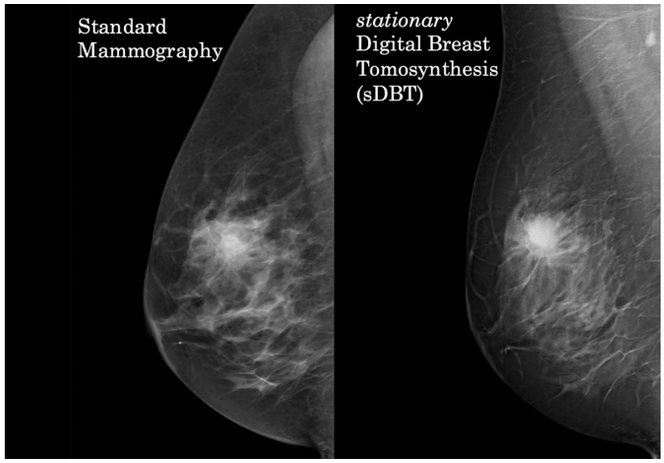
Tomosynthesis Outperforms Digital Mammography in Breast Cancer Detection

Researchers at the University of Pennsylvania in Philadelphia have found that the advantages of digital breast tomosynthesis (DBT) over digital mammography (DM), including increased cancer detection and fewer false positive findings, are maintained over multiple years and rounds of screening. In addition, research showed that DBT screening helped detect a higher proportion of poor prognosis cancers than DM. This study is published in the journal *Radiology*.

DBT, sometimes called 3D mammography, emerged in the last decade as a powerful tool for breast cancer screening. The procedure uses an X-ray tube that moves in an arc and takes low radiation-dose projections of the breast from different angles. Varying the angle allows for multiple data points that can be reconstructed in different ways.

The lead author Emily F. Conant, M.D., professor and chief of breast imaging in the Department of Radiology, Perelman School of Medicine at the University of Pennsylvania in Philadelphia attributed the improved outcomes achieved with tomosynthesis



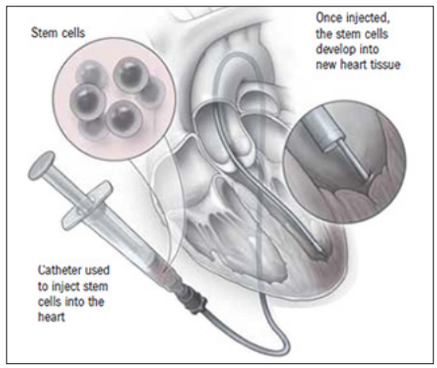
to better visualization of both benign and malignant lesions and a reduction in tissue superimposition.

"With tomosynthesis you can remove some of the overlapping or obscuring breast tissue so that both normal and abnormal findings are better seen," she said. "That provides both improved cancer detection and decreased false positives."

Role of Stem Cells to Repair Damage from Heart Attacks

Researchers at Mayo Clinic have uncovered stem cell-activated mechanisms of healing after a heart attack. Stem cells restored cardiac muscle back to its condition before the heart attack, in turn providing a blueprint of how stem cells may work.

The study, published in *NPJ Regenerative Medicine*, finds that human cardiopoietic cells zero in on damaged proteins to reverse complex changes caused by a heart attack. Cardiopoietic cells are derived from adult stem cell sources of bone marrow.



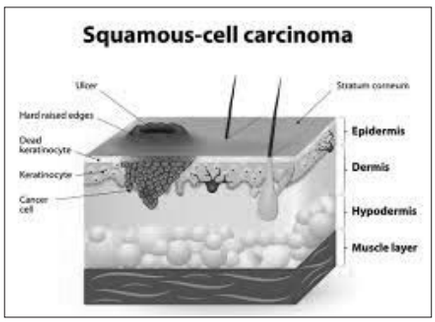
"The extent of change caused by a heart attack is too great for the heart to repair itself or to prevent further damage from occurring. Notably, however, cardiopoietic stem cell therapy reversed, either fully or partially, two-thirds of these disease-induced changes, such that 85% of all cellular functional categories affected by disease responded favorably to treatment," says Andre Terzic, M.D., Ph.D., director of Mayo Clinic's Center for Regenerative Medicine. Dr. Terzic is the senior author of the study.

This new understanding of how stem cells restore heart health could provide the framework for broader applications of stem cell therapy across various conditions.

Genes that Trigger Squamous Cell Carcinoma Growth

A team of researchers affiliated with several institutions in Canada has identified 15 tumor suppressor genes that can trigger rapid growth of human head and neck squamous cell carcinoma (HNSCC) when they mutate. In their paper published in the journal *Science*, the group describes their reverse genetic CRISPR screen, which allowed them to analyze almost 500 long-tail genetic mutations that lead to HNSCC.

HNSCC is the sixth-most common type of human cancer, and has a low survival rate. Prior research has shown that there are hundreds of these so called "long tail" genes, many of which have not been identified. In this new effort, the researchers used a reverse genetic CRISPR screen that allowed them to identify 15 of them.



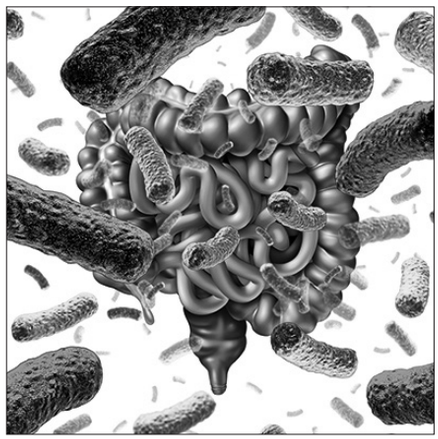
The work focused on tumor suppressor genes that regulate cell division. When they mutate, they lose their function and thus cannot prevent the cells they were regulating from mutating out of control. More specifically, the team focused their attention on the genes in cells that are part of the notch signaling pathway—in particular, those cells that develop into HNSCC tumors. All mammals have four kinds of notch receptors, which are used for communications between cells. The team carried out in vivo CRISPR screening on 484 long-tail gene mutations that had triggered the development of tumors in mice and identified 15 tumor suppressor genes. They then looked for the same types of mutations in human long-tail mutations and were able to calculate percentages for each.

The researchers conclude that 67 percent of human HNSCC cases occur along the notch signaling pathway, which suggests notch inactivation is a distinguishing characteristic of HNSCC.

Researchers Learn How Gut Microbes Can Promote Heart Disease

Cleveland Clinic researchers have identified a gut microbe-generated byproduct – phenylacetylglutamine (PAG) that is linked to development of cardiovascular disease, including heart attack, stroke and death. The study was published in *Cell*. Phenylalanine is an amino acid found in many foods, including plant- and animal-based protein sources like meat, beans and soy. The researchers found that when phenylalanine is broken down by microbes in the gut, it produces a byproduct (metabolite) that ultimately shows up in blood called phenylacetylglutamine (PAG) that contributes to heart disease.

"Over the past decade there has been an increasing amount of data to suggest that gut microbes play a role in health, especially as it relates to heart disease," said Dr. Stanley Hazen, M.D., Ph.D., chair of the Department of Cardiovascular & Metabolic Sciences in Lerner Research Institute and co-section head of Preventive Cardiology & Rehabilitation in the Miller Family Heart, Vascular & Thoracic Institute, who also directs the Cleveland



Clinic Centre for Microbiome and Human Health. "We found that blood levels of PAG contribute to cardiovascular disease risk in a couple of different ways."

Analysing samples from more than 5,000 patients over three years revealed that elevated PAGln levels predicted subjects who went on to experienced adverse cardiac events like heart attack and stroke in the future, and also in those with type 2 diabetes (an independent risk factor for cardiovascular disease). Animal model and microbe transplantation studies suggest the gut microbe-produced PAG can play an important role in driving cardiovascular disease. The researchers also analysed whole blood, platelet-rich plasma and isolated platelets from patient samples to understand how PAG affects cell processes. They then analysed animal models of arterial injury to see how PAG induced cellular changes manifest into disease. Dr. Hazen and his team found that PAG enhanced platelet reactivity and clotting potential, which increases the likelihood of blood clots, a major cause of adverse cardiac events like heart attack and stroke.

"Part of the reason we were so interested to have made this discovery is because we found that PAG binds to the same receptors as beta blockers, which are drugs commonly prescribed to help treat cardiac diseases." said Hazen. Administering beta blockers to animal models with elevated PAG was shown to reverse cardiovascular endpoints driven by PAG. Additionally, researchers found that using gene editing technology or drugs to block PAG receptor signalling significantly reduced clotting activity.

Dairy Milk Associated with Increased Risk of Breast Cancer

New paper finds that even relatively moderate amounts of dairy milk consumption can increase women's risk of breast cancer -- up to 80% depending on the amount consumed. It is published in the *International Journal of Epidemiology*.

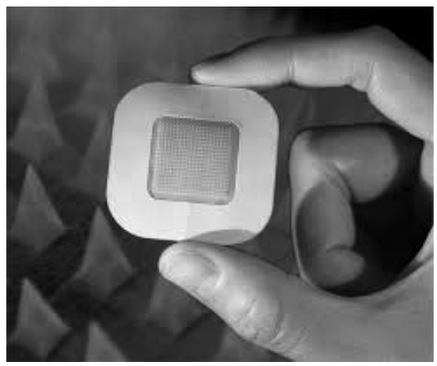
First author of the paper, Gary E. Fraser, MBChB, PhD, said "Consuming as little as 1/4 to 1/3 cup of dairy milk per day was associated with an increased risk of breast cancer of 30%," Fraser said. "By drinking up to one cup per day, the associated risk went up to 50%, and for those drinking two to three cups per day, the risk increased further to 70% to 80%."Current dietary guidelines recommend three cups of milk per day. "Evidence from this study suggests that people should view that recommendation with caution," Fraser said.

Dietary intakes of nearly 53,000 women were evaluated for the study, all of whom were initially free of cancer and were followed for nearly eight years. Dietary intakes were estimated from food frequency questionnaires (FFQ), also repeated 24 hour recalls, and a baseline questionnaire had questions about demographics, family history of breast cancer, physical activity, alcohol consumption, hormonal and other medication use, breast cancer screening, and reproductive and gynaecological history. By the end of the study period, there were 1,057 new breast cancer cases during follow-up. No clear associations were found between soy products and breast cancer, independent of dairy. But, when compared to low or no milk consumption, higher intakes of dairy calories and dairy milk were associated with greater risk of breast cancer, independent of soy intake.

Fraser said the possible reasons for these associations between breast cancer and dairy milk may be the sex hormone content of dairy milk, as the cows are of course lactating, and often about 75% of the dairy herd is pregnant. Breast cancer in women is a hormone-responsive cancer. Further, intake of dairy and other animal proteins in some reports is also associated with higher blood levels of a hormone, insulin-like growth factor-1 (IGF-1), which is thought to promote certain cancers.

Automatic Insulin Delivering Patch

New technology has been making an impact on how diabetics control their blood sugar levels. A combination of a wearable glucometer and insulin pump, connected via a smart control mechanism, can function as an artificial pancreas, but researchers at University of California Los Angeles, University of North Carolina, and MIT have created and now tested an electronics-free wearable patch that automatically releases insulin based on rising glucose levels.



The stick-on device is about the size of a U.S. quarter coin and features dozens of tiny needles loaded with insulin. They're less than a millimeter in length and made out of a polymer that's sensitive to glucose. As glucose concentration reaches a preset level, the needles begin releasing the insulin stored inside of them. When sugar levels come down, the insulin release slows down as well. According to the researchers, the technology is cheap to manufacture and one day people with diabetes will hopefully be able to put on one of these patches in the morning and not worry about their glucose levels throughout the rest of the day.

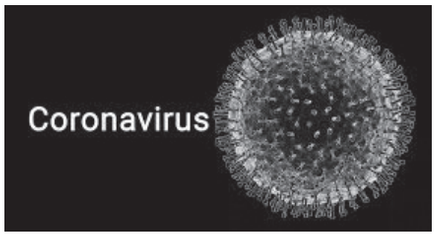
New Policy for Diagnosing COVID-19

The US-FDA has issued a new policy for certain laboratories, seeking to develop diagnostic tests for coronavirus, to facilitate rapid testing capacity in the US.

The recent outbreak of respiratory disease caused by a novel coronavirus has been named SARS-CoV2 and the disease caused by the virus has been named 'Coronavirus Disease 2019' or COVID-19.

SARS-CoV-2 has become a potential public health threat with the rapid spread of the COVID-19. The vi-

rus has significantly impacted the health care systems and led societal disruption.



The availability of testing capabilities in health care settings is crucial for rapid detection of cases, appropriate clinical management and infection control, to address the COVID-19 outbreak, said the US agency.

FDA said that its new policy is aimed at certain laboratories, which develop and use validated COVID-19 diagnostics, prior to the agency's review of their emergency use authorization (EUA) requests.

EUA will permit the use of certain medical products for diagnosis, treatment or prevention of a disease, based on scientific data. The EUA is issued only when the Secretary of Health and Human Services (HHS) realise a public health emergency, which may affect the health and security of citizens.

As rapid detection of COVID-19 cases needs diagnostic testing tools, the FDA has authorised one EUA for COVID-19 for use in the US Centres for Disease Control and Prevention (CDC) and other public health labs in the country.

FDA said that its guidance will provide recommendations for test developers, information regarding test validation, along with notification and interim confirmatory clinical testing.

After the tests are validated, laboratories should contact the FDA, through email, to notify the same, and should submit a completed EUA request within 15 business days of notification.

AI Tool to Help Detect Heart Attacks

Scientists from New York have developed an artificial intelligence (AI) enabled system that can better predict heart attacks and other cardiac events as compared to conventional risk models. The AI based tool uses Machine Learning (ML) algorithms that play a critical role in predicting heart attacks and other cardiac issues.

Coronary computed tomography arteriography (CCTA), that gives highly detailed images of the heart vessels, is a promising tool for refining risk assessment, according to a study published in the journal *Radiology*.

While CAD-RADS is an important and useful development in the management of cardiac patients, its focus on stenoses may leave out important information about the arteries, said Kevin M Johnson, associate professor at the Yale School of Medicine in the US.

Noting that CCTA shows more than just stenoses, Johnson investigated that machine learning (ML) system is capable of mining the myriad details in these images for a more comprehensive prognostic picture.

The researchers compared the ML approach with CAD-RADS and other vessel scoring systems in 6,892 patients. They followed the patients for an average of

nine years after CCTA.

Compared to CAD-RADS and other scores, the ML approach better discriminated which patients would have a cardiac event from those who would not.

If machine learning can improve vessel scoring, it would enhance the contribution of non-invasive imaging to cardiovascular risk assessment.

The ML-derived vessel scores could be combined with non-imaging risk factors such as age, gender, hypertension and smoking to develop more comprehensive risk models. This would benefit both physicians and patients.

Phagenyx System for Overcoming Swallowing Problems After Stroke

Dysphagia, or difficulty swallowing, can dramatically decrease a person's quality of life and lead to poor nutritional intake. Neurological oropharyngeal dysphagia is due to damage to the nerves that control the muscles related to swallowing, often caused by strokes or other neurological

conditions.

The Phagenyx System is a neurostimulation device that helps to restore neurological swallowing control through electrical stimulation. The device delivers small amounts of electrical stimulation to a specific area of the pharynx. This stimulation travels along the nerve pathways from the pharynx to the usually non-dominant swallow control center of the brain, where increased activity results in improvements in

swallow function. In one study of 50 stroke patients with dysphagia, those who received the treatment were able to go home an average of five days sooner than those who did not.

The Phagenyx System consists of a touch-screen base station, which delivers and records optimal stimulations for each patient, plus a catheter with two electrodes through which the stimulation is delivered. The treatment regime consists of 10-minute sessions per day for 3 consecutive days. According to the company, the stimulation is often described as a fizzing or tingling sensation in the throat that can be uncomfortable but not painful.

Affordable Test Kits for Diabetes Launched

Indian Council of Medical Research (ICMR), has developed "SuChek", which is 100% indigenous glucometer suitable for diverse climatic conditions, affordable and validated as per International standards. Another indigenous device developed as a part of ICMR study for HbA1c testing is under validation.

To leverage mobile technology, an application called mDiabetes has been launched for generating awareness, promoting adherence to treatment and inculcating healthy habits among the masses. Media campaigns are undertaken for creating awareness about risk factors of NCDs, including diabetes.

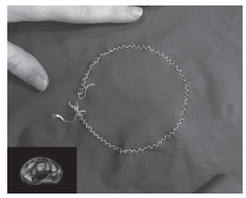
Under National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS), testing, diagnosis and treatment facilities for Diabetes is provided through different levels of healthcare facilities. To tackle the challenge of NCDs including diabetes, 616 NCD Clinics at District level and 3,827 NCD Clinics at Community Health Centre level have been set up across the country under NPCDCS.

MRI Imaging Made Easier with Stretchy Coils

Researchers at Purdue University have developed RF coils that can be flexed and stretched, and that may one day be used within wearable garments that would be worn during MRI exams.

The new coils rely on conductive silver-coated threads that are stitched to a fabric. The threads are applied in an alternating pattern to create a zig-zag pattern that optimizes the signal to noise ratio.

Because the coil is pliable and can be placed close to the body, the imaging quality improves compared with rigid one-size-fits-all devices. MRI imaging of breasts may be particularly impacted, as those organs tend to be of different sizes and densities.



So far, only basic imaging has been attempted using the new coils, but the results are promising already.

SNR [signal to noise] calculations show that this stretchable coil design is comparable to a flexible, standard PCB coil with a 13-30% decrease in SNR depending on stretch degree and direction. *In vivo* human wrist images were obtained using the stitched coil.

Despite the reduction in SNR for this combination of material, there is a reduced percentage of SNR drop as compared to existing stretch coil designs. These imaging results and calculations support further experimentation into more complex coil geometries.

This coil is uniquely stretchable in all directions, allowing for joint imaging at various degrees of flexion, while offering the closest proximity of placement to the skin. The materials provide a similar level of comfort to athletic wear and could be incorporated into coils for a variety of anatomies.

New Study Links Ulcerative Colitis to Missing Gut Microbes

Bacteria make substances called metabolites. The researchers say they discovered that study participants with ulcerative colitis had a depleted supply of a certain family of bacteria, or microbes, called *Ruminococcaceae*.The researchers found that those with ulcerative colitis had depleted levels of a kind of metabolite made by the *Ruminococcaceae* microbes called secondary bile acids.Ulcerative colitis may be tied to a missing gut microbe. That's the conclusion of a study published from researchers at Stanford University in California.

"The studies show that the bacterial finding is quite important since there is significant depletion of secondary bile acids, which we found to be also the case in an experimental model of colitis," said Dr. Aida Habtezion, MSc, co-principal investigator of the study and associate professor of gastroenterology and hepatology at Stanford University.In studies with mice that had colitis, the researchers treated them by giving them an enema with secondary bile acids. "It treated their disease as well as decreased intestinal inflammation significantly. This… suggests that we could treat [ulcerative colitis] with secondary bile acids, applying it locally within the intestine. This impact could be huge, especially since the treatment would be using naturally gut occurring bacteria and/or their metabolites," said Habtezion. In a clinical observation in people with a rare condition known as familial adenomatous polyposis (FAP).The researchers used stool samples to measure the levels of secondary bile acids in 7 people with FAP and 17 people with ulcerative colitis, all of whom had a pouch.The researchers found that the secondary bile acids were significantly lower in the stool samples of people with ulcerative colitis when compared with the participants who had FAP.

In three studies involving mice, the Stanford researchers supplemented the missing secondary bile acids. They found that this reduced the amount of inflammatory immune cells in the mice and also reduced classic symptoms of colitis such as weight loss."Bile acids are considered to have a wide range of effects on metabolism, on gastrointestinal motility and secretion, brain function, and throughout the body. They're a ubiquitous signaling molecule in the body," said Dr. Emeran Mayer, co-director of CURE: Digestive Diseases Research Centre at the University of California Los Angeles. He says it's possible that a lack of secondary bile acids in people with ulcerative colitis could explain a variety of inflammatory symptoms. "Some of these secondary bile acids have anti-inflammatory effects. This could be one of the reasons why they develop this chronic inflammation. Patients with [ulcerative colitis] also have other inflammatory manifestations. They have a skin disease. They have joint problems. They have inflammatory autoimmune eye problems, so one could speculate that the absence or lack of these secondary bile acids throughout the body plays some role in that, but that's just speculation," he said.

Diabetes Drug Shows Potential to Reduce Steroid Treatment Side-Effects

A drug used to treat type 2 diabetes could offer a simple and cheap solution to reduce dangerous side effects of steroid treatment, new research from Queen Mary University of London suggests.The researchers analysed results from over 50 non-diabetic patients on glucocorticoid treatment and found

that patients treated with metformin showed improved clinical outcomes. This included a 30 percent reduction in the rate of infections and lower hospital admissions, in comparison to the placebo group. They also observed that treatment with metformin strengthened the intended anti-inflammatory effects of glucocorticoids and had beneficial results on several cardiovascu-

lar, metabolic and bone markers over the 12-week trial period.The study is published in the journal *The Lancet Diabetes & Endocrinology*.

Professor MártaKorbonits, Professor of Endocrinology at Barts and the London School of Medicine and Dentistry at Queen Mary, said: "Our findings are strikingly positive and suggest that a simple and immediately available intervention, treatment with the diabetes drug metformin, can improve the clinical status of patients on glucocorticoid treatment, even if they do not have diabetes. The results could have a huge impact on the large number of patients on long-term glucocorticoids, improving treatment-related complications and their cardiovascular prognosis.

"Whilst developed countries may be increasing the use of biologics or other steroid-sparing agents, in many other parts of the world there's still a heavy reliance on glucocorticoids. Therefore, doctors and patients have been waiting for a safe, cheap and effective treatment that can prevent the major metabolic complications of these medicines, but does not affect, or could even improve, their anti-inflammatory properties. Our results suggest metformin has the potential to help these patients."

Study Links Chronic Inflammation in Pregnancy to Childhood Neurodevelopmental Delays

Researchers have suspected chronic maternal inflammation may play a role in altering neurodevelopmental trajectories, leading to adverse childhood outcomes. Earlier studies, involving animals, have implicated maternal inflammation as a mechanism causing neurodevelopmental delays in offspring. The study is reported in the journal *Biological Psychiatry*, strengthens evidence that chronic low-grade inflammation, common to these maternal conditions, may be partly to blame for the higher risk of childhood neurodevelopmental delays.

"Our findings suggest a potential therapeutic strategy to reduce prenatal exposure to inflammation and improve childhood neurodevelopment outcomes," said first author Polina Girchenko, PhD, an epidemiologist and postdoctoral researcher in the Department of Psychology and Logopedics at University of Helsinki, Finland. To investigate further, Dr. Girchenko and her colleagues analyzed data of 418 pregnant women and their children aged between 7-to-11-years old in Southern and Eastern Finland. The women's data came from a study called PREDO, which is designed to predict and prevent preeclampsia during pregnancy, so there was a large prevalence of risk factors, including obesity, gestational diabetes, and hypertension. The team evaluated two maternal inflammatory biomarkers i.e. maternal depression and anxiety taken at three time points in the pregnancy.

Results revealed that prenatal exposure to at least one of the maternal metabolic conditions or mental health adversities was associated with a two-fold higher risk of more areas of childhood neurodevelopmental delays and was also linked to persistently high levels of antenatal inflammation. Prenatal exposure to higher levels of two maternal inflammatory biomarkers also increased a child's risk of neurodevelopmental delays. The two biomarkers combined predicted childhood neuro developmental delay more precisely than one alone.

Antibiotics, Corticosteroids Advantageous in COPD Exacerbations

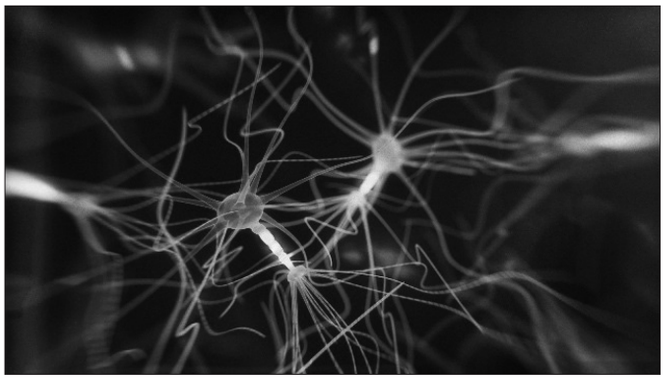
For adults with exacerbation of chronic obstructive pulmonary disease (COPD), antibiotics and systemic corticosteroids are associated with less treatment failure, according to a review published in the *Annals of Internal Medicine*. Claudia C. Dobler, M.D., Ph.D., from the Mayo Clinic in Rochester, Minnesota, and colleagues assessed the comparative effectiveness and adverse events (AEs) of pharmacologic interventions for adults with COPD exacerbation. Data were included from 68 randomized controlled trials enrolling adults with

exacerbation of COPD that compared pharmacologic therapies to placebo, usual care, or other pharmacologic interventions.

The researchers found that independent of severity of exacerbations in outpatients and inpatients, antibiotics given for three to 14 days were associated with increased resolution of exacerbation and less treatment failure at the end of the intervention (odds ratios, 2.03 and 0.54, respectively) compared with placebo or management without antibiotics. Systemic corticosteroids given for nine to 56 days were associated with less treatment failure at the end of the intervention (odds ratio, 0.01) compared with placebo in outpatients and inpatients, but with a higher number of total and endocrine-related AEs. Insufficient evidence was found for other pharmacologic interventions compared with placebo or usual care in inpatients."The results of this systematic review support use of antibiotics and systemic corticosteroids in COPD exacerbations, independent of severity," the authors write.

Increasing Energy Supply in Injured Spinal Cord Nerves Helps Promote Axon Regrowth

A team of researchers from Indiana University School of Medicine, in collaboration with the National Institute of Neurological Disorders and Stroke, have investigated how boosting energy levels within damaged nerve fibres or axons may represent a novel therapeutic direction for axonal regeneration and functional recovery.The study, published in "*Cell Metabolism*," examined three central nervous system injury mouse models to determine how energy levels affect spinal cord injury repair.



Investigators from the Spinal Cord and Brain Injury Research Group at Stark Neurosciences Research Institute--led by Xiao-Ming Xu, PhD--and a team led by Zu-Hang Sheng, PhD at Porter Neuroscience Research Centre at the National Institute of Neurological Disorders and Stroke, part of the National Institutes of Health, collaborated on the research. When a person suffers from a spinal cord injury, the axon, or nerve fibres, regenerate poorly, often leading to neurological impairment and eventual motor paralysis. In this study, Xu`s group found that the injured axons fail to regenerate due to energy deficits and dysfunction in mitochondria.Through three mouse model experiments, they found deleting a protein anchor in the mitochondria--syntaphilin--promoted axonal regeneration and improved recovery of motor functions. They also determined that increasing energy metabolism via creatine treatment promotes axonal regeneration and recovery of function following a spinal cord injury.

Scientists Creates Breakthrough in Treatment for Asthma

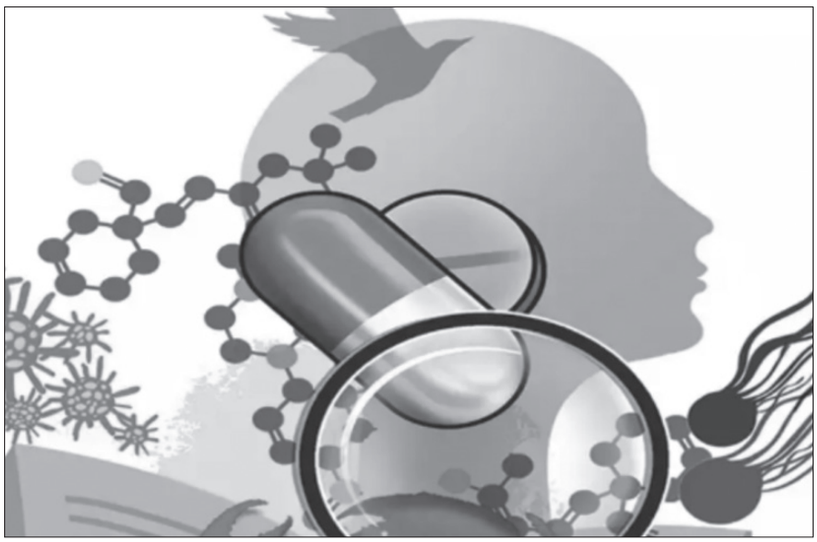
Researchers from Trinity College Dublin have made a breakthrough that may eventually lead to improved therapeutic options for people living with asthma. The researchers have uncovered a critical role for a protein (Caspase-11), which had previously never been implicated in the disease. The findings are reported in *Nature Communications.*

Lead author Zbigniew Zaslona, working with a team led by Luke O'Neill, Professor of Biochemistry in the School of Biochemistry

and Immunology in the Trinity Biomedical Sciences Institute, has been exploring the role that inflammation plays in asthma. Dr. Zaslona said: "Caspase-11 can cause cells to die, which is a very inflammatory event as the cells then release their contents, which can irritate tissues in our body. Caspase-11 is a key driver of inflammation in the airways in asthma. This causes the signs and symptoms of asthma which most notably involves difficulty breathing." Dr. Zaslona added, "A variety of irritants such as airborne pollutants, certain types of pollen and house dust mites can induce cell death in the lungs. Our work suggests that Caspase-11 is sensing these noxious things and causing disease."Professor O'Neill said: "Caspase-11—or it's human

equivalent, which is Caspase-4—has never been implicated in asthma before so we think it holds great promise as a possible target for new drugs to treat this common, debilitating disease."

Researchers can Now Hear Cancer Cells, Says New Study



A new technique developed by scientists will now help in deciphering how millions of individual cells communicate with each other in tumours known as organoids. The technique was developed by researchers which has been published in the Nature Methods journal. This is the first time that scientists have been able to analyse many different signalling molecules at once in individual cells within replicas of patients' tumours. Understanding how cells communicate could reveal how tumours are able to evade the immune system and become resistant to treatments.

This could allow scientists to develop more effective new drugs, by revealing why tumours respond the way they do to treatments. It could also help doctors to select the best course of treatment for each individual patient, by testing treatments on a bespoke replica of a patient's tumour before prescribing them. The technique rapidly analyses each individual cell in an organoid, looking for the presence of specific signalling molecules - messages that cells send to neighbouring cells, telling them how to behave."Organoids are already revolutionising cancer research by allowing us to test whether experimental new drugs are effective on lifelike models of tumours," said lead researcher Dr Chris Tape. "This new technique helps scientists to understand why a treatment works or not, by revealing in unprecedented detail how cells are talking to each other," added Tape.

In order to listen in on cancer cells, the team grew organoids in the lab. These are self-organising 3D structures made up of cancer cells alongside other types of cells, such as immune cells and connective tissue. They mimic the behaviour of cancer in the human body much more accurately than cells grown in a dish. They then modified a complex technique called mass cytometry, which is used to detect and analyse protein molecules. The organoids were broken up into individual cells, then antibodies combined with heavy metal atoms were added.

The researchers tested this technique in bowel cancer cells and were able to simultaneously detect 28 key signalling molecules, across 6 different cell types, in over 1 million cells. They found indications that the cancer cells themselves, as well as immune cells and connective tissue, had 'rewired' the normal signalling networks of bowel tissue, allowing tumours to grow unchecked. "Having a better understanding of this complex communication between cancer cells and other types of cell that make up a tumour could reveal secrets of how cancer comes back after treatment and spreads around the body," said another researcher Dr Emily Armstrong.