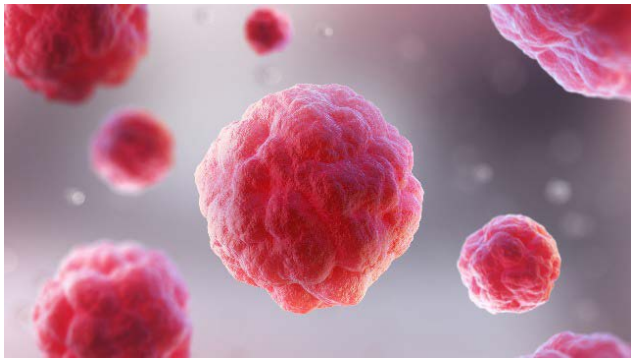
Early Cancer Detection Made Possible with Paper-Based Technology

Washington State University researchers have developed a technology that is 30 times more sensitive than current lab-based tests in finding early stage cancer biomarkers in blood. This technology uses an electric field to concentrate and separate cancer biomarkers onto a paper strip. Wenji Dong, associate professor in the Gene and Linda Voiland School of Chemical Engineering and Bioengineering, and graduate student Shuang Guo were able to detect miniscule levels of the cancer markers in the exosomes in as little as 10 minutes.Their work in the journal *Biosensors and Bioelectronics*.

The exosomes shuttle molecules from parent cancer cells through the body, entering and then re-programming cells to become cancerous. Cancer cells secrete more exosome bubbles than regular cells. "Exosomes provide a unique opportunity as a cancer marker," Dong said.

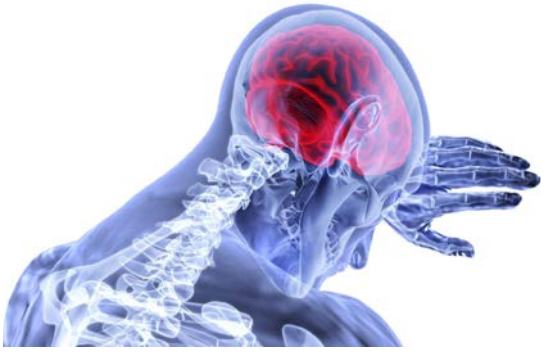
The WSU team for the first time applied a technology that uses an electric field to rapidly isolate, enrich and detect the exosomes taken from a pros-



tate cancer cell line. The technology was able to concentrate and then separate the cancer-cell exosomes from those from normal cells by immune-binding i.e. the researchers captured the target exosomes by using an antibody that is specific to a protein marker on the exosome surface. The researchers were also able to separate out and analyze cancer protein markers within the exosomes. The technology was 33 times more sensitive than conventional methods that are used in research labs to detect and analyze exosomes.

Link between Gut Bacteria and Stroke-Related Brain Blood Vessel Abnormality Established

NIH funded researchers found that the presence of abnormal bundles of brittle blood vessels in the brain or spinal cord, called cavernous angiomas (CA), are linked to the composition of a person's gut bacteria. Current treatment involves surgical removal of lesions. Previous studies in a small number of patients suggested a link between CA and gut bacteria. This study is the first to examine the role the gut microbiome plays in a larger population of CA patients.

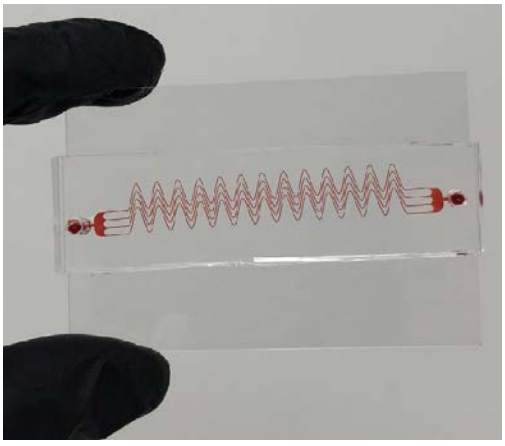


Led by scientists at the University of Chicago, the researchers used advanced genomic analysis techniques to compare stool samples from 122 people who had at least one CA as seen on brain scans, with those from age- and sex-matched, control non-CA participants. Initially, they found that on average the CA patients had more gram-negative bacteria whereas the controls had more gram-positive bacteria, and that the relative abundance of three gut bacterial species distinguished CA patients from controls regardless of a person's sex, geographic location, or genetic predisposition to the disease. Moreover, gut bacteria from the CA patients appeared to produce more lipopolysaccharide molecules which have been shown to drive CA formation in mice. According to the authors, these results provided the first demonstration in humans of a "permissive microbiome" associated with the formation of neurovascular lesions in the brain.

Further analysis showed that some gut bacteria compositions could identify aggressive ver-

sus non-aggressive forms of the disease as well as those with recent symptomatic hemorrhages. Also, for the first time, they showed combining gut bacteria data with results from blood plasma tests might help doctors better diagnose the severity of a brain disorder. The results, published in *Nature Communications*, supports evidence for the role of gut bacteria in brain health.

Researchers Find New Way to Detect Blood Clots



Researchers in the Department of Biomedical Engineering at Texas A&M University are working on a new way to detect blood clots. Blood vessels have complex curves, spirals and bends. When the blood reaches these curves, it makes changes to its fluid mechanics and interactions with the vessel wall. In a diseased person, these changes could lead to very complex flow conditions that activate proteins and cells eventually leading to blood clots.

Researchers in Dr. Abhishek Jain's lab at Texas A&M designed a microdevice that mimics tortuous blood vessels and created a diseased microenvironment in which blood may rapidly clot under flow. They showed this biomimetic blood clotting device could be used to design and monitor drugs that are given to patients who suffer from clotting disorders."It can be used in detection of clotting disorders and used in precision medicine where it is important to monitor pro-thrombotic or anti-thrombotic therapies and optimize the therapeutic approach," Jain said.

Working with Dr. Jun Teruya, chief of transfusion medicine at Texas Children's Hospital and Baylor College of Medicine, the team coordinated with clinicians to test the device with paediatric patients in critical care whose heart and lungs were not working properly.

These patients needed an extracorporeal membrane oxygenation (ECMO) machine and these patients were prone to bleeding. As compared with current chemically based blood clotting tests, Jain's team's tortuosity based microfluidic system doesn't require expensive chemicals, is quick, with results within 10-15 minutes, uses low blood sample volume and is easy to operate. "The margin for error is essentially zero for these patients," Jain said. By having the opportunity to test their system with real patients, Jain said his team was able to demonstrate that their design could detect bleeding in anticoagulated patients with low platelet counts, which can help guide doctors to make better evidence-based clinical decisions for their patients.

New Test Identifies Uridine Can Benefit for CAD Deficiency in Children

Scientists at Sanford Burnham Prebys Medical Discovery Institute and the Centro de Biología Molecular Severo Ochoa in Spain have created a test that determines which children with CAD deficiency are likely to benefit from receiving uridine, a nutritional supplement. The study was published in *Genetics in Medicine.*

"The effect of uridine for some children with CAD deficiency is amazing. These kids go from being bedridden to interacting with people and moving around," says Hudson Freeze, Ph.D., director of the Human Genetics Program at Sanford Burnham Prebys and co-corresponding author of the study. "Our results identified 11 children who have mutations in both copies of the CAD gene and would likely benefit from uridine therapy."

In the study, the scientists created a cell-based assay that was able to test if a CAD variation is

pathogenic based on the cell's ability to grow with or without uridine. The researchers tested 25 suspected CAD cases with presence of two variants in the CAD gene. Of these samples, the scientists found 11 that had two damaging variations that disrupted uridine production. These individuals would likely benefit from supplemental uridine.

"Recent studies have shown that giving these children uridine can dramatically improve their symptoms. After receiving uridine, their seizures halted, cognitive and motor development improved, and alertness increased," says Freeze.

Scientists Develop AI to Enhance Brain Tumour Diagnosis

Researchers have developed new machine learning approach classifies a common type of brain tumor into low or high grades with almost 98% accuracy. Their research has been published in the journal *IEEE Access*. Scientists in India and Japan, including Kyoto University's Institute for Integrated Cell-Material Sciences (iCeMS), developed the method to help clinicians choose the most effective treatment strategy for individual glioma patients.

Gliomas are a common type of brain tumour affecting glial cells, which provide support and insulation for neurons. Patient treatment varies depending on the gliomas's aggressiveness, therefore, it's important to get the diagnosis right for each individual. Much of the data available in MRI scans cannot be detected by the naked eye. Artificial intelligence (AI) algorithms help

extract this data.

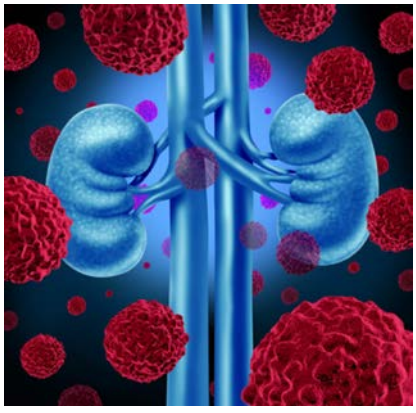
iCeMS bioengineer Ganesh Pandian Namasivayam collaborated with Indian data scientist Balasubramanian Raman from Roorkee to develop a machine learning approach that can classify gliomas into low or high grade with 97.54% accuracy. Low grade gliomas include grade I pilocytic astrocytoma and grade II low-grade glioma. High grade gliomas include grade III malignant glioma and grade IV glioblastoma multiforme. The choice of patient treatment largely depends on being able to determine the glioma's grading. The team used a dataset from MRI scans belonging to 210 people with high grade gliomas and another 75 with low grade gliomas. They developed an approach called CGHF (computational decision support system for glioma classification using hybrid radiomics) and stationary wavelet-based features. They chose specific algorithms for extracting features from some of the MRI scans and then trained another predictive algorithm to process this data and classify the gliomas. They then tested their model on the rest of the MRI scans to assess its accuracy.

"Our method outperformed other state-of-the-art approaches for predicting glioma grades from brain MRI scans," says Balasubramanian.

Cryoablation Comparable to Surgery for Kidney Cancer

A minimally invasive procedure that destroys cancer cells by freezing them is as effective as surgery for treating early-stage kidney cancer, offering similar to 10-year survival rates with a lower rate of complications, according to a study published in the journal *Radiology*.

Percutaneous cryoablation (PCA) is an alternative to surgery that kills the tumor by freezing it. In the procedure, an interventional radiologist inserts a hol-



low needle into the tumor under imaging guidance. Argon gas circulating through the needle freezes a small volume of tissue, including the tumor and a small amount of normal tissue around it. The tumor dies, and over time it turns into scar tissue that is absorbed by the body.

"We have been doing cryoablation with increasing frequency at Johns Hopkins," said study lead author Christos S. Georgiades, M.D., Ph.D., professor of radiology, oncology and surgery from the Department of Vascular

and Interventional Radiology at Johns Hopkins University in Baltimore. "It's an outpatient procedure that takes about 30 to 40 minutes to perform. We observe the patient for three hours, and then they can go home." For the study, Dr. Georgiades and colleagues looked at 134 patients who underwent cryoablation for early-stage kidney cancer and compared their outcomes over 10 years with those of patients who had either a radical or partial nephrectomy. Overall survival probability after percutaneous cryoablation at five and 10 years was longer than for radical or partial nephrectomy. "The risk of significant complications from this procedure is about 6%, compared to between 15 and 20% for surgery. In addition, recovery is much faster than with surgery", said Georgiades.

Smartphone-Based AI Tool Can Help Manage Type-1 Diabetes

Researchers and physicians at Oregon Health & Science University, USA used artificial intelligence and automated monitoring to, design a method to help people with type 1 diabetes better manage their glucose levels.Their research was published in the journal *Nature Metabolism*. "We designed the AI algorithm entirely using a mathematical simulator, and yet when the algorithm was validated on real-world data from people with type 1 diabetes at OHSU; it generated recommendations that were highly similar to recommendations from endocrinologists," said lead author Nichole Tyler, an M.D.-Ph.D. student in the OHSU School of Medicine.

The algorithm developed by OHSU scientists uses data collected from a continuous glucose monitor and wireless insulin pens to provide guidance on adjustments. Paired with a smart phone app called DailyDose, the recommendations from the algorithm were shown to be in agreement with physicians 67.9% of the time.

The study involved monitoring 16 people with type 1 diabetes over the course of four weeks, showing that the model can help reduce hypoglycaemia."In addition to showing improvement in glucose control, our algorithm generated recommendations that had very high in correlation with physician recommendations with over 99% of the algorithm's recommendations delivered across 100 weeks of patient testing considered safe by physicians," said Peter Jacobs, Ph.D, senior author on the study.

An Aspirin a Day, Keeps the Doctor Away

A regular dose of aspirin to reduce the risk of inherited bowel cancer lasts at least 10 years after stopping treatment, a research has revealed. The CAPP2 international trial involved patients with Lynch syndrome from around the world and revealed that two aspirins a day, for an average of two and a half years, reduced the rate of bowel cancer by half. The study, led by experts at the Universities of Newcastle and Leeds, UK, published in *The Lancet* is a planned double blind 10 year follow-up, supplemented in more than half of recruits with comprehensive national cancer registry data for up to 20 years.

The findings of the study further strengthens the National Institute for Health and Care Excellence (NICE) recommendation on taking daily aspirin for those at high risk and supports wider use of aspirin to prevent cancer. Based on the preliminary five year data from the CAPP2 trial, NICE recommended that aspirin should be offered for the prevention of bowel cancer in adults with Lynch syndrome.

Professor Sir John Burn, from Newcastle University and Newcastle Hospitals NHS Foundation

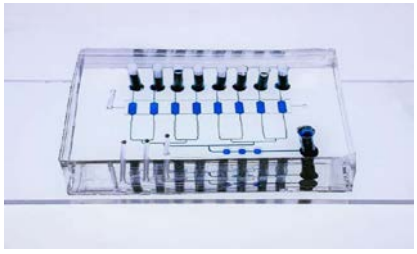
Trust, who led the research, said, "Patients with Lynch syndrome are high risk and this offered statistical power to use cancer as an endpoint. Two aspirins a day for a couple of years gives protection that lasts more than 10 years and the statistical analysis has become much stronger with time. For people at high cancer risk, the benefits are clear. Our new international trial, CaPP3, will see if smaller doses work just as well."

The study involved 861 patients with Lynch syndrome. A group of 427 were randomised to aspirin continuously for two years and 434 were allocated to a placebo and then they were all followed for 10 years. Out of those given two aspirins each day (600mg) there were 18 fewer colon cancers, representing a drop of 42.6%. When all 163 Lynch syndrome cancers are included in the analysis such as cancer of the endometrium or womb there was an overall reduced risk of cancer of 24% in those taking aspirin, or 37% in those who took aspirin for the full two years.

'Lab-On-A-Chip' Technology Accurately Detects Early and Advanced Breast Cancer

A "lab-on-a-chip" has shown promise in detecting early breast cancers and tumours that have developed in other parts of the body. The EV-CLUE uses nanotechnology to pump a tiny amount of blood into eight miniscule channels equipped to detect different markers of cancer, explained co-researcher Liang Xu, a professor of molecular bioscience at the University of Kansas USA. The EV-CLUE requires about 2 microliters of blood to run a scan, Xu said.

Xu and his colleagues tested their lab-on-a-chip by equipping one of its channels to look for MMP14, an enzyme released by tumours that has been linked to cancer progression. The enzyme



attacks healthy cells in ways that seem to promote the spread of cancer.

In early tests focused on MMP14, the device detected early-stage or metastatic breast cancer with 97% accuracy in a first group of 30 people and 93% in a second group of 70 people.

"This highly sensitive technology can catch early signs of cancer metastases. The early detection for cancer metastases is a key to reduce the death rate of women with breast cancer," Xu said.

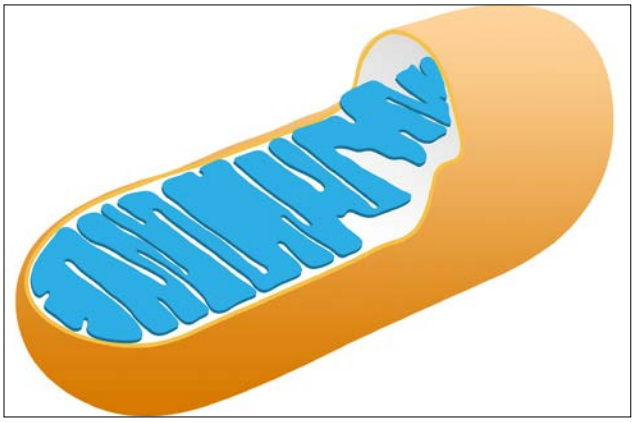
The EV-CLUE chips are created using a 3-D printer, in a process that could be distributed widely and affordably, Xu said. He added that using the chips would be much cheaper than a mammogram.

The chips would not be limited to breast cancer detection. Researchers have just started an early trial to see if the EV-CLUE can detect lung cancer as well, Xu said.The early results of the EV-CLUE were published in the journal *Science Translational Medicine.*

Lack of Mitochondria Causes Severe Disease in Children

Researchers at Karolinska Institutet in Sweden have discovered that excessive degradation of mitochondria plays an important role in the onset of mitochondrial disease in children. These inherited metabolic disorders can have severe consequence such as brain dysfunction and neurological impairment. Their study is published in *EMBO Molecular Medicine.*

"This is a completely new disease mechanism for mitochondrial disease which may provide a novel entry point for treating affected patients," says Nils-Göran Larsson, professor at the Department of Medical Biochemistry and Biophysics, Karolinska Institutet, who led the study.



Mitochondrial diseases are inherited metabolic disorders that affect about one in 4,300 individu-

als and are caused by dysfunctional mitochondria. FBXL4 is a gene that is implicated in controlling mitochondrial function, and mutations in this gene are the most common cause of mitochondrial diseases. FBXL4 mutations have been linked to encephalopathy. The manifestations are impaired cognitive function, developmental regression, epileptic seizures and other types of neurological deficits. In the current study, researchers generated mice that lack FBXL4 and showed that these mice recapitulate important characteristics present in patients with FBXL4 mutations. They were able to demonstrate that the reduced mitochondrial function is caused by increased degradation of mitochondria via autophagy.

In the absence of FBXL4, mitochondria is more frequently delivered to the lysosome. FBXL4 thus acts as a break on mitochondrial degradation. Patients who lack FBXL4 have few mitochondria in their tissues which lead to disease.

UMSOM Researchers Identify Genetic Defect Linked to ALS

Researchers at the University of Maryland School of Medicine (UMSOM) have identified how certain gene mutations cause amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's disease. The pathway identified by the researchers can potentially also be responsible for a certain form of dementia related to ALS. The finding offers potential new approaches for treating this condition. Their discovery was published in the *Proceedings of the National Academy of Sciences (PNAS)* and included collaborators from Harvard University, University of Auckland, King's College London, and Northwestern University.

Patients with ALS slowly lose the ability to move their muscles, leading to problems with basic functions such as breathing and swallowing. About half of ALS patients also develop dementia. Genetic studies of families with a predisposition to develop ALS have shown that the condition can be associated with certain gene mutations. Some of these mutations involve the gene UBQLN2 which regulates the disposal of misfolded cells from the body's cells.

"We mapped out the process by which ubiquilin-2 (UBQLN2) gene mutations disrupt an important recycling pathway that cells use to get rid of their trash. Without this recycling, misfolded proteins build up in the nerve cell and become toxic, eventually destroying the cell. This destruction could lead to neurodegenerative disorders like ALS," said Mervyn Monteiro, Ph.D., Professor of Anatomy and Neurobiology, who is affiliated with the UMSOM's Center for Biomedical Engineering and Technology (BioMET) at UMSOM.

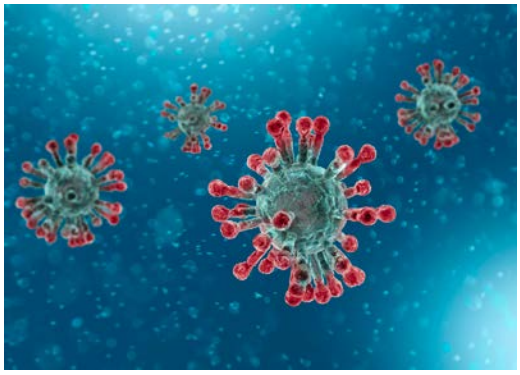
To investigate how UBQLN2 mutations cause ALS, Dr. Monteiro's group used both human cells and UBQLN2-mutant mouse models for their study. The mouse models mimic the progression of the disease in people who inherit these gene mutations. Dr. Monteiro's group first removed the UBQLN2 gene from human cells and found it completely stalled the recycling pathway. They then reintroduced either the normal gene or one of five gene mutations into the cells. They found that reintroduction of normal UBQLN2 restored the recycling pathway while all five of the gene mutations failed to restart the pathway.

Using the mouse model, Dr. Monteiro and his colleagues outlined the reason for the pathway disruption in the presence of gene mutations. They found that the mice with the gene mutations had reduced levels of a protein called ATP6v1g1, which is an essential part that acidifies the cell's trash in order to initiate the breakdown and recycling process.

"Our new finding suggests that restoration of the defect could have implications for not only treating ALS, but possibly other neurodegenerative diseases as well," Dr. Monteiro said.

Study Finds Promising Rheumatoid Arthritis Drug against COVID-19

A drug against rheumatoid arthritis called baricitinib could potentially be repurposed to treat patients with COVID-19, according to a study conducted by an international research team including researchers at Karolinska Institutet in Sweden. The findings, published in the journal *EMBO Molecular Medicine*, represent an example of how artificial intelligence (AI)-algorithms could help identify existing drugs as potential therapies against as new illnesses.



Baricitinib is a once-daily oral drug used for treatment of adult patients with moderate to severe rheumatoid arthritis. It acts as an inhibitor of janus kinase, a type of enzyme that acts as an "on" or "off" switch in many cellular functions. The drug works by interfering with the inflammatory processes of the immune system and has been viewed as a potential treatment candidate for COVID-19.

In this study, the researchers used AI-algorithms to identify existing drugs capable of blocking both inflammation and infectivity. Baricitinib was identified as a promising repurposing candidate for COVID-19, due to its previously demonstrated ability to inhibit both cytokine activity and viral spread.

In test tubes and 3-D-human miniature livers, researchers showed that the drug inhibited signaling of cytokines. It also helped reduce the viral load of SARS-CoV-2 and the level of interleukin-6 (IL-6).

In addition to the lab tests, a small pilot study of three men and one woman with bilateral COVID-19 pneumonia was conducted in Milan, Italy. After 10-12 days of treatment with baricitinib, all four patients showed improvements in signs and symptoms such as cough, fever and reductions in viral load and plasma IL-6 levels.

"Collectively, this data suggest that baricitinib may lower inflammation and viral load in COVID-19," says Ali Mirazimi, adjunct professor in the Department of Laboratory Medicine, Karolinska Institutet, who led the functional virus studies.

"We are integrating and carefully analyzing these trial data and providing functional and mechanistic follow-up studies to scrutinize baricitinib's mode of action," says Volker Lauschke, associate professor of personalized medicine and drug development at the Department of Physiology and Pharmacology, Karolinska Institutet, who led the functional testing of baricitinib.

Scientists Develop Self-Healing Bone Cement

Materials scientists at Friedrich Schiller University Jena Germany have developed a bone replacement material that minimizes the extent of damage to it and at the same time repairs itself. They report on their research is published in the *Scientific Reports.*

The experts from Jena, who collaborated with colleagues from the University of Würzburg, concentrated calcium phosphate cement, a bone substitute that is already widely used in medicine. On one hand, the material stimulates bone formation and increases the in-growth of blood vessels while on the other hand, it can be introduced into the body as a paste in a minimally invasive procedure. Its malleability allows it to bind closely to the bone structure.

The materials scientists in Jena have developed calcium phosphate cement in which cracks do not develop into catastrophic damage. Instead, the material itself seals them. This is achieved by adding

carbon fibres to the material.

"Firstly, these fibres significantly increase the damage tolerance of the cement, because they bridge cracks as they form, and thus prevent them from opening further. Secondly, we have chemically activated the surface of the fibers i.e. as soon as the exposed fibres encounter body fluid, which collects in the openings created by the cracks, a mineralisation process is initiated. The resulting apatite then closes the crack again." said scientists.

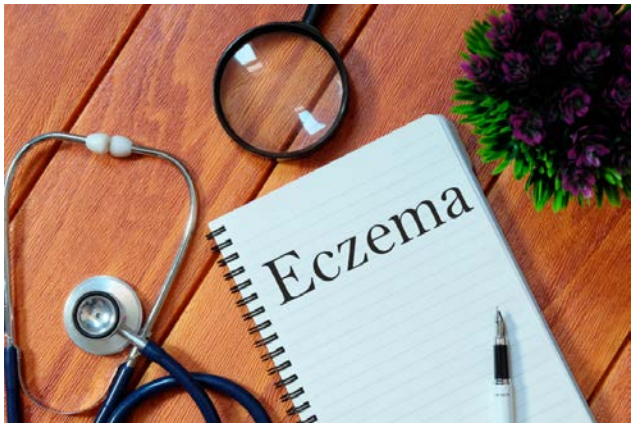
The Jena scientists have simulated this process in their experiments by deliberately damaging the calcium phosphate cement and healing it in simulated body fluid. This intrinsic self-healing ability and the greater load-bearing capacity associated with fibre reinforcement can considerably expand the areas in which bone implants made of calcium phosphate cement can be used.

New Approach for Eczema Treatment

Researchers at the University of British Columbia (UBC) and Vancouver Coastal Health Research Institute (VCHRI) in Canada have identified a key enzyme that contributes to eczema, which may lead to better treatment to prevent the skin disorder's debilitating effects. Their study was published in the *Journal of Investigative Dermatology*.

"The symptoms people often experience with eczema make them more likely to avoid going outside their homes or to work," says the study's senior author, Dr. David Granville, a professor in UBC's faculty of medicine and researcher at VCHRI. The Granzyme B enzyme is positively correlated with itchiness and disease severity in eczema. Researchers found that Granzyme B weakens the skin barrier by cleaving through the proteins holding cells together making it easier for allergens to penetrate across.

"Between cells in our skin are proteins that anchor them tightly together. In eczema, Granzyme B is secreted by cells that eats away those proteins, causing these bonds to weaken and the skin to become further inflamed and itchy," says Granville. Researchers found that by knocking out Granzyme



B with genetic modification, or inhibiting it with a topical gel, they could prevent it from damaging the skin barrier and significantly reduce the severity of AD. "Our study provides evidence that topical drugs targeting Granzyme B could be used to treat patients with eczema and other forms of dermatitis," says Granville. "A gel or cream that blocks Granzyme B could have fewer if any side-effects and circumvent the itch-scratch cycle, making flare-ups less pronounced," says Dr. Chris Turner, the study's lead author and former UBC postdoctoral fellow in Granville's laboratory.

Study Shows Dairy Products are Linked to Lower Risks of Diabetes and High Blood Pressure

A large international study has discovered an association between consuming a higher amount of dairy and lower rates of hypertension and diabetes.

Participants included nearly 150,000 people from 21 countries, including Africa, Asia, Europe and North and South America. In the study published in the journal *BMJ Open Diabetes*

Research & Care, researchers used questionnaires to learn about participants' food consumption throughout a year. Those in the study outlined how many times they ate specific items from the list, which included dairy such as milk, yogurt, cheese and meals made with dairy.

Also, dairy products were classified as whole-fat or low-fat. Researchers considered participants' medical history, prescriptions, blood pressure, waist circumference, and glucose and fat

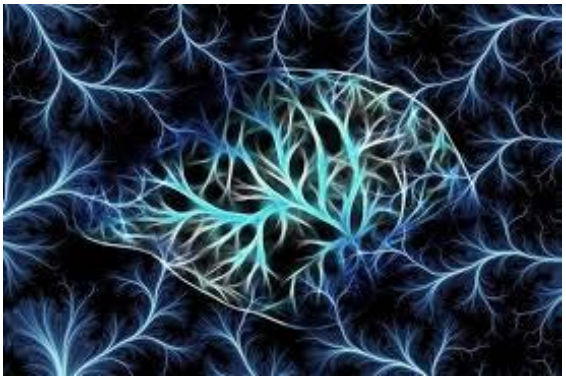
levels along with education, the latter of which is important in diagnosing Type 2 diabetes. Researchers followed up with participants about nine years later.

On average, people consumed 179 grams of dairy each day, which is equivalent to a little less than a glass of milk or a cup of yogurt per day. The results also showed that people in Europe and North and South America generally consumed more dairy than people in Asia and Africa.

Researchers analyzed the results and found an association of a 24% lower risk of metabolic syndrome. That lowered risk was tied to having a minimum of two servings of dairy per day as opposed to eating no dairy. Consuming whole-fat dairy had a stronger association than low-fat dairy with lowering the risk of diabetes and high blood pressure. But having at least two servings of any dairy product was linked to an 11–12% lower risk of having heart conditions.

Antioxidants in Brain Linked to Improvised Psychosis Treatment

Canadian professor at Schulich School of Medicine & Dentistry Dr. Lena Palaniyappan and his team explored specific chemicals in the brain with the aim of speeding up the time it takes a patient to respond to medication.



The research team from Schulich and Lawson Health Research Institute looked specifically at antioxidant levels in the brain and found that free radicals may improve outcomes of early intervention in psychosis. They looked specifically at cingulate cortex which is well connected to a network of regions that play a major role in generating symptoms of psychosis.

The findings showed that patients with higher levels of glutathione responded more quickly to medication for psychosis and had improved outcomes. They estimated that a 10 percent increase in antioxidants could lead to a reduction in length of hospital stay by at least seven days.

"This study demonstrates that if we can find a way to boost the amount of antioxidants in the brain, we might be able to help patients transition out of hospital more quickly, reduce their suffering more quickly and help them return earlier to their work and studies," said Palaniyappan, the Tanna Schulich Endowed Chair in Neuroscience and Mental Health at Western. The studywas published in *Nature Molecular Psychiatry.*

Scientists Develop an Eye Scanner that Detects and Tracks Biological Ageing in Humans

The researchers from Boston University School of Medicine (BUSM) have discovered that a specialized eye scanner accurately measures spectroscopic signals from proteins in lens of the eye can detect and track biological aging in living humans.

According to the researchers, chronological age does not adequately measure individual variation in the rate of biological aging. "The lens contains proteins that accumulate aging-related changes throughout life. These lens proteins provide a permanent record of each person's life history of aging. Our eye scanner can decode this record of how a person is aging at the molecular level," explains corresponding author Lee E. Goldstein, MD, Ph.D., associate professor of neurology, pathology & laboratory medicine, psychiatry and ophthalmology at BUSM. The findings appear online in *Journal of Gerontology: Bi- ological Sciences.*

"The framework for clinical implementation of this technology to measure molecular aging is similar to PET brain imaging for Alzheimer's disease, bone densitometry for osteoporosis and serum blood tests for diabetes mellitus," adds Goldstein, who also holds an appointment at Boston University College of Engineering.

The eye scanning technology probes lens protein affords a rapid, noninvasive, objective technique for direct measurement of molecular aging that can be easily, quickly, and safely implemented at the point of care. Such a metric affords potential for precision medical care across the lifespan. he further added.

Researchers Find Link between Sleep and Teenage Depression

Teenagers with very poor sleep experience may be more likely to experience poor mental health in later life, according to a new study. In a paper published in the *Journal of Child Psychology and Psychiatry*, researchers analysed self-reported sleep quality and quantity from teenagers and found that there was a significant relationship between poor sleep and mental health issues.

The team, based at the University of Reading, and Goldsmiths and Flinders Universities, Australia found that among the 4790 participants, those who experienced depression reported both poor quality and quantity of sleep, while those with anxiety had poor quality of sleep only, compared to those teenagers who took part who didn't report anxiety or depression.

Dr. Faith Orchard, a Lecturer in Clinical Psychology at the University of Reading said, "This research shows that there is a significant link between sleep and mental health for teenagers. This study highlights that young people who have experienced depression and anxiety had experienced poor sleep during their teens. There is a difference in average amount of sleep between those who experienced depression, which amounts to going to sleep 30 minutes later each night compared to other participants. Within the data, there were some participants who reported worse quality and quantity of sleep, and the overall picture highlights the need to take sleep much more into account when considering support for teenager wellbeing."

During the study, teens were asked to self-report on sleep quality and quantity over a series of issues, and the researchers found that the control group of teenagers were on average getting around eight hours of sleep a night on school nights and a little over nine and half hours sleep on weekends. Meanwhile, the group who had a depressive diagnosis were getting less than seven and a half hours sleep on week nights and just over nine hours sleep at weekends. A co-author, Professor Alice Gregory from Goldsmiths University, said, "The National Sleep Foundation recommends that adolescents aged between 14-17 years typically need around 8-10 hours of sleep each night. It was seen that the group with a diagnosis of depression fell outside of these recommendations during the week i.e. getting on average 7.25 hours of sleep on each school night"

The depression group were therefore reporting an average total of 3325 minutes of sleep a week compared to the control group who reported 3597, meaning that the depression group were on average getting 272 minutes or three and a half hours less sleep a week. Co-author Professor Michael Gradisar from Flinders University, Australia said: "This longitudinal study confirms that poor sleep during adolescence can deteriorate a teen's mental health if not treated."