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## Highlights

- Indian biotech start-ups attract investments
- Thailand seeks partnership with India
- New method of genetic engineering
- New twists in protein folding
- Scientists create human-pig embryos
- Genes that help crops adapt to change



The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



*The shaded areas of the map indicate ESCAP members and associate members*

#### **Cover Photo**

The genome of *Botryococcus braunii*, being studied for its potential for bio-fuel by Texas A&M AgriLife Research scientists in College Station, has been sequenced.

*(Credit: Texas A&M AgriLife Research / Kathleen Phillips, USA)*

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### Indian biotech start-ups attract investments

According to a report from the Association of Biotechnology Led Enterprises (ABLE), India has over 3,000 entrepreneurs, one third of whom are women, who have started biotechnology firms in the past five years and have raised a combined total of \$2.8 billion or Rs 18,700 crore in the same period. These entrepreneurs have formed 1,022 biotechnology start-ups in the period between 2012 and 2016, with the major hubs for firms being Bengaluru, Delhi, Mumbai and Hyderabad.

The numbers are promising for the biotechnology sector in India, which had identified start-ups as a key driver for growth as early as 2012. With over 470 biotech start-ups being formed in the last two years alone, the possibility of reaching a goal of 2,000 biotechnology startups by 2020 seems possible. ABLE found that of these 1,022 start-ups 57 per cent of them were working in the field of Bio-pharma, 16 per cent in Bio-research services, 10 per cent in Bio-agri and 9 per cent in Bio-industrial sectors.

The report also said that most biotech startups in the country have adopted a combination of products and services offerings. "While bulk of the start-ups have been working with basic biochemical processes, the R&D kind of start-ups are on the rise too. Nearly 16 percent of the start-ups have showed their activity as research and experimental development," the report said.

Source: <http://www.business-standard.com>

### Project to close gaps in Indian gene data

A new initiative involving India, Britain and Singapore hopes to change that by creating a service that will help gather and share genetic information on individuals from across India. Global Gene Corp (GCC), India, was formed four years ago with the intention of studying Indian genomes, and coming up with clinical solutions. It has tied up with a British initiative that has created 'beacons' – essentially, an online service that allows researchers from across the world to find and share particular types of genomic data – to create an India beacon, ggcINDIA.

"The beacon will be hugely significant because it allows us to share with people, and it will allow them to share with us. Maybe, if a scientist has a question, we may have the answers coming out of our beacon," said Dr. Jonathan Picker, at GGC. The expansive campus is home to many organisations working on cutting-edge research on genomics, including the Global Alliance for Genomics and Health, a collaboration of over 400 health care and research institutions that set up the beacon network.

Some of the beacons are based in other countries, including the India beacon, which will be based out of Singapore. The Indian beacon will be the first one to focus on an Asian population. While the collection of genomic data in India is taking place, it has largely been on a sporadic basis to date, with little opportunity to be shared, and fed into, globally.

Source: <http://www.thehindubusinessline.com>

### US approves genetically engineered potatoes

The U.S. Environmental Protection Agency (EPA) and the U.S. Food and Drug Administration (FDA) have approved three types of potatoes genetically engineered to resist the pathogen that caused the Irish potato famine as safe for the environment and safe to eat. The approval gives J.R. Simplot Company, the United States, permission to plant the potatoes this spring and sell them in the fall.

Simplot said the potatoes contain only potato genes, and that the resistance to late blight, the disease that caused the Irish potato famine, comes from an Argentine variety of potato that naturally produced a defense. The three varieties are the Russet Burbank, Ranger Russet and Atlantic. They've previously been approved by the U.S. Department of Agriculture. All three varieties "have the same taste and texture and nutritional qualities" as conventional potatoes, said Doug Cole, at Simplot.

Late blight thrives in the type of wetter conditions that led to the Irish potato famine in the 1840s. Potatoes were a main staple, but entire crops rotted in the field. Historical records say about a million people died of starvation and disease, and the number of Irish who emigrated might have reached several million. The most recent federal approvals apply to Simplot's second generation of Innate potatoes.

Source: <http://www.abcnews.go.com>

### India to map genetic code for TB proclivity

Indian Council of Medical Research (ICMR) conducted a research to find

out some tribes in Madhya Pradesh (MP) which were genetically predisposed to tuberculosis (TB). The ICMR's state-of-art diagnostics van went to tribal areas and a team from the council and MP department of health and family welfare tried to find out answer for the same.

Without concrete studies, the government intervention has had a marginal effect in control of TB among affected tribes. As per an ICMR research paper, there is no nationwide TB burden estimates available for tribal population. One of the most comprehensive data estimates by National Sample Survey for TB carried out between 1955 and 1958 did not include tribal groups. Equipped with sputum microscope and X-ray and a doctor, an ICMR van went in four districts of MP.

Eight vans with ICMR researchers focused on Alirajpur, Barwani, Jhabua and Dindori districts. Experts indicated there is great heterogeneity (diversity) across different tribal groups, which included a sub-category of particularly vulnerable tribes known as primitive tribes that were studied. Tribals face a number of health risks, including infant and maternal mortality, malnutrition, anaemia and malaria

Source: <http://www.timesofindia.indiatimes.com>

## Trials on novel dengue-control

The Indian Council of Medical Research (ICMR) has signed a Memorandum of Understanding (MoU) with Monash University, Australia, to conduct laboratory trials on a global vector-control method, whereby a naturally occurring bacteria is introduced into dengue virus-carrying mosquitoes to "inhibit" viral transmission. The efficacy of the disease-control method will be

tested at Vector Control Research Centre (VCRC) in Puducherry before undertaking any field trial.

"Monash University came up with this strategy six years ago, when trials on introduction of Wolbachia bacteria in aedes aegypti mosquitoes, were conducted in Cairns in Australia. And, results were fine. "Besides Australia, we have partnered with a few other countries – Brazil, Colombia, Indonesia and Vietnam – where such methods are being used. It would now be tested in Indian environment," said Scott O'Neill, at Monash University.

"As part of the MoU, now aedes aegypti strain carrying Wolbachia bacteria is proposed to be imported to India from Monash University, which transfer technology to us at VCRC. We are setting up our labs there, meanwhile, as we are meeting formalities to get the strain imported," said Soumya Swaminathan, at ICMR. *Aedes aegypti* is one of the two main mosquito species which transmit dengue and chikungunya viruses. Delhi saw one of the worst outbreak of the vector-borne disease last year.

Source: <http://www.outlookindia.com>

## Asia preferred destination for clinical trials

Frost & Sullivan, the United States, have released its latest white paper, 'Asia: Preferred Destination for Clinical Trials', with Asia Pacific specialist CRO Novotech. Research from the new white paper revealed Asia is quickly becoming a clinical research powerhouse; facilitated by the availability of vast treatment-naive patient pools, exceptional clinical infrastructure and talent, and low operational costs.

"Asia is an increasingly attractive destination for our biotech clients.

The huge patient pools available in Asia are mainly concentrated in easily accessible urban areas, meaning that trials tend to recruit faster. In addition, the cost of trials in most Asian countries is significantly lower than the West. Now is an exciting time for clinical trials taking place in Asia," said Dr. John Moller, at Novotech.

"There are a number of large, state-of-the-art clinical trial centers in Asia that meet patient enrolment and retention goals, generate high-quality data, and are led by globally recognised key opinion leaders. Regulatory processes in Asia are continuing to become more streamlined. Novotech is actively working with a number of regulatory authorities and clinical trial centres to improve approval processes and timelines," said Dr. Moller.

Source: <http://www.businessnewsasia.com>

## Green nod for biotech park in India

The Indian Ministry of Environment and Forests (MoEF) is expected to give environmental clearance for the much-awaited biotechnology park to be set up at Nalagarh industrial area. The clearance is being sought for the second time as earlier the Department of Biotechnology, which owned this land measuring 165 bighas, had decided to execute the project and it too had sought the clearance. It is supposed to be sought in case forestry land is used for non-forestry purpose as per the provisions of the Forest Conservation Act, 1980.

With all formalities of securing environmental clearance having been completed, the officials of Industries Department are keenly awaiting the ministry's nod to proceed further. "We were hopeful of getting the nod from the ministry



soon as the case had been submitted about two months ago. Once the approval is sought, we will explore the possibility of obtaining funds for the project under various Central schemes,” said Rajesh Sharma, Member Secretary, Industries Department, Nalagarh.

Source: <http://www.tribuneindia.com>

## Australian research receives funding boost

In a bid to further boost research and development, Australian government has announced a fresh series of funding for the country's research activities. The National Health and Medical Research Council (NHMRC) funding of A\$125.3 million (\$95.9 million) includes almost A\$39 million to fight multiple types of cancer facing children and adults. “The government's backing of the country's researchers and scientists will help them to make the next major medical breakthrough,” said Mr. Greg Hunt, Australian Minister for Health.

Peter MacCallum Cancer Centre in is one of the institutions receiving new funding and received A\$13.2 million to continue its research into cancer immunology and immunotherapy. Apart from this, the QIMR Berghofer Medical Research Institute will receive almost A\$20 million to develop the tools needed to eliminate tropical disease, an issue that is still of particular importance and relevance in Queensland, where the center is located.

“These are just a small, but very impressive, snapshot of the 110 projects and 232 researchers that will share in \$125.3 million,” said Mr Hunt. With almost \$43 million in new grants, medical research in New South Wales is receiving a major boost – with a particularly

strong focus on cancer treatments and neuroscience. Other grants are aimed at furthering research into hepatitis C, mental health, cardiac arrests and more therapy areas.

Source: <http://www.biospectrumasia.com>

## Bangladesh to release Bt brinjal varieties

Bangladesh Agricultural Research Institute (BARI) will release three more varieties of the country's first genetically modified (GM) crop—Bt Brinjal, which is infused with a pest-resistant gene. BARI Director General Dr Abul Kalam Azad made the announcement at a workshop on “Bt Eggplant Research and Development,” at a hotel in Dhaka today. “Bt technology is not a panacea. It works only against shoot and fruit borer. For other diseases, we must manage using other mechanisms,” he added. Addressing the occasion, Agriculture Minister Matia Chowdhury said that government is ready to accept any advanced technology keeping in mind the safety of the people.

Currently, around 6,000 farmers in 36 districts are cultivating four Bt Brinjal varieties—BARI Bt (Uttara), BARI Bt (Kajla), BARI Bt (Nayontar) and ISD006 Bt BARI. Farmers from Rajshahi, Rangpur, Pabna and Gazipur started cultivating the Bt Brinjal for the first time in 2014. With the journey of cultivating Bt Brinjal, Bangladesh has joined a group of 29 countries that grow GM crops.

BARI Chief Scientific Officer ASM Mahbubur Rahman Khan gave a presentation on “Performance of Bt Brinjal varieties at Farmers Field” and Prof Anthony M Shelton, director of Feed the Future South Asia Eggplant Improvement Project from Cornell University, also spoke at the function.

Source: <http://www.thedailystar.net>

## Malaysian fund for biotech companies

A RM100 million fund for biotechnology companies to take their businesses global has been launched at Bank Negara Malaysia's (BNM) Karnival Kewangan. The government fund, dubbed the Biotechnology Commercialisation Fund (BCF) 2.0, was launched by Science, Technology and Innovation Minister Datuk Seri Wilfred Madius Tangau. He said the funds, which would be given as soft loans, were projected to assist 30 to 50 companies by the end of 2020.

“The government has taken into consideration that bio-based companies require a longer gestation period. As such, BCF shall be offered at a rate of up to 5 per cent interest, and up to 18 months' grace period on repayment to ease the burden of repayment by companies.” The disbursement of the funds was in its second phase under the 11th Malaysia Plan, which intended to take home-grown bio-based companies to the world stage. Madius said the fund's first phase was rolled out under the Ninth and 10th Malaysia Plan to provide seed capital for bio-based companies to establish their business and market the products. He said 20 of the 278 bionexus status companies were also being groomed to take their businesses to international markets.

Companies would be selected by the Malaysian Bioeconomy Development Corporation and the funds would be disbursed by the Malaysian Industrial Development Finance. Its chairman, Professor Tan Sri Zakri Abdul Hamid, said that BCF was offered through two schemes to accommodate the diverse needs of bio-based companies.

Source: <https://www.nst.com.my>

### Thailand seeks partnership with India

Thailand seeks India's cooperation in a number of sectors, such as aerospace, automation, medical devices, pharmaceutical, bio-technology and IT/ITes, as it strives to transform into a value-based economy. The Thailand Board of Investment (BOI) invited 2,500 investors from across countries to its mega seminar Opportunity Thailand 2017, especially interested in investments from India.

"According to the government's Thailand 4.0 model, 10 target industries have been identified as the new engines of growth to transform the country into a regional innovation hub through the use of creativity, advanced technology, research and development and human resource development. Indian companies can contribute in all these sectors," said Kanokporn Chotipal, at BIO.

The India-Thailand Free Trade Agreement being considered by the two countries could play a big role in boosting trade and investments. "A full-fledged FTA can play a vital role to boost trade for both sides, and will lead to investment as well. Trade volume has increased significantly after the Early Harvest Scheme of Thailand-India was put in place and the ASEAN-India FTA was implemented. Definitely, an FTA can complement each other's economy in the long run," said Chotipal.

Source: <http://www.thehindubusinessline.com>

### Research on zoonotic diseases

Indian Council of Medical Research (ICMR) has signed a Memorandum of Understanding (MoU) with Indian

Council of Agricultural Research (ICAR) for cooperation in the area of zoonoses, anti-microbial resistance, nutrition and pesticide residues. This MoU is expected to strengthen the ties between the two organisations and energise environment of mutual cooperation and collaboration.

"In line with the vision of the Prime Minister Narendra Modi, this MoU gives us an opportunity to work beyond the silos we have created. We have been working very closely with the agriculture sector. There is paucity of data regarding occurrence of zoonotic diseases, their modes of transmission to humans, sensitive and specific clinical and laboratory diagnostic tools. Suitable strategies to prevent them would be of utmost important especially in India," said J P Nadda, Minister of Health and Family Welfare.

Zoonoses have been defined as diseases and infections that are naturally transmitted between vertebrate animals and humans. The effects of zoonoses are accentuated among marginalised groups since the poor tend to have closer interactions with animals and are further removed from accessible health services. With the second largest human population and one of the world's greatest densities of livestock, coupled with socio-cultural characteristics particular to Indian populace present a challenge in itself.

Source: <http://www.business-standard.com>

### Lupin to distribute anti-depressant drug

Drug major Lupin Ltd. India, through its subsidiary Kyowa Pharmaceutical Industry Co Ltd., Japan, has entered into an agreement with Astellas Pharma

Inc., Japan, for exclusive right to distribute and promote extended-release tablets of quetiapine fumarate in Japan. Lupin said "its Japanese subsidiary Kyowa Pharmaceutical Industry Co. Ltd., and Astellas Pharma Inc., have entered into an agreement providing Kyowa the exclusive right to distribute and promote extended-release tablets of quetiapine fumarate in Japan".

Lupin further said: "Astellas submitted a new drug application (NDA) with the Ministry of Health, Labour and Welfare in Japan for extended-release tablets of quetiapine fumarate for the indication of improvement of depressive symptoms associated with bipolar disorder. When Astellas obtains an approval for the new drug application of extended-release tablets of quetiapine fumarate, based on the agreement, Kyowa will exclusively distribute and promote the products in Japan".

"The Astellas agreement reinforces Kyowa's transition toward a hybrid pharmaceutical specialty care company and bolsters its leadership in the CNS space in Japan. Post regulatory approval for the product, we hope to bring to market a new solution for the treatment of depressive symptoms associated with bipolar disorder addressing unmet need for patients as well as provide additional treatment option for health care professionals in Japan," said Dr. Fabrice Egros, at Lupin."

Source: <http://www.timesofindia.india-times.com>

### WuXi AppTec acquires HD biosciences

WuXi AppTec, China, a leading global pharmaceutical, biotechnology and medical device open-access capability and

technology platform, has acquired HD Biosciences (HDB), China, a leading biology focused preclinical drug discovery contract research organization (CRO). After completion of acquisition, HD Biosciences will become a wholly-owned subsidiary of WuXi, and will continue to focus on growing its core competences and providing greater services.

The acquisition will further strengthen WuXi's R&D capability from target validation to lead discovery and optimization, improving and expanding WuXi's open-access enabling service platform. Founded in 2002, HD Biosciences is headquartered in Shanghai with operating facilities in Beijing and San Diego, USA. As a leading biology and pre-clinical service provider, its plate-based pharmacology & screening capability and AGMTM based target validation are industry leading platforms with great reputation.

The company also provides hit identification, lead discovery, in vivo pharmacology and other related services. HD Biosciences has long established close and strategic partnerships with major multinational pharmaceutical companies, biotechs and research institutions worldwide. Over the years, HD Biosciences has been providing award winning services to its worldwide clients, and has won a leading position among the biology CROs in China.

Source: <http://www.prnewswire.com>

## Collaboration for novel COPD treatments

Boehringer Ingelheim, Germany, has collaborated with Weill Cornell Medicine, the United States, to identify new treatment

approaches for chronic obstructive pulmonary disease (COPD) in order to develop novel treatments that could possibly halt or even reverse the progression of the disease process. This collaboration combines Weill Cornell Medicine's unique understanding of chronic airway diseases and experience in the investigation of novel therapeutic concepts for airway repair with Boehringer Ingelheim's expertise in the discovery and development of new therapies for respiratory diseases.

This collaboration is the second collaboration between Boehringer Ingelheim and Weill Cornell Medicine, following prior work in inflammatory bowel disease (IBD). Chronic lower respiratory diseases, which include COPD, are the third leading cause of death in the United States, and approximately 15 million Americans have been told by a healthcare provider that they have COPD. It cannot be cured and current treatment approaches focus on bronchodilation, reducing symptoms and preventing exacerbations to decelerate the downward spiral of the disease.

The goal is to help patients keep as active as possible and overall, improve their quality of life. Boehringer Ingelheim is combining a focus on cutting-edge science with a long-term view enabling the company to create a stable environment for the development of the next generation of medical breakthroughs. This new project adds another building block in this long-term strategy to improve the lives of patients with high unmet medical needs.

Source: <http://www.pharmiweb.com>

## Apollo therapeutics to invest in Cambridge

Apollo Therapeutics, the collaborative venture between three world-leading UK universities and a trio of top global pharmaceutical companies, has invested in and launched the first of its drug discovery programmes in collaboration with academics at each of its partner universities. Apollo, the United Kingdom, was established in January 2016 by AstraZeneca, GlaxoSmithKline, Johnson & Johnson Innovation and the technology transfer offices of Imperial College London, University College London and the University of Cambridge.

It supports the translation of ground-breaking academic science from within these universities into innovative new drug discovery programmes and potential new medicines for a broad range of diseases. According to Apollo, these initial projects represent novel and compelling drug discovery projects, emerging from academic research in areas of high medical need for which Apollo's drug discovery team saw a clear route to value creation.

A total of £8.5m has been committed in milestone project plans. Two further projects are currently being finalised, with multiple others in the evaluation process across all three academic institutions. Apollo's collaborative model is working well with its technology transfer partners – Cambridge Enterprise, Touchstone Innovations (formerly Imperial Innovations) and UCL Business – providing valuable support in sourcing opportunities from within their respective academic institutions.

Source: <http://www.businessweekly.co.uk>



## New method of genetic engineering

A research done by Dr. Huimin Zhao and graduate student Behnam Enghiad at the University of Illinois, the United States, is pioneering a new method of genetic engineering for basic and applied biological research and medicine. Their work has the potential to open new doors in genomic research by improving the precision and adherence of sliced DNA. “Using our technology, we can create highly active artificial restriction enzymes with virtually any sequence specificity and defined sticky ends of varying length,” said Zhao.

Restriction enzymes are an important tool in genomic research: by cutting DNA at a specific site, they create a space wherein foreign DNA can be introduced for gene-editing purposes. This process is not only achieved by naturally-occurring restriction enzymes; other artificial restriction enzymes, or AREs, have risen to prominence in recent years. CRISPR-Cas9, a bacterial immune system used for “cut-and-paste” gene editing, and TALENs, modified restriction enzymes, are two popular examples of such techniques.

Though useful in genetic engineering, no AREs generate defined “sticky ends” – an uneven break in the DNA ladder-structure that leaves complementary overhangs, improving adhesion when introducing new DNA. “If you can cleave two different DNA samples with the same restriction enzyme, the sticky ends that are generated are complementary. They will hybridize with each other, and if you use a ligase, you can stick them together,” explained Enghiad.

Source: <http://www.sciencenewsline.com>

## Novel genomics model for radiation therapy

In a study researchers at Moffitt Cancer Center, the United States, have described a novel genomics model that allows a personalized approach to radiation therapy. Moffitt researchers believe that precision medicine also has a role in radiation therapy and that it could be used to improve patient outcomes and reduce toxicities. The study has been published in *The Lancet Oncology*.

Previously, a team of Moffitt researchers, led by Javier F. Torres-Roca, developed a gene-expression based radiosensitivity index (RSI) that predicts tumor sensitivity to radiation therapy based on the expression of 10 specific genes. The RSI accurately predicts clinical outcomes in many different cancer patients treated with radiation, including breast, head and neck, glioblastoma, pancreas, and metastatic colorectal cancer patients.

The researchers used the RSI to develop a genomics model called the genomic-adjusted radiation dose (GARD) that predicts the therapeutic effect for radiotherapy and could guide radiation dosing to match an individual’s tumor radiosensitivity. This study demonstrates that it is possible to differentiate those patients who may benefit from radiation therapy through genomics approaches.

.Source: <https://www.moffitt.org>

## Genetic basis of pandas eating bamboo

Researchers from Chinese Academy of Sciences (CAS) had uncovered the genetic basis of why giant pandas

and red pandas have evolved independently to possess few shared features such as a bamboo-based diet and false thumb. Despite being classified as carnivores, both giant pandas and red pandas, which separately evolved from meat-eating ancestors and diverged from each other more than 40 million years ago, subsist almost entirely on bamboo – a phenomenon termed convergent evolution, where similar traits arise in two unrelated or distantly related species.

Additionally, both species possess a false thumb, which enables the animals to adroitly grasp bamboo. To uncover the genetic basis of such convergence researchers sequenced the genome of a wild male red panda and compared it with the reassembled genome of the giant panda. The results confirmed that giant pandas belong to the family Ursidae together with polar bears, whereas red pandas belong to the superfamily Musteloidea together with ferrets and that the two species separated 47.5 million years ago, slightly earlier than previous molecular-based estimate of 43 million years ago.

Genome analysis revealed signs of adaptive convergence in 70 genes, including two genes, known as *DYNC2H1* and *PCNT*, that are involved in false thumb development. Furthermore, enzymes involved in dietary protein digestion and amino acid utilisation as well as proteins involved in vitamin metabolism and absorption showed signs of adaptive convergence, suggesting that these genes may have similarly evolved to support and supplement a bamboo-based diet. Giant and red panda genomes also share 10 pseudogenes, or “false” genes, which look like real genes but have no apparent function.

Source: <http://www.asiabiotech.com>

## New tool to map RNA-DNA interactions

Bioengineers at the University of California San Diego, the United States, have developed a new tool to identify interactions between RNA and DNA molecules. The tool, called MARGI (Mapping RNA Genome Interactions), is the first technology that's capable of providing a full account of all the RNA molecules that interact with a segment of DNA, as well as the locations of all these interactions – in just a single experiment.

RNA molecules can attach to particular DNA sequences to help control how much protein these particular genes produce within a given time, and within a given cell. And by knowing what genes produce these regulatory RNAs, researchers can start to identify new functions and instructions encoded in the genome. The findings of the study have been published in the *Current Biology*.

Existing methods to study RNA-DNA interactions are only capable of analyzing one RNA molecule at a time, making it impossible to analyze an entire set of RNA-DNA interactions involving hundreds of RNA molecules. "It could take years to analyze all these interactions," said Tri Nguyen, at UC San Diego. Using MARGI, an entire set of RNA-DNA interactions could be analyzed in a single experiment that takes one to two weeks.

Source: <https://www.biotechnin.asia>

## Changing DNA of entire species

Researchers from University of Kansas (KU), the United States, and colleagues from Cornell University, the United States, have

revealed daunting challenges to changing the DNA of entire populations of species via the most promising techniques available today to produce "gene drive." For decades, scientists have proposed various methods of genetically altering natural populations to solve problems that plague human beings.

"A lot of times nature interferes with how humans would like the world to be. Good examples of that are pests in crops and insect-vectored diseases, like the Zika virus or dengue or malaria," said Robert Unckless, at KU. Scientists gained a new edge with the advent of techniques using "selfish genes" that take advantage of natural elements to cheat genetic "Mendelian inheritance" – whereby offspring of modified and nonmodified organisms are just as likely to inherit traits from either parent – and overcome the fitness cost.

The KU researcher said by tying the mutation for shorter lifespan, or resistance to dengue fever in mosquitoes, for example, to one of these selfish genetic elements that can drive through populations, scientists found a way to overcome fitness cost. Unckless said despite its promise, the approach "more or less stalled out" until two years ago when researchers in California incorporated CRISPR/Cas9 into their gene drive constructs. Suddenly, dreams of creating super mosquitoes to eradicate disease were alive again

Source: <https://www.news.ku.edu>

## Greater understanding of wheat genes

Scientists at Howard Hughes Medical Institute (HHMI), the United States, have developed a much-needed genetic resource

that will greatly accelerate the study of gene functions in wheat. The resource, a collection of wheat seeds with more than 10 million sequenced and carefully catalogued genetic mutations, is freely available to wheat breeders and researchers, and is already aiding in the development of wheat plants with improved traits.

Jorge Dubcovsky, at HHMI, and Betty Moore, at the University of California, the United States, and Cristobal Uauy, at the John Innes Institute, the United Kingdom, led the development of this new genetic tool. To study the function of an individual gene, researchers typically mutate or eliminate that gene to find out what happens – an approach known as reverse genetics. But in a polyploid organism such as wheat, mutations in individual genes often have no apparent effect, because additional copies of the mutated gene compensate for the loss.

Researchers must cross plants with mutations in different copies of the gene several times to obtain a generation of plants in which the gene's function is lost. The gene copies also hide natural variation in the wheat genome that could create opportunities to selectively breed plants with useful traits. Dubcovsky and his colleagues chemically induced random genetic mutations in thousands of wheat seeds and began developing and characterizing their collection of wheat mutant lines more than five years ago.

Source: <https://www.sciencemag.com>

## Researchers identify new genetic mutations

Scientists from the Broad Institute of MIT and Harvard, the United States, have identified new genetic mutations that cause high-level

antibiotic resistance. According to a 2013 report from the Centers for Disease Control and Prevention (CDC), antibiotic-resistant infections kill at least 23,000 people in the United States annually. "Some species of bacteria, including mycobacteria, develop drug resistance as a result of mutations in their genes," said Deborah Hung, at the Broad Institute.

Researchers grew hundreds of cultures of *Mycobacterium smegmatis*, related to the bacterium that causes tuberculosis. The bacteria was exposed to low antibiotic concentrations, where the drugs' microbe-killing effects were slow. The team then monitored the killing of sensitive bacteria while isolating individual wells where mutants developed. The study showed that ribosomal mutations gave the bacteria resistance to many different classes of antibiotics that do not target ribosome.

The ribosomal mutations also increased resistance to heat shock and membrane stress. However, the reprogramming that occurred within the cells in response to the mutations made the bacteria much less sensitive to both antibiotic and non-antibiotic stresses. This suggests that, in species such as *M. smegmatis*, these types of mutations can enhance fitness in multidrug environments and serve as stepping stones toward the development of high-level drug resistance, despite the cost that the mutations have on growth

Source: <http://www.upi.com>

## Genes that help crops adapt to change

A new study done by researchers at the USDA-Agricultural Research Service (ARS), the United States,

analyzed close to 4,500 maize varieties – called landraces – bred and grown by farmers from 35 countries in the Americas to identify more than 1,000 genes driving large-scale adaptation to the environment. "The study provided a powerful catalog of the genes necessary for corn to adapt to different latitudes and elevations across the world," said Edward Buckler at USDA-ARS.

The researchers also identified genes associated with flowering time – the period between planting and the emergence of flowers, which is a measure of the rate of development. Flowering time is a basic mechanism through which plants integrate environmental information to balance when to make seeds instead of more leaves. The study found that more than half of single nucleotide polymorphisms (the most basic form of genetic variation) associated with altitude were also associated with flowering time, revealing these traits are highly linked.

Current technology, including a new rapid experimental design called F-One Association Mapping (FOAM), allowed the researchers to use the collection of diverse maize varieties to figure out which genes were important for adaptation. "With global climate change over the next century, we can directly use this information to figure out what genes are important" to greatly speed up breeding efforts of maize, Buckler said.

Source: <http://www.news.cornell.edu>

## 'Gene-silencing' technique for crop protection

Researchers at the University of Surrey, the United Kingdom and University of Queensland, Australia, have developed a revolutionary new crop protection technique which

offers an environmentally-friendly alternative to genetically-modified crops and chemical pesticides. The breakthrough research, published in *Nature Plants*, could have huge benefits for agriculture and positively impact communities around the world.

Plant pests and pathogens are estimated to reduce global crop yields by 30 to 40 per cent a year, constraining global food security. At the same time, the need for higher production, regulatory demands, pesticide resistance, and concern about global warming driving the spread of disease all mean there is a growing need for new approaches to crop protection.

The researchers have found that by combining clay nanoparticles with designer 'RNAs' (molecules with essential roles in gene biology), it is possible to silence certain genes within plants. The spray they have developed – known as BioClay – has been shown to give plants virus protection for at least 20 days following a single application. When sprayed with BioClay, the plant 'thinks' it is being attacked by a disease or pest insect and responds by protecting itself. The latest research overcomes the instability of 'naked' RNAs sprayed on plants, which has previously prevented them from being used effectively for virus protection. By loading the agents on to clay nanoparticles, they do not wash off, enabling them to be released over an extended period of time before degrading.

The BioClay technology, which is based on nanoparticles used in the development of human drug treatments, has a number of advantages over existing chemical-based pesticides. Since BioClay is non-toxic and degradable, there is less risk to the environment and human health.

Source: <https://www.sciencedaily.com>



## New twists in protein folding

Biophysicists at JILA (a joint institute of the University of Colorado and the National Institute of Standards and Technology [NIST], the United States) have measured protein folding in more detail than ever before, revealing behavior that is surprisingly more complex than previously known. The results suggest that, until now, much about protein behavior has been hidden to science – happening on faster timescales and with finer changes in structure than conventional methods could detect.

The JILA research revealed many previously unknown states by unfolding an individual protein. For example, the JILA team identified 14 intermediate states – seven times as many as previously observed – in just one part of bacteriorhodopsin, a protein in microbes that converts light to chemical energy and is widely studied in research. “The increased complexity was stunning. Better instruments revealed all sorts of hidden dynamics that were obscured over the last 17 years when using conventional technology,” said Tom Perkins, at JILA.

Knowledge of protein folding is important because proteins must assume the correct 3-D structure to function properly. Misfolding may inactivate a protein or make it toxic. Several neurodegenerative and other diseases are attributed to incorrect folding of certain proteins. Over the last 50 years, protein folding has become the focus of a large, interdisciplinary research field. Significantly, bacteriorhodopsin is a membrane protein that resides in the boundary between the inside and outside of cells

Source: <https://www.sciencedaily.com>

## Cutting down on calories

A new research conducted by Brigham Young University (BYU), the United States, suggests while anti-ageing moisturisers only go skin deep, reducing calorie consumption can slow the ageing process at cellular level. The study, published in the journal *Molecular & Cellular Proteomics*, showed that when ribosomes – the cell’s protein makers – slow down, the ageing process slows too. The decreased speed lowers production but gives ribosomes extra time to repair themselves.

“The ribosome is a very complex machine, sort of like your car, and it periodically needs maintenance to replace the parts that wear out the fastest,” said study senior author John Price, Professor at BYU. Price and his fellow researchers observed two groups of mice. One group had unlimited access to food while the other was restricted to consume 35 per cent fewer calories, though still receiving all the necessary nutrients for survival. “When you restrict calorie consumption, there’s almost a linear increase in lifespan,” said Price.

“We inferred that the restriction caused real biochemical changes that slowed down the rate of ageing,” Price added. Despite this study’s observed connection between consuming fewer calories and improved lifespan, Price assured that people should not start counting calories and expect to stay forever young. Calorie restriction has not been tested in humans as an anti-ageing strategy, the researchers pointed out.

Source: <http://www.tribuneindia.com>

## Molecular mechanisms of complex diseases

The Helmholtz Zentrum München, Germany, has published results of their largest genome-wide association study (GWAS) on proteomics to date. An international team of scientists has reported 539 associations between protein levels and genetic variants. These associations overlap with risk genes for 42 complex diseases. GWAS provide an opportunity to associate concentration changes in certain proteins or metabolic products with gene loci. Knowledge of these genes makes it possible to establish connections to complex diseases.

Scientists utilize the fact that to date, hundreds of associations between genetic variants and complex diseases have been demonstrated. These associations are immensely important because they do help uncover the underlying molecular mechanisms. “In the world’s largest proteomics GWAS to date, we worked with colleagues to examine blood samples from 1,000 participants in the KORA study,” said Dr. Gabi Kastentmüller. The team quantified a total of 1,100 proteins.

“We found 539 independent associations between protein levels and genetic variants,” said Dr. Christian Gieger, at the Helmholtz Zentrum München. These overlap with genetic risk variants for 42 complex conditions, such as cardiovascular diseases and Alzheimer’s disease. “Our results provide new insights into the biological processes that are influenced by a very wide range of complex diseases and that can



be used as a basis for the development of new strategies to predict and prevent these diseases," Gieger added.

Source: <http://www.news-medical.net>

### Analysis of human proteomes

Scientists from ProteomeTools, Germany, have reported the synthesis of a library of more than 330,000 reference peptides (termed PROPEL for ProteomeTools Peptide Library) representing essentially all canonical proteins of the human proteome. All peptides were analysed by multi-modal liquid chromatography-tandem mass spectrometry (LC-MS/MS), creating a compendium of millions of very high quality reference spectra (termed PROSPECT for ProteomeTools Spectrum Compendium).

The study illustrates the utility of these reagents and data to verify protein identifications from sparse observations and to predict the behaviour of peptides during liquid chromatography and tandem mass spectrometry. The consortium of TUM, JPT Peptide Technologies (JPT), SAP and Thermo Fisher Scientific has made the vast quantity of data freely available to the scientific community to enable scientists and to foster collaboration around the globe.

Going forward, the ProteomeTools project will generate a further one million peptides and corresponding spectra with a focus on splice variants, cancer mutations and post-translational modifications such as phosphorylation, acetylation and ubiquitylation. Using the new resources, the scientists will study human proteomes with

the aim of turning the vast amount of molecular information on the human proteome into new reagents, equipment, workflows, assays and software to enhance the application of proteomics in both science and medicine.

Source: <https://www.tum.de>

### Database to help uncover 'missing' proteins

A new study done by researchers at Macquarie University, Australia, has provided what it says is a way to help uncover the 2,949 missing proteins in the human body that are currently 'in the shadows' and have yet to be proven to exist. The newly released *MissingProteinPedia* database collates information about proteins in unprecedented ways, allowing Human Proteome Project scientists to gain a deeper understanding of how our proteins work together to make every human an individual.

The database, developed by a collaborative research group led by scientists at Macquarie University, will assist all researchers pinpoint every protein found in the human body and how these interact, with potential repercussions for better understanding many diseases. It could not only help researchers learn more about the location and use – termed 'expression' – of specific proteins in the body but also how they interact to make us human. It will also help to pin down those proteins which are still 'in the shadows', with implications for several diseases.

The tool accelerates the discovery of many missing proteins, particularly those in elusive protein families, with potentially significant

consequences for human disease. "MissingProteinPedia has uncovered substantial evidence for many hard-to-detect proteins for which small amounts of information have taken years to gather. The very fact that we have come so far in such a short time bodes well for our understanding of complex human diseases such as cancer," said Professor Shoba Ranganathan, at Macquarie University.

Source: <https://www.mq.edu.au>

### Researchers analysed alternatives to amyloid

Researchers at Emory University School of Medicine (EUSM), the United States, have performed the first large-scale analysis of post-mortem brain proteins in Alzheimer's, using systems biology tools previously reserved for gene expression data. Comparing samples from Alzheimer's patients with those from healthy elderly controls and patients with other neurodegenerative diseases, the team identified networks of changing proteins that were specific to Alzheimer's.

Putting together protein and gene data, the scientists saw patterns pointing to the importance of inflammation and certain cell types, such as microglia, the brain's scavenger immune cells, which gobble up amyloid plaques. "Our findings make a significant contribution towards understanding the earliest molecular changes at the protein level in human brain, which are linked to Alzheimer's pathogenesis and cognitive decline," said Nicholas Seyfried, at EUSM.

Source: <http://www.news.emory.edu>

### New biological pacemaker

A team of scientists from Israel and Canada have developed a biological pacemaker that overcomes many of the limitations of electrical pacemakers by using human embryonic stem cells to create a type of cardiac cells known as sinoatrial (SA) node pacemaker cells. The breakthrough findings could pave the way for an “assembly line” for an unlimited reservoir of pacemaker cells to treat patients with heart rhythm problems.

The research group included Professor Lior Gepstein of the Technion Faculty of Medicine, Israel, and Rambam Health Care Campus, Israel. The study was led by Prof. Gordon M. Keller from the McEwen Centre for Regenerative Medicine and also included collaboration with Dr. Peter Backx, at the Peter Munk Cardiac Centre, both from the University Health Network, Canada. The team used their knowledge to develop a differentiation protocol for the creation of pacemaker cells from human embryonic stem cells.

“The pacemaker generated from embryonic stem cells exhibits the molecular, electrical and functional properties characteristic of human pacemaker cells,” said Prof. Gepstein. To demonstrate the potential future clinical use of the cells as biological pacemakers, experiments were conducted in the Gepstein laboratory on rats. Pacemaker cell transplants restored normal heart rhythm in 6 of the 7 rats that were tested

Source: <http://www.news-medical.net>

### New malaria vaccine

According to the results of a clinical trial conducted by University

of Tubingen, Germany, in collaboration with the biotech company Sanaria, the United States, a new vaccine for malaria is up to 100% effective when assessed at 10 weeks after last dose. The vaccine called Sanaria PfSPZ-CVac incorporated fully viable – not weakened or otherwise inactivated – malaria pathogens together with the medication to combat them.

The study involved 67 healthy adult test persons, none of whom had previously had malaria. The best immune response was shown in a group of nine test persons who received the highest dose of the vaccine three times at four-week intervals. At the end of the trial, all nine of these individuals had 100% protection from the disease. “That protection was probably caused by specific T-lymphocytes and antibody responses to the parasites in the liver,” said Professor Peter Kremsner.

The researchers analysed the bodies’ immune reactions and identified protein patterns which makes it possible to further improve malaria vaccines. They injected live malaria parasites into the test subjects, at the same time preventing the development of the disease by adding chloroquine, which has been used to treat malaria for many years. This enabled the researchers to exploit the behaviour of the parasites and the properties of chloroquine. Once the person is infected, the Plasmodium falciparum parasite migrates to the liver to reproduce.

Source: <http://www.thehindu.com>

### Scientists create human-pig embryos

According to a study, scientists have for the first time grown embryos that contain a combination of pig and human stem cells, in a step toward one day growing

transplantable organs. However, the research remains at a very early stage and proved more difficult than expected. “This is an important first step. The ultimate goal is to grow functional and transplantable tissue or organs, but we are far away from that,” said Juan Carlos Izpisua Belmonte, at the Salk Institute of Biological Studies, the United States.

Scientists implanted adult human stem cells – known as intermediate induced pluripotent stem cells – into pig embryos and allowed them to grow for four weeks. They terminated the embryos before any human-animal mixture, known as a chimera after the cross-species figures of Greek mythology, could be born. They found that the human cells began to form into muscle tissue in the pig embryos.

The effort involved some 1,500 pig embryos and took four years, far longer than initially estimated, due to the complicated nature of the experiments. The notion of creating human-animal mixtures has stoked controversy and raised ethical questions, particularly since the experiments could theoretically lead to the creation of animals with human qualities, and possibly intelligence. Previous research has produced combinations of rats and mice, which are far more closely related.

Source: <http://www.indianexpress.com>

### Plasmid-based reverse genetics system

Scientists at the Research Institute for Microbial Diseases at Osaka University, Japan, have

reported a new plasmid-based reverse genetics system, to identify which genes are crucial for the infection of rotaviruses. "Reverse genetics allows us to generate artificially engineered viruses. Using reverse genetics, we can mutate a gene and see its effects on the virus", said lead researcher Takeshi Kobayashi.

Reverse genetics systems have been developed for a wide number of viruses to study the conditions in which a virus thrives, but systems for multiple-segmented RNA-based viruses like rotaviruses have proven more difficult. Kobayashi's group solved this problem by including two viral proteins, FAST and VV capping enzyme, into their plasmid-based system. Taking advantage, the researchers tested their system by mutating a single protein of rotaviruses, NSP1, finding that they could decrease viral replication.

Through comprehensive testing of all proteins in future studies, researchers expect to find the key determinants that make rotaviruses a severe public threat. "We could modify the propagation and pathogenicity of the rotavirus", said Kobayashi. Researchers are optimistic about how plasmid-based reverse genetics system will bring new innovations to combat rotaviruses. The system will increase the number of labs working on rotaviruses and lead to more effective vaccines.

Source: <https://www.phys.org>

## Immune cells to fight cancer

After the successful results of the immunotherapy route to cancer treatment, the Cancer Institute (WIA), India, has launched the 2<sup>nd</sup> phase of the clinical trials in

collaboration with National Institute of Immunology (NII), India. The Dendritic cell based Human clinical trials being conducted at WIA, are employing therapeutic grade SPAG9, recombinant protein discovered by Dr. Anil Suri, at NII in support of Department of Biotechnology. SPAG9 is a cancer antigen that could help reset the immune system and prepares it with information to target cancer cells.

"This discovery will connect cancer research and treatment in an integrated manner and will be the first Dendritic Cell based cancer vaccine employing SPAG9 being used for Human Cervical Cancer patients in India and in the world", said Dr. Suri. SPAG9 is a potential biomarker for cervical carcinoma, ovarian cancer, breast and prostate cancer. In immunotherapy, which is a new modality of cancer treatment, the aim is to teach the fighter cells like T-cells to attack cancer cells with this biomarker.

Cancer cells hide from the immune system or block its ability to fight. For the therapy, scientist at the hospital draw cells called monocytes from the patient's blood and modify them into dendritic cells that have efficient antigens to stimulate the 'fighter' cells, or T-cells, in the body. These cells are then exposed to the cancer cell proteins drawn from the patient's tumour. The trial, which is likely to go on for nearly a year, will involve 54 cervical cancer patients.

Source: <http://www.dbtindia.nic.in>

## New HIV vaccine strategy

According to researchers at University of Adelaide's Basil Hetzel Institute for Translational Health Research, Australia, a

recombinant rhinovirus (common cold virus) used along with an injection of DNA-based vaccine can activate the immune system against transmission of human immunodeficiency virus (HIV) via mucosal sites. Results from a mouse model trial may help develop effective mucosal HIV-1 vaccines in the future. Unlike previous vaccine trials, the new approach offers protection at mucosal sites – vaginal or rectal – that are most likely to encounter the virus first.

"Our vaccine approach aims at making the antibodies inhibit the HIV Tat (Transactivator of HIV gene expression) effect, thereby preventing the HIV virus from replicating. We believe that our strategy may be more effective than other studies for three reasons: Our vaccine will elicit mucosal immunity to Gag (The capsid proteins or group specific antigens) and Tat; systemic immunity to Tat; and cell-mediated immunity to Gag and Tat," said lead researcher Eric Gowans. This approach may provide a novel strategy to prevent HIV infection.

Approximately 80 per cent of HIV infections are the result of mucosal transmission. A recent study from Switzerland suggested that although broadly neutralising antibodies to Env (envelope proteins) developed in a small number of patients, these were dependent on a high viral antigen load for many years and viral diversity criteria that cannot be achieved with current vaccine strategies. "Most HIV vaccines are designed to elicit systemic immunity to the Env, which can mutate rapidly. The Gag and Tat proteins are more highly conserved," Gowan added

Source: <http://www.scidev.net>



## Genes that help crops adapt to change

In a recent study, researchers analyzed close to 4,500 maize varieties – called landraces – bred and grown by farmers from 35 countries in the Americas to identify more than 1,000 genes driving large-scale adaptation to the environment. “The study provided a powerful catalog of the genes necessary for corn to adapt to different latitudes and elevations across the world,” said Edward Buckler, a research geneticist at the USDA-Agricultural Research Service and adjunct professor of plant breeding and genetics at the Institute for Genomic Diversity at Cornell.

“It takes a thousand genes to attune a plant for a particular latitude and the elevation where it is grown. That’s what we are mapping here,” said Buckler. The researchers also identified genes associated with flowering time – the period between planting and the emergence of flowers, which is a measure of the rate of development. Flowering time is a basic mechanism through which plants integrate environmental information to balance when to make seeds instead of more leaves. The findings have been published in *Nature Genetics*.

The study found that more than half of single nucleotide polymorphisms (the most basic form of genetic variation), associated with altitude were also associated with flowering time, revealing these traits are highly linked. Current technology, including a new rapid experimental design called F-One Association Mapping (FOAM), allowed the researchers to use the collection of diverse maize

varieties to figure out which genes were important for adaptation

Source: <http://www.news.cornell.edu>

## Curing cancer through mushrooms

Zhenjuntang Biotechnology, Taipei, China, aims to cure cancer through a mushroom -stout camphor fungus, also called “niu zhang zhi” in Chinese. Since its establishment in 2009, the company has dedicated itself to the artificial cultivation of the mushroom, its pharmacological extraction and detailed analysis and the various potential clinical applications it offers. To provide further impetus to its efforts the company has plans to launch a tumor research center in Xiamen and open three chain stores in the cities of Zhangzhou, Quanzhou and Shishi and three cultivation facilities in Xiamen, Sichuan and Anhui.

Zhenjuntang Biotech is also aiming to establish a standardized research and supply chain specialized for the development and cultivation of stout camphor fungus, with DNA profiling and genome sequence mapping for visible traceability. The company plans to work closely with medical research centers in both Taiwan and China to actively develop and manufacture a series of target medicines for the treatment of severe cancers, such as leukemia, liver and gastric cancer. By utilizing the benefits of stout camphor fungus to the fullest, Zhenjuntang Biotech hopes to deliver a brighter future that patients can look forward to.

Source: <http://www.biospectrumasia.com>

## ‘BioClay’ for pest-free crops

Scientists from the University of Queensland (UQ), Australia, have

found a nano-sized degradable clay that could serve as an alternative to chemicals and pesticides, effectively protecting plants from specific disease-causing pathogens. “BioClay – an environmentally sustainable alternative to chemicals and pesticides – could be a game-changer for crop protection,” said Neena Mitter at UQ. The study was recently published in *Nature Plants*.

“In agriculture, the need for new control agents grows each year, driven by demand for greater production, the effects of climate change, community and regulatory demands and toxicity and pesticide resistance. Our disruptive research involves a spray of nano-sized degradable clay used to release double-stranded RNA that protects plants from specific disease-causing pathogens,” said Mitter.

Mitter further stated that the technology reduced the use of pesticides without altering the genome of the plants. Once BioClay is applied, the plant ‘thinks’ it is being attacked by a disease or pest insect and responds by protecting itself from the targeted pest or disease. A single spray of BioClay protects the plant and then degrades, reducing the risk to the environment or human health. Mitter further said BioClay met consumer demands for sustainable crop protection and residue-free produce.

Source: <http://www.dnaindia.com>

## Drought-tolerant genetically engineered maize

According to scientists overseeing the trial for the Water Efficient Maize for Africa (WEMA) project, Tanzania’s first-ever genetically



modified (GM) crop – a field trial of drought-tolerant maize intended to benefit small-scale farmers suffering the effects of climate change – is proceeding well and will be harvested imminently. Dr. Alois Kullaya, technical advisor to the WEMA project, is confident the added drought gene will perform as intended.

However, Kullaya cautioned that a definitive conclusion will need to await scientific data produced by the trial. The researchers expect the overall yield to be higher from plants with the drought-tolerant gene than those without the added trait. Until recently, researchers were unable to conduct field trials in Tanzania because of restrictive legislation termed “strict liability,” which effectively blocked scientific research.

GM WEMA hybrids could be in the hands of Tanzania farmers by about 2021, although Kullaya emphasized the nation’s strict liability laws would need to be further amended before environmental release could take place. The drought-tolerant gene added to the genetically modified maize originates from the soil bacterium *Bacillus subtilis*. Future GM WEMA hybrids will also carry the insect-resistant Bt gene stacked alongside the drought gene, helping farmers to protect against corn borer attacks without applying insecticides to control the pest.

Source: <https://www.geneticliteracy-project.org>

## Mutation makes plants less resistant to stress

Scientists from the University of Western Australia have identified a tiny mutation in plants that can

influence how well a plant recovers from stressful conditions, and ultimately impact a plant’s survival. The researchers, from the ARC Centre of Excellence in Plant Energy Biology, Australia, in collaboration with CSIRO, Australia, carried out a long-term study, following the discovery of the mutation in the genetic makeup of a plant that alters its ability to recover from stressful factors.

In order to survive being rooted to one spot, plants must adapt fast to stresses in their environment, which include pathogens and harsh changes in weather and temperature. The researchers chemically induced stress in the roots of plants, treating them with salicylic acid, to examine the signalling response inside of the plants’ cells. They observed key changes in a particular enzyme (called succinate dehydrogenase) that leads to the complete loss of stress signalling. The impact of this tiny change is an inability of the plant to fight off disease-causing pathogens.

“It is astonishing to realise that the part of the plant that we knew is responsible for energy production, is also involved in how plants cope with stress,” said lead researcher Ms Katharina Belt. Ms. Belt said that a better understanding of how plants deal with stress could open up new opportunities to develop stronger plants for the future. It is hoped that this research will contribute to the science community’s thinking about how to create more efficient and robust plants. This could help to combat food security issues we face in these times of climate change.

Source: <http://www.africabusiness-communities.com>

## A switch for switchgrass

Dazhong “Dave” Zhao, at University of Wisconsin-Milwaukee (UWM), the United States, hopes to build a genetic sterility switch that prevents the modified grass from contaminating the genes of nearby unmodified grasses. Switchgrass is an attractive biofuel feedstock because it can grow on marginal lands of little agricultural value. It also requires less chemical fertilizer than corn, the dominant source of ethanol currently mixed into unleaded gasoline.

“Grasses can grow anywhere and are not in competition with human food production,” said Zhao. In addition to being a low-input and fast-growing crop, switchgrass can survive for 10 years or more, while corn must be sown at the start of each growing season. Last but not least, switchgrass greatly reduces erosion by holding soil in place while providing habitat for birds, insects and other wildlife.

To make biofuel production more sustainable, Zhao and team are tackling the main obstacle keeping genetically modified switchgrass off the commercial market. Zhao is testing this method in *Brachypodium distachyon*, a model grass very similar to switchgrass. He has already demonstrated that his fusion gene, works well in tobacco and Arabidopsis, a flowering plant commonly used as the first test case for genetic modifications. If the fusion gene works well in the model grass, Zhao plans to collaborate with USDA scientists on testing it in switchgrass.

Source: <https://www.uwm.edu>

## Advances in Plant Breeding Strategies: Breeding, Biotechnology and Molecular Tools

The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the development of new crop varieties under different environmental conditions to achieve sustainable food production. The book consists of two volumes. In vitro techniques and their applications in plant breeding are discussed with an emphasis on embryo rescue, somatic cell hybridization and somaclonal variation.

Contact: Agritech Publications/Agricell Report, P.O. Box 255, Shrub Oak, NY 10588, U.S.A. Tel: +1-914-528-3469; E-mail: agritech@agritechpublications.com

## Animal Biotechnology Report 2016

This report describes and evaluates animal biotechnology and its application in veterinary medicine and pharmaceuticals as well as improvement in food production. Knowledge of animal genetics is important in the application of biotechnology to manage genetic disorders and improve animal breeding. Genomics, proteomics and bioinformatics are also being applied to animal biotechnology.

Contact: Research and Markets, Laura Wood, Senior Manager. Tel: +1-917-300-0470; Fax: +353-1-481-1716, E-mail: press@researchandmarkets.com

## Applied Molecular Biotechnology: The Next Generation of Genetic Engineering

This book explains state-of-the-art advances in the rapidly developing area of molecular biotechnology, the technology of the new millennium. The book comprised of chapters authored by leading experts in their respective fields. The book serves as a springboard for new discoveries in molecular biology and its applications.

Contact: Taylor & Francis Books India Pvt. Ltd., 2nd & 3rd floor, The National Council of YMCAs of India, 1, Jai Singh Road, New Delhi 110001, India. Tel: +91-11-4315-5100; Fax: +91-11-2371-2132; E-mail: inquiry@tandfindia.com

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Web: <http://www.icbbs.org>

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