelling of artificial gels with CUBIC, they were able to establish a fine-tuned, versatile 3-D-staining/imaging method, which they named CUBIC-HistoVIsion. By using this optimized system with high-speed 3-D microscopic imaging, they succeeded in staining and imaging the whole brain of a mouse, half a marmoset brain, and a square centimetre of human brain tissue. The system worked well with about 30 different antibodies and nuclear staining agents, making it useful for scientists in many different fields, from studying the brain to studying kidney function.

"The 3-D staining method developed in our study surpasses the performance of the typical staining methods published so far and is the best method in the world at present," says Susaki. "It also provides a paradigm shift in the development of methods in tissue chemistry, such as the construction of staining protocols based on tissue properties.

## Study Finds PFA Chemicals Associated with Miscarriage

Researchers at the Yale School of Public Health, USA have found that maternal exposure to synthetic chemicals widely used in food packaging and commonly found in drinking water supplies is associated with a woman's risk for miscarriage in the second trimester.

All women in the Danish cohort studied had detectable and multiple types of per- and polyfluoroalkyl substances (PFAS) in their pregnancy serum. The study estimated a nearly 80% to 120% increased risk for miscarriage in women with the highest level of two common PFAS compounds, compared with those in the cohort with the lowest PFAS levels. Some positive associations, though in smaller magnitudes and less consistent, were also reported for exposure to other types of PFAS compounds evaluated.

The association was stronger among women who had already borne children, and the researchers said that the results need to be replicated. The study is published in the journal *Environmental Health Perspectives*. "Policy regulation of PFAS ex-

posure should consider adverse effects on maternal and child health, which have repeatedly suggested that these are vulnerable populations that need to be protected from exposure to these widespread chemicals," said Zeyan Liew, the study's lead author and an assistant professor in the Department of Environmental Health Sciences at the Yale School of Public Health.

## Prolonged Use of Synthetic Corticosteroid Drugs Increases Adrenal Gland Inflammation

New research by academics at the University of Bristol England has found evidence that prolonged treatment of synthetic corticosteroid drugs increases adrenal gland inflammation in response to bacterial infection, an effect that in the long-term can damage adrenal function. In this study, published in *Brain, Behavior, and Immunity*, the research team tested the hypothesis that synthetic corticosteroids causes long-term changes in the adrenal gland steroidogenic pathways that are responsible for adrenal suppression.

The research found that the rhythms of glucocorticoid secretions are disrupted following prolonged treatment with synthetic corticosteroid drugs, and that the adrenal steroidogenic pathway is directly affected. Importantly, these changes persist long after discontinuation of the treatment. The study also showed a pro-inflammatory effect of synthetic glucocorticoid treatment in the adrenal gland. This is an important finding with high clinical relevance as intra-adrenal activation of the immune system can affect adrenal functionality by interfering with the steroidogenic pathway, damaging adrenal endothelial microvascular cells, and by inducing apoptosis and reducing cell viability.

Dr. Francesca Spiga, Honorary Research Fellow in the Bristol Medical School: Translational Health Sciences (THS) and corresponding author, said, "Our study provides valuable insights on the regulation of the adrenal steroidogenic pathway that are important starting points for future studies on adrenal gland physiology. Our research builds on our knowledge of the mechanisms through which corticosteroid drugs induce adrenal insufficiency, by showing simultaneous effects within multiple pathways involved in steroidogenesis, including circadian clock genes and inflammation pathways."

## Blood Test Helps Identify Biomarkers That Signal Chemotherapy-Related Heart Problems

Scientists have identified a collection of biomarkers that together signal that a person's cancer treatment may be harming their heart. After further validation, the biomarkers could eventually allow doctors to assess cardiovascular side effects of chemotherapy with a simple blood test early in the treatment process.

"Compared to the current standards for diagnosing chemotherapy-related cardiac dysfunction (CRCD), the biomarker panel we have suggested would be cost-effective and easy to implement, but more importantly, would aid in earlier diagnosis, risk assessment and CRCD progression monitoring that would ultimately improve patient care and outcomes," said study author Hari Vishal Lakhani, a clinical research associate at the Marshall University Joan C. Edwards School of Medicine, USA. "It is especially relevant to patients in rural, lower socioeconomic communities, who may not have access to serial echocardiography as a means to diagnose CRCD."

The researchers compared blood samples from 17 healthy women with samples from 17 women undergoing anthracycline treatment for breast cancer. The women with breast cancer also received echocardiograms before beginning anthracycline and three months and six months after starting treatment.

The results revealed signif-

icant differences in the levels of a dozen biomarkers related to cardiovascular changes between the two groups. While no single biomarker was sufficient to predict CRCD on its own, in combination they provided a reliable predictor of heart toxicity as assessed with echocardiography. Many of the biomarkers showed detectable changes well before heart damage was visible on an echocardiogram. The biomarkers include a variety of proteins as well as microRNAs (miRNAs), which affect gene expression. The particular miRNAs identified in the study have previously been implicated in cardiac dysfunction and the proteins have been linked with inflammation, damage to the heart muscle, and other processes involved in heart disease.

"Our results support the clinical application of these serum biomarkers and circulating miRNAs to develop a panel for early diagnosis of chemotherapy-related cardiac dysfunction which will enable early detection of disease progression and management of irreversible cardiac damage," said Lakhani.

## Vagus Nerve Stimulator May Help Relieve Indigestion

People who suffer frequent indigestion may find relief with a transcutaneous auricular vagus nerve stimulator, or taVNS. People who used taVNS showed significant improvements in their stomach's ability to accommodate and process a meal, according to a new study.

taVNS devices deliver short pulses of painless electrical current to the vagus nerve. While taVNS has been explored as a possible treatment for epilepsy, depression and a variety of other conditions, the new research study is one of the first to assess the potential benefits of auricular taVNS for gastrointestinal problems. The study involved a Respiratory-gated Auricular Vagal Afferent Nerve Stimulation (RAVANS) that delivers electrical pulses in tune with the respiratory rhythm.

"Our findings suggest that RAVANS has the ability to modulate the stomach's response to food ingestion, which may be impaired in functional dyspepsia patients," said lead study author Roberta Sclocco, Ph.D., a postdoctoral fellow at Massachusetts General Hospital and Harvard Medical School, USA.

"RAVANS is a non-invasive, safe peripheral nerve stimulation intervention and while our results are encouraging, further research is needed to estimate the optimal dose and timings of this intervention." Sclocco and colleagues tested RAVANS in 12 volunteers with functional dyspepsia. All volunteers participated in two research sessions in which they wore the RAVANS device or control, ate a meal, and underwent magnetic resonance imaging (MRI) scans 15, 65, and 80 minutes after eating. MRI scans revealed the ratio of stomach volume to the volume of ingested food was higher during RAVANS, indicating that taVNS helped participants' stomachs expand to accommodate the meal. Besides, the stomach emptied more quickly during the 80 minutes following the meal during RAVANS.

The findings suggest that modulating the activity of the vagus nerve with taVNS could help reduce symptoms of indigestion, though Sclocco cautioned that patients should ask a doctor before trying it.

## Researchers Identify Drugs That Could Halt Preterm Labour

Researchers have discovered a common molecular pathway in women who experience preterm labour and are using this insight to develop new treatments for women who experience early labour. "We not only identified an abnormality in the uterus of women who experience preterm labour but also found that FDA-approved drugs historically used to treat other disorders can be used to target this problematic pathway and are extremely effective at halting contractions," said Scott Barnett, Ph.D., University of Nevada, Reno School of Medicine, USA.

"Most drugs used to treat preterm labour were not designed to specifically address the abnormalities in the uterus that cause preterm labour but rather to treat other muscle disorders," said Dr. Barnett. "A way to delay that birth, even by a matter of days or weeks, will significantly improve the outcome of the child." The researchers identified four candidate drugs that target the problematic molecular pathway and tested them on small pieces of uterine muscle donated by women who had a cesarean section. These tissue samples were placed in a solution simulating conditions in the body and then stimulated to contract with oxytocin. Applying the candidate drugs to the bath solution allowed the researchers to observe how the drugs affected the contractions.

Although all four drugs decreased contractions, contractions were almost completely halted with combined administration of the FDA-approved beta-blocker nebivolol and the small molecule N6022, which underwent clinical trials for the treatment of asthma.

## Light-based DBS Method Can Alleviate Motor Symptoms of Parkinson's disease

Biomedical engineers at Duke University, USA have used deep brain stimulation based on light to treat motor dysfunction in an animal model of Parkinson's disease. This method promises to provide new insights into why deep brain stimulation works and ways in which it can be improved on a patient-by-patient basis. The results appear in *The Journal of Neuroscience.*

"If you think of the area of the brain being treated in deep brain stimulation as a plate of spaghetti, with the meatballs representing nerve cell bodies and the spaghetti representing nerve cell axons, there's a longstanding debate about whether the treatment is affecting the spaghetti, the meatballs or some combination of the two," said Warren Grill, the Edmund T. Pratt, Jr. School Distinguished Professor of Biomedical Engineering at Duke. "Our new light-based method is capable of targeting just a single ingredient, so we can now begin teasing out the individual effects of activating different neural elements."

In Grill's metaphor, the meatballs are the neurons that make up the subthalamic nucleus. While its exact function remains unknown, research suggests that it holds muscular responses in check. The spaghetti in the bowl represents long nerve fibbers called the hyper direct pathway that extend into the region from neurons in the cerebral cortex, the thin outer layer of neurons responsible for most

of the brain's information processing.

As Grill suggests, teasing out the role all of these various types of cells play in mediating the effects of deep brain stimulation is nearly impossible using traditional methods.

In the new paper, Chunxiu Yu, a research scientist with expertise in optogenetics embedded the Chronos optogenetics machinery into the subthalamic nucleus neurons of rats that have been given Parkinson's disease-like conditions in one-half of their brains. This model helps researchers determine when a treatment is successful because the resulting physical movement symptoms only occur on one side of the rat's body. They then delivered deep brain stimulation using light flashes at the standard 130 flashes per second. The technique worked, and the rats' physical symptoms were substantially alleviated.