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Highlights

- Engineers design online tool to aid Ebola research
- Bluetongue vaccine for cattle launched in India
- 3D laser printer to print custom DNA
- Researchers study on a new DNA repair protein
- New lens-free microscope to detect cancer
- Plant extract can help smokers quit
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**

Scanning electron micrograph of HIV particles infecting a human T cell.

*(Credit: NIH, USA)*
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* Value Added Technology Information Services
Europe recommends approval for first stem-cell therapy

The European Medicines Agency (EMA), the United Kingdom, have recommended of the first medicine containing stem cells to treat a rare condition caused by burns to the eye. Manufactured by privately held pharmaceutical company Chiesi, Italy, ‘Holoclar’ is a living tissue product made from a biopsy taken from a small undamaged area of the patient’s cornea and grown in the laboratory using cell culture. The recommendation by the European agency has been sent to the European Commission for the adoption of a decision on an EU-wide marketing authorization.

Source: http://www.news.yahoo.com

US endorses first lower-cost biotech drug

A panel of U.S. Food and Drug Administration (FDA), have unanimously endorsed a Novartis, Switzerland, drug which is expected to become the first lower-cost copy of a biotech drug to reach the U.S. market. The panel found that the company’s version of Neupogen is highly similar to Amgen’s original blockbuster biotech drug, which is used to boost blood cells that help cancer patients fight off infections. The non-binding recommendation likely paves the way for a new market of quasi-generic biotech medicines, capable of generating billions in cost saving for insurers, doctors and patients. The FDA is slated to make its final decision on the drug, which Novartis would market as Zarzio, in coming months.

Biotech drugs are powerful, injected medicines produced in living cells which are typically much more expensive than traditional chemical-based drugs. Many newer biotech drugs cost more than $100,000 per year and together they account for nearly 30 percent of all U.S. drug spending. They have never faced generic competition in the U.S. because for decades the FDA lacked authority to approve copies. That finally changed with the Obama health overhaul of 2010, which ordered the FDA to create a system for approving so-called “biosimilars.” That’s the industry term for generic biotech drugs, used to indicate that they are not exact copies of the original biologic medicines.

FDA reviewers said that Novartis’ version of Neupogen has no “clinically meaningful differences” in safety, purity or potency from the original Neupogen, known generically as filgrastim, which treats a dangerous decrease in white blood cells common in cancer patients receiving chemotherapy and related treatments. Novartis has sold its version of Neupogen in Europe under the brand name Zarzio since 2009. The Swiss drug maker also markets two other biosimilar drugs in about 60 countries around the world.

Source: http://www.news.yahoo.com

Engineers design online tool to aid Ebola research

Biomedical engineers at Johns Hopkins University (JHU), the United States, have prepared an Internet site called MuPIT (Mutation Position Imaging Toolkit) Ebola Edition, to help biotech researchers and drug developers seeking to find ways to control the Ebolavirus outbreak, which enables visualization of Ebolavirus gene mutations in the context of three-dimensional protein structures. This first version of the program, which can be accessed online provides visualization of user-specified mutations as well as mutations from 101 viral genome sequences, derived from blood samples taken from Ebola patients in West Africa. It includes functional annotations from the [US] National Institutes of Health’s Universal Protein Resource database and epitope sequences from the [US] National Institute of Allergy and Infectious Diseases’ Immune Epitope and Analysis Resource.

The MuPIT Ebola Edition browser was designed to interact with the new Ebola Genome Browser released by the University of California (UC), the United States. The Ebola Genome Browser offers detailed genetic information about the virus while MuPIT provides three-dimensional views of Ebola’s proteins, making it easier to interpret the functional implications of mutations and their relationship to Ebolavirus evolution and its potential vulnerabilities. “Learning more about the mutations and binding sites can be enormously valuable in developing new and better ways to treat Ebola patients and, ideally, to keep the virus from infecting people in the first place,” said Dr. Rachel Karchin, at JHU.

Source: http://www.biotfueldaily.com

Banana industry in threat of deadly fungal disease

According to the United Nations Food and Agriculture Organization (FAO), without global efforts to respond to a fungal disease affecting banana production, the $36 billion global industry, which provides a source of income or food to some 400 million people around the world, is under threat.
The agency and its partners said $47 million is needed to tackle the new and deadly Tropical Race 4 (TR4) strain of Fusarium wilt disease, part of which would be used to provide swift on-the-ground assistance to countries facing new outbreaks. “Fusarium wilt disease has been a major challenge in the history of banana production. After the devastation TR4 recently caused to bananas in parts of Asia, we consider it as a threat to production globally,” said Clayton Campanhola, FAO’s head of Plant Protection.

Fusarium wilt disease, colloquially known as Panama Disease, brought Indonesia’s banana exports of more than 100,000 tonnes annually to a grinding halt, causing annual losses of some $134 million in revenue in Sumatra alone. Currently, the disease is severely affecting more than 6,000 hectares in the Philippines and 40,000 hectares in China. Following a case in Mozambique in December 2014, which prompted an emergency intervention from FAO, the agency and a group of international experts agreed on a framework for a global intervention-and-prevention programme that would work to prevent outbreaks, manage existing cases and strengthen international collaboration and coordination.

Supporting ongoing research, educating producers and assisting governments in developing country-specific policies and regulation for prevention of the disease would be key aspects of the programme. Fast responses are vital because of the speed with which the disease spreads and the damage it can cause. Once contaminated, an affected field becomes unfit for producing bananas susceptible to the disease for up to three decades. “Bananas are the world’s most consumed and exported fruit. With 85 percent of all bananas being produced for domestic consumption, you can imagine the impact of this disease on food security and livelihoods in developing countries,” said Fazil Dusunceli, a plant disease expert with FAO’s Plant Protection Division.

Source: http://www.un.org

Agri-biotech market sustains growth

In a report released by the international market research organization BCC Research, the United States, the global agricultural biotechnology market hit $27.8 billion as of the end of 2014, sustaining a projected compound annual growth rate of 11 percent. The report has also projected that the global market for agricultural biotechnology could hit $46.8 billion by 2019. “North America and South America are the leading geographic markets for agricultural biotechnology products. South America and Asia are projected to post high growth rates in their markets due to favorable regulatory climate and new transgenic crops.

Biotechnology tools, including DNA sequencing, biochips, RNA interference, synthetic biology and genome editing tools comprise a small but high growth segment of the industry,” the report said. The said tools, enable the development of better plant breeding programs, as well as novel plant traits, thus enhancing downstream agricultural markets. The research pointed out that the market growth for biotechnology tools is aided by the ongoing revolution in genomics, which is rapidly changing how plant breeding is done and is accelerating the discovery and implementation of new plant traits.

In the Philippines, the Southeast Asian Regional Center for Graduate Study and Research (Searca) said the farm income of farmers engaged in biotech crop cultivation had reached some P400 million over a nine-year period. The Philippines had achieved self-sufficiency in yellow corn over the same period, following the introduction of a biotech corn variety in the country. The Searca also said the Philippines’ advances in biotech crop cultivation were key to improving the country’s food security and reduce the country’s reliance on imported corn. The center also confirmed that higher biotech yellow corn harvests have helped the Philippines stop the annual importation of some one million metric tons of this commodity which is used by the livestock industry.

Source: http://www.business.inquirer.net

India to have locally-made low cost rotavirus vaccine

India will soon have a locally manufactured low cost rotavirus vaccine, as a part of the government’s universal immunization programme (UIP). According to a senior official, privy to developments, the vaccine is expected to be available at almost one-fifteenth of the current market price. “Bharat Biotech, India, which has been licensed for manufacturing of this vaccine, has already made 5-6 million doses. However, the requirement is much more to meet the UIP demand. The vaccine is likely to be launched in the market as well as in the UIP in 2015 itself,” said M. K. Bhan, founder chair-
man of the Biotechnology Industry Research Assistance Council (BIRAC), India. Bhan is currently national science professor at Indian Institute of Technology (IIT), Delhi and deeply associated with infant mortality.

According to Bhan, while the locally developed vaccine is almost ready to be launched, the company is waiting for a final approval from the Drugs Controller General of India (DCGI) for the manufacturing plant. The government included the vaccine into UIP in 2014 along with three other vaccines. India developed and licensed its first indigenous rotavirus vaccine in 2013. The vaccine was developed under a public-private partnership (PPP) by the ministry of science and the ministry of health and family welfare, along with Hyderabad-based Bharat Biotech, which conducted clinical studies. The company will supply the vaccine for the public programme at around Rs. 55-60 per dose, while the market price will vary a bit.

Once launched, Rotavac, the monovalent rotavirus vaccine of Bharat Biotech, will compete with GlaxoSmitkline’s Rotarix and RotaTeq, a preventive made by Merck and Co. that protects against five rotavirus strains. Diarrhoea caused by rotavirus kills nearly 80,000 children each year, results in up to 10 lakh hospitalizations, pushing many Indian families below the poverty line. It also imposes an economic burden of over Rs. 300 crore each year on the country. Immunization is considered a key tool to fight severe, dehydrating diarrhoea. The disease kills nearly 800,000 children worldwide each year, mostly in south Asia and sub-Saharan Africa.

Source: [http://www.timesofindia.indiatimes.com](http://www.timesofindia.indiatimes.com)

### €1bn in EU funding for health and raw materials

The European Institute of Innovation and Technology (EIT), Hungary, has selected the consortium InnoLife, Germany, as the Knowledge and Innovation Community (KIC) for EIT Health, which will receive a total funding of €700m for research in the areas of health and raw materials. The funding from the EU will be invested over a period of seven years and will be supplemented by financing from the private sector interested in start-ups and applied research. The European branch of InnoLife will be headquartered in Munich at the Technical University and will coordinate the consortium partners, which consists of 50 core players and 90 associated partners from 16 countries.

The second cluster is RawMatERS, bringing together a consortium of 116 partner organisations from 22 EU member states. RawMatERS specialises in resource efficiency and will receive €410m in funding. The partners include the KGHM Polish Copper S.A., Poland, the RISE Research Institute of Sweden and the University of Milano-Bicocca, Italy. The EIT will provide both clusters with a start-up grant of up to €4m to ensure a smooth and rapid start to their work in the first year.

Source: [http://www.european-biotechnology-news.com](http://www.european-biotechnology-news.com)

### European Commission funds Ebola vaccine projects

The European Commission has announced it will fund eight research projects with a total of €215m. The projects will focus on vaccine development and rapid diagnostics tests and are run under the new Ebola+ programme of the Innovative Medicines Initiative (IMI) and jointly funded by the European Commission and the European Federation of Pharmaceutical Industry and Associations (EFPIA). €114m has come from the EU’s research funding programme Horizon 2020 and the remaining €101m from the pharmaceutical industry. Among the companies involved in the projects are pharma giants GlaxoSmithKline, the United Kingdom, Merck and Johnson & Johnson, the United States. The funding stems from the €280m call for proposals that EFPIA’s specialised group Vaccines Europe and the Innovative Medicines Initiative (IMI) launched back in November 2014. The programme named Ebola+ aims to address the Ebola crisis.

The projects, which include partners from all over the world, in particular from Europe, Africa and the US address various aspects of the crisis. Three projects focus on the development of the Ebola vaccine candidates of drug developers GSK, Merck & J&J

One project will scale up vaccine manufacture by establishing a platform so that sufficient quantities of the vaccine are met. Another project has been set up on compliance with vaccine regimens. And finally, three projects have been established to develop rapid diagnostic tests. Currently, there is no fast, reliable test to determine if someone is infected with the Ebola virus or not. The projects aim to create tests that will deliver reliable results in as little as 15 minutes.

Source: [http://www.european-biotechnology-news.com](http://www.european-biotechnology-news.com)
Bluetongue vaccine for cattle launched in India

Veterinary biological company Immunologicals Ltd., India, has launched first vaccine for bluetongue disease that is increasingly afflicting sheep and goat population across the country. Bluetongue is a viral disease, which has about 24 viral strains prevalent across the world. However, in India, only five strains are mostly prevalent, but its incidence in the cattle population is increasing. "The incidence rate (of this disease) is estimated at 50 per cent of the sheep and goat population in India, with the mortality rate touching almost 30 per cent. India has about 200 million sheep and goat population," said K. V. Balasubramaniam, MD of IIL, an arm of the National Dairy Development Board (NDRB), India.

The incidence of this disease is much higher compared to other susceptible species, including camels, with several outbreaks reported from the sheep belt in southern and western States. There is no preventive mechanism till date and routine drugs are used for treatment. The symptoms include fever and blue tongue. IIL developed this vaccine in collaboration with Indian Council of Agriculture Research (ICAR) and Tamil Nadu University of Veterinary and Animal Sciences (TANUVAS).

"We took about three years to develop this vaccine. Although we are the first to come out with this vaccine, we still have kept the price at an affordable ₹5 per dose," said Balasubramaniam. India would require about 60 million doses to vaccinate the vulnerable sheep and goat population. The vaccine is given to four-month-old cattle population, followed by a booster dose three months later and one dose every year from then. Source: http://www.thehindubusinessline.com

A strategic alliance for cancer immunotherapy

Merck KGaA, Germany, has announced that it will jointly develop and commercialize its MSB0010718C with Pfizer, the United States, in a deal that raises the companies’ presence in cancer immunotherapies— and could net the German drug developer as much as $2.85 billion. The investigational anti-PD-L1 antibody is a potential treatment for multiple types of cancer now in two ongoing clinical studies: A Phase II trial evaluating the antibody in patients with metastatic Merkel cell carcinoma; and a Phase I program in more than 550 patients across were treated with MSB0010718C across multiple types of cancers. Merck KGaA disclosed positive interim Phase I data for the compound showing a complete response and partial responses in patients with non-small cell lung cancer and ovarian cancer.

Pfizer and Merck KGaA will study MSB0010718C both as a single agent as well as in various combinations with Pfizer’s and Merck KGaA’s broad portfolio of approved and investigational oncology therapies. "The global alliance will enable Merck to gain an early entry into the US oncology market as well as to strengthen our existing oncology business in several other important global markets,” said Belén Garijo at Merck KGaA, Germany, has an immunotherapy arm of the National Dairy Development Board (NDRB), India.

"The new alliance with Pfizer comes some two months after Merck KGaA scrapped development of tecemotide (L-BLP25), an investigational MUC1 antigen-specific cancer immunotherapy, as a monotherapy in Stage III non-small cell lung cancer (NSCLC). The company cited disappointing results from a Phase I/II study in Japan that missed its primary endpoint of overall survival (OS), and the secondary endpoints of progression-free survival (PFS), time to progression (TTP), and time to treatment failure.

Pfizer had hoped to emerge as a major cancer immunotherapy player earlier by acquiring AstraZeneca, until that deal fell through amid concerns about potential layoffs in the U.K., and inversion mergers in the U.S. As part of their new alliance, Merck KGaA and Pfizer also agreed to advance Pfizer’s already-marketed anti-PD-1 antibody Xalkori® (crizotinib) into Phase I trials for additional indications. Pfizer agreed to pay Merck KGaA $850 million upfront, with Merck KGaA also eligible to receive regulatory and commercial milestone payments of up to approximately $2 billion. Both companies agreed to jointly fund all development and commercialization costs and to share equally all revenues obtained from selling any anti-PD-L1 or anti-PD-1 products generated from their collaboration. Source: http://www.genengnews.com

Saliva screening test for Ebola under development

Ceres Nanosciences Inc. (Ceres), the United States, has announced the commencement of a development program, funded by the Gates Foundation, to use Ceres’ Nanotrap® particle technology to develop a new method of detecting the presence of the Ebola virus in saliva. During the 4-month performance of this program, Ceres
$570m deal to develop ultra-rapid insulin

Eli Lilly, the United States, has entered a licensing collaboration with Adocia, France, to develop ultra-rapid insulin, known as BioChaperone Lispro, for the treatment of patients with type 1 and type 2 diabetes. Adocia will get $50 million upfront with the potential to receive up to $280 million in development and regulatory milestones, and $240 million in sales milestones and royalties. The U.S. drugmaker will also reimburse Adocia for certain R&D expenses and assume responsibility for future development, manufacturing, and commercialization of BioChaperone Lispro.

The companies will co-develop the therapy, currently in Phase I/II studies, with the goal of optimizing glucose levels during and after meals. Benefits of BioChaperone Lispro could include better flexibility in insulin injection timing, lower variability of post-meal blood glucose elevations, lower rates of hypoglycemia, and overall improved glucose control. Eli Lilly has had a long-term commitment to developing treatments for diabetes since 1923 when it introduced the first commercial insulin. Currently, the company has two top ranked diabetes drugs — Humalog® and Humulin® — ranked at number 4 and 10, respectively, on GEN’s list of Top 20 Diabetes Drugs.

Source: http://articles.economictimes.indiatimes.com

Pharma companies ink pact for HIV drug development

Pharma major Strides Arcolab, India, has entered into a licensing agreement with Gilead Sciences Inc., the United States, to manufacture and distribute latter’s low-cost Tenofovir Alafenamide (TAF) product used for HIV treatment in developing countries. Strides Arcolab has entered into a licensing agreement with Gilead Sciences Inc., under which Gilead has extended non-exclusive rights to Strides to manufacture and distribute Tenofovir Alafenamide (TAF), both as a single agent product and in combination with other drugs. Strides said that the license being granted to it extends to 112 countries.

As a part of the licensing agreement, pending US Food and Drug Administration (US-FDA) approval of Gilead product, Strides will receive technology transfer from Gilead, enabling Strides to manufacture low cost versions of TAF for developing countries. TAF and TAF-based regimens are investigational products in the US and have not yet been determined safe and efficacious in humans.

Source: http://articles.economictimes.indiatimes.com

E-Biosafety Training Platform

The United Nations Industrial Development Organization (UNIDO) e-Biosafety Training Platform offers long-term in-depth training to developing country researchers, government and industry professionals involved in the assessment and management of risks related to biotechnology-derived products and services. The programme is delivered in modular form covering the entire range of disciplines related to bio safety. For more information, access: http://binas.unido.org
Largest collection of genomic data ever released

Developed jointly by European Bioinformatics Institute (EMBL-EBI), the United Kingdom, and the Wellcome Trust Sanger Institute, the United Kingdom, has release the largest collection of helminth genomic data ever assembled. This new resource will be a major asset in the fight against parasitic worms, which infect more than one billion people worldwide. Roundworms, whipworms, hookworms and other helminths produce a disease burden that exceeds that of malaria or tuberculosis. The Helminth Genome Initiative, which has provided much of the data for the WormBase-ParaSite, is a global community of researchers dedicated to reducing this disease burden by identifying weaknesses in the worms’ genetic code.

"Helminth researchers are caught in a catch-22 situation where, because there is a lack of resources, it’s difficult to secure research funding, which means progress can be slow. There’s a danger that this situation will cause a terminal decline in the field; a pretty dangerous scenario when many of these worms cause diseases that affect millions,” said Dr. Matt Berriman at Sanger Institute. The public database, which is funded by the Biotechnology and Biological Sciences Research Council (BBSRC), the United Kingdom, contains 89 draft genome sequences for a total of 82 helminth species. Of the 59 unpublished genomes, 44 were sequenced at the Sanger Institute as part of the 50 Helminth Genomes project, nine genomes were sequenced at Washington University, the United States, and the remaining six were sequenced by other helminth researchers throughout the world.

WormBase-ParaSite combines these data to help researchers identify genetic similarities in different helminth species that share certain traits, such as the ability to invade through human skin. This approach will speed up the difficult, costly search for candidate genes. Currently, many of the genomes in WormBase-ParaSite are early drafts and, accordingly, highly fragmented. Contributions from the helminth research community will gradually fill these gaps as data emerges from new research, building a robust resource for future investigation. “In human biology, we take things like access to large genomic data sets for granted. This just hasn’t been available for helminth research before now. This capacity-building project will catapult the field into a new era of comparative work, boosting funding and research in this crucial area,” said Dr. Paul Kersey, Team Leader at EMBL-EBI and joint Principal Investigator for WormBase-ParaSite.

Source: http://www.phys.org

3D laser printer to print custom DNA

Austen Heinz, the founder of Cambrian Genomics, the United States, has invented a 3D laser printer that prints custom DNA sequences, which has become the foundation of his new startup company. The idea behind the company is that everything is alive is simply code. The primary nucleobases adenine (A), cytosine (C), thymine (T), and guanine (G) form base pairs in a specific order to create strands of DNA. Cambrian Genomics uses proprietary technology to synthesize, sequence, recover, and assemble ACTG to create custom DNA for customers. “Everything that’s alive can be made better and more useful to humankind, including human cells. Plants can be made to take out much more carbon out of the atmosphere. We can make humans that are born without disease that can live much longer. We can make humans that can interface directly with computers by growing interfaces into the brain,” said Heinz.

The process starts with the chemicals ACTG being individually flowed over an array. The array is an electro chip that has around 94,000 electrodes on it. Each electrode, when activated, creates an acid locally on top of each electrode that will remove the protective cap from the last letter in the strand. As the capped letters are flowed in, they will only bind with the unprotected strands. The chemical passes over the other electrodes that were not activated, only binding with the unprotected strands on the specific, activated electrodes. That process is imperfect, which is why the DNA goes on to a sequencer that determines whether it is good or bad. Then, a laser causes an explosion creating a plasma on the surface of the glass, catapulting the DNA sequence into a collection plate. From there a bunch of robots combine these 100 letter blocks and to make them become 100 to 30,000 letter strands.

That is the shipped product. It is a set of wells on a plastic plate containing a dry chemical polymer that customers add water to before they put it inside of cells. While coding a human from scratch is a ways off, what can be written is growing exponentially. Still, there are ethical concerns due to the fact that potentially deadly diseases come from small sequences. Cambrian Genomics is connected to a database where users can drag and drop genes to create their product. The problem comes when users
search outside the database and download sequences for diseases such as Ebola. To counteract these potential threats, Cambrian Genomics uses a program that looks for homology between the sequences to determine what the sequences represent.

Source: http://www.news.yahoo.com

**Study to analyse genetic drivers of thyroid cancer**

The Cancer Genome Atlas (TCGA) Research Network, the United States, recently analysed a comprehensive study of the genomes of nearly 500 papillary thyroid carcinomas (PTC), the most common form of thyroid cancer has provided new insights into the roles of frequently mutated cancer genes and other genomic alterations that drive disease development. The findings also may help improve diagnosis and treatment. Investigators identified new molecular subtypes that will help clinicians determine which tumors are more aggressive and which are more likely to respond to certain treatments. Their findings confirmed that PTCs are driven primarily by mutations in one of two cancer-associated genes: BRAF (and a particular mutation, V600E) or RAS. The work also detailed many differences between the two genetic types, particularly in signaling pathways that promote tumor development and growth.

The researchers developed a scoring system to reflect gene expression in the two PTC types, allowing them to characterize tumors and determine both the pathway a tumor uses to send signals and its relative aggressiveness. Where a tumor lies on a scale — called its thyroid differentiation score — can have important treatment implications because different tumor signaling properties can mean the cancer responds differently to particular therapies. The study also showed that BRAF-driven tumors have a broader range of genetic complexity than previously thought, with distinct subtypes. The results suggest a need for a new classification system that more accurately reflects underlying genetic characteristics of the cancer. The researchers, led by Thomas Giordano, University of Michigan, the United States, Ann Arbor, and Gad Getz, Broad Institute of MIT and Harvard, Cambridge, Massachusetts, have reported their results in the journal *Cell*.

Source: http://www.genome.gov

**Bird genomes abound**

In a research project scientist from University of Bristol, the United Kingdom, Duke University Medical Center (Duke), the United Kingdom, and the University of Copenhagen, Denmark, studied the genomes of a staggering 45 bird species which were sequenced, analyzed, and compared. This mammoth project has brought the total number of completed avian genomes to just over 50, of which 48 have now been computationally aligned and evaluated to create the most accurate avian evolutionary tree to date. "The relationships of modern birds have proved very hard to disentangle, and they are still much debated.

The new work provides the first authoritative, consensual resolution of the problem. "The key to the new endeavor is that these studies are based on whole genome analyses," said Mike Benton at the University of Bristol.

"The most likely reason that branches of the avian evolution-ary tree have been so muddled is that birds basically underwent a rapid radiation of speciation soon after the mass extinction of dinosaurs. This large-scale extinction likely caused by an asteroid hitting Earth also wiped out most bird species. But a few closely related species remained, which then spread the globe filling ecological niches with little competition, an evolutionary Big Bang. The surviving species were so closely related to each other that now, 66 million years later, it is hard to figure out their deep relationships, said Erich Jarvis, a neurobiology professor at Duke. But deciphering the tree was important. It wasn’t sequencing those 45 genomes that was difficult, it was the subsequent analysis. The team developed new algorithms to handle all the data.

Altogether, the analysis required the equivalent of 400 years of single-processor computing time. The results of this effort provide not only the most precise genetic history of birds to date, but also reveal why avian genomes tend to be small compared to those of other vertebrates: because they have lost a lot of genes and have far fewer repeat sequences.

Furthermore, the data show that, compared with mammals, both the nucleotide sequences and the order of genes tend to be more conserved, perhaps because of the smaller number of repeat sequences, which would reduce the possibility of homologous recombination events. Researchers found how birds lose their teeth, how their sex chromosomes evolved, and how avian genes involved in vocal learning have convergently evolved in distinct lineages of birds, as well as in humans.

Source: [http://www.the-scientist.com](http://www.the-scientist.com)
A team of students create designer ‘barrel’ proteins

Proteins are long linear molecules that fold up to form well-defined 3D shapes. These 3D molecular architectures are essential for biological functions such as the elasticity of skin, the digestion of food, and the transport of oxygen in blood. Despite the wide variety of tasks that natural proteins perform, they appear to use only a limited number of structural types, perhaps just a few thousand or so. These are used over and over again, being altered and embellished through evolution to generate many different functions. Now a team from University of Bristol, School of Chemistry and School of Biochemistry, the United Kingdom, headed by Professor Dek Woolfson, have addressed this by designing manmade protein molecules from scratch.

Although the design principles used are learnt from natural proteins, from which the team develops rules for assembling their proteins, some of the designed protein shapes are completely new and have not been observed in nature yet. Specifically, the scientists have made proteins with central cavities, or channels, running through them. The team believes that these will be useful in designing new protein functions, such as catalysts for breaking down fats, or molecules that span cell membranes to allow new communications between cells. “This is a really exciting time to be exploring what can be done with biological principles and building blocks to make new and useful molecules, but completely outside the context of biology itself,” said Professor Woolfson.

This work has been highly collaborative combining computational modelling, peptide chemistry, biophysics and protein X-ray crystallography across the Schools of Chemistry. It is part of the growing effort in the new field of synthetic biology at the University of Bristol, which has recently been awarded £13.5 million to establish BrisSynBio, a BBSRC/EPSRC-funded Synthetic Biology Research Centre.

Source: http://www.proteomicsnews.com

Researchers study on a new DNA repair protein

Mutations in the gene that encodes BRCA2 are well known for raising the risk of breast cancer and other cancers. Although the protein was known to be involved in DNA repair, its shape and mechanism have been unclear, making it impossible to target with therapies. Now researchers at Imperial College, the United Kingdom, and the Cancer Research UK London Research Institute, purified the protein and used electron microscopy to reveal its structure and how it interacts with other proteins and DNA. The results have been published in Nature Structural and Molecular Biology. The study was led by Professor Xiaodong Zhang at Imperial College and Dr. Stephen West at the London Research Institute.

Around one in 1000 people in the UK have a mutation in the BRCA2 gene. The lifetime risk of breast cancer for women with BRCA2 mutations is 40 to 85 per cent, depending on the mutation, compared with around 12 per cent for the general population. Many women who test positive for BRCA1 and BRCA2 mutations choose to undergo surgery to reduce their risk of breast cancer. Mutations can also raise the risk of other cancers, such as ovarian, prostate and pancreatic cancer. The BRCA1 and BRCA2 genes encode proteins involved in DNA repair. The DNA in our cells undergoes damage thousands of times a day, caused by toxic chemicals, metabolic by-products and ultraviolet radiation. Repair mechanisms correct most of this damage, but unrepaired damage can lead to cancer.

“This study improves our understanding of a fundamental cause of cancer. It’s our first view of how the protein looks and how it works, and it gives us a platform to design new experiments to probe its mechanism in greater detail,” said Professor Zhang. The study found that BRCA2 proteins work in pairs – which the researchers found surprising since BRCA2 is one of the largest proteins in the cell. BRCA2 works in partnership with another protein called RAD51. BRCA2 helps RAD51 molecules to assemble on strands of broken DNA and form filaments. The RAD51 filaments then search for matching strands of DNA in order to repair the break. The findings showed that each pair of BRCA2 proteins binds two sets of RAD51 that run in opposite directions.

Source: http://www3.imperial.ac.uk

Scientists maximize intensity of protein based lasers

Scientists from the Wellman Center for Photomedicine at Massachusetts General Hospital, the United States, and University of St. Andrews, the United Kingdom, has shown that use of fluorescent proteins in a solid form rather than in solution greatly increases the intensity of light produced, an accomplishment that takes advan-
tage of natural protein structures surrounding the light-emitting portions of the protein molecules. Led by investigators Dr. Seok Hyun Yun and Dr. Malte Gather, this is the same research team that developed the first laser based on a living cell. “We found that the size and shape of fluorescent proteins are such that their brightness is at the maximum when they are in their most concentrated form. It is almost as if, Nature had optimized these proteins for maximal brightness. We used this property to develop several miniature solid-state lasers,” said Yun.

The current study was designed to investigate the development of a laser based on fluorescent proteins in a solid state, which would be easier to incorporate into other devices. The portion of a fluorescent protein molecule that actually emits light called a fluorophore is enclosed in a cylindrical protein structure that keeps the fluorophores of adjacent molecules from getting too close to each other, which would reduce the amount of light lost to a phenomenon called quenching. To investigate their hypothesis that these structural features prevent quenching in naturally occurring fluorescent proteins, the researchers measured the intensity of light emitted by green fluorescent protein (GFP) solutions of varying concentrations and by a thin film of dried GFP, and comparing those results with the light produced by an artificial fluorescent dye.

While at lower concentrations increasing the levels of both GFP and the dye produced increasing fluorescence, at a certain point the amount of light emitted by the artificial dye began to drop off until no light was detectable from the solid form of the dye. In contrast, the fluorescence of GFP continued to intensify with higher concentrations and maximum brightness was achieved by the solid form, supporting the theory that the fluorophores of GFP and other natural proteins are protected against quenching. With this evidence, the investigators first constructed a laser device in which a thin film of dried GFP is sandwiched between two highly reflective mirrors. Compared with devices utilizing lower concentrations of GFP in solution, the solid-state GFP laser required 10 times less excitation energy to start lasing.

Source: http://www.nanowerk.com

Scientists create new protein-based material

Scientists at the University of California (UC), the United States, have taken proteins from nerve cells and used them to create a “smart” material that is extremely sensitive to its environment. This could give birth to a flexible, sensitive coating that is easy and cheap to manufacture in large quantities. This work could lead to new types of biological sensors, flow valves and controlled drug release systems. Biomedical applications include microfluidic devices that can handle and process very small volumes of liquid, such as samples of saliva or blood, for diagnostics. “This work represents a unique convergence of the fields of biomimetic materials, biomolecular engineering and synthetic biology. We created a new class of smart, protein-based materials whose structural principles are inspired by networks found in living cells,” said Dr. Sanjay Kumar, associate professor at UC.

The research team set out to create a biological version of a synthetic coating used in everyday liquid products, such as paint and liquid cosmetics, to keep small particles from clumping together. The synthetic coatings are often called polymer brushes because of their bristle-like appearance when attached to the particle surface. To create the biological equivalent of a polymer brush, the researchers turned to neurofilaments, pipe cleaner-shaped proteins found in nerve cells. By acting as tiny, cylindrical polymer brushes, neurofilaments collectively assemble into a structural network that helps keep one end of the nerve cell propped open so that it can conduct electrical signals.

The research team noted that neurofilaments are good candidates for protein brushes because they are intrinsically disordered proteins, so named because they don’t have a fixed 3-D shape. The size and chemical sequence of these hair-like proteins are far easier to control when compared with their synthetic counterparts. Researchers found that the protein brushes could be grafted onto surfaces, and that they dramatically expand and collapse in reaction to changes in acidity and salinity. Materials that are environmentally sensitive in this way are often referred to as “smart” materials because of their ability to adaptively respond to specific stimuli. The finding have been published in the journal Nature Communications.

Source: http://www.proteomicsnews.com

Biosafety database

The database is an open access searchable collection of scientific studies on biosafety and risk assessment in biotechnology.

For more information, contact:
E-mail: Biosafety-data-join@icgeb.org
http://bibliosafety.icgeb.org
New lens-free microscope to detect cancer

Researchers from the University of California, Los Angeles (UCLA), the United States, have developed a lens-free microscope that can be used to detect the presence of cancer or other cell-level abnormalities with the same accuracy as larger and more expensive optical microscopes. According to the researchers, the invention could lead to less expensive and more portable technology for performing common examinations of tissue, blood and other biomedical specimens. It may prove especially useful in remote areas and in cases where large numbers of samples need to be examined quickly. “This is the first time tissue samples have been imaged in 3D using a lens-free on-chip microscope,” said Aydogan Ozcan at UCLA.

The invention is the first lens-free microscope that can be used for high-throughput 3-D tissue imaging – an important need in the study of disease. The device works by using a laser or light-emitting diode to illuminate a tissue or blood sample that has been placed on a slide and inserted into the device. A sensor array on a microchip – the same type of chip that is used in digital cameras, including cellphone cameras - captures and records the pattern of shadows created by the sample. The device processes these patterns as a series of holograms, forming 3-D images of the specimen and giving medical personnel a virtual depth-of-field view. An algorithm colour codes the reconstructed images, making the contrasts in the samples more apparent than they would be in the holograms and making any abnormalities easier to detect.

Ozcan’s team tested the device using Pap smears that indicated cervical cancer, tissue specimens containing cancerous breast cells, and blood samples containing sickle cell anaemia. In a blind test, a board-certified pathologist analysed sets of specimen images that had been created by the lens-free technology and by conventional microscopes. The pathologist’s diagnoses using the lens-free microscopic images proved accurate 99 percent of the time. Another benefit of the lens-free device is that it produces images that are several hundred times larger in area, or field of view, than those captured by conventional bright-field optical microscopes, which makes it possible to process specimens more quickly.

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

Researchers develop haemoglobin based blood substitute

A team of researchers at Department of Biochemistry, Delhi University (DU), India, led by Professor Suman Kundu, has applied for a patent for laboratory-made haemoglobin, which enjoys several advantages as a blood substitute. According to Kundu, The lab developed haemoglobin is a safe and portable blood substitute. It has multiple advantages like cheaper cost of production, long shelf life, blood group neutral, no associated risk of transmission of diseases and easy to store. “Traditional blood transfusion practice is to use blood donated by benevolent human individuals (donor). However, the worldwide supply of donated blood for transfusion therapy is always woefully short than the demand due to either a general aversion to blood donation or inability to donate blood due to medical reasons,” said Kundu.

Scientists have thus been forced to look for alternatives to donated blood, which are called “artificial blood substitutes”, “artificial haemoglobins” or “haemoglobin based oxygen carriers (HBOC)”. Researchers across the world have been trying for years to develop a portable blood substitute that functions as an oxygen carrier, is stable enough to be stored for prolonged periods in different conditions. The protein (haemoglobin) easily releases a chemical compound called ‘heme’ due to its breakdown under physiological conditions. Heme is severely toxic to the body when released from the haemoglobin molecule. In India, one unit of blood (350-400 cc) costs around Rs. 500-800, while this blood substitute will cost approximately 10-12 percent less than that and can be stored for three years.

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

Scientists find drug candidate for TB and malaria

Scientists at International Centre for Genetic Engineering and Biotechnology (ICGEB), India, have created a common drug candidate capable of tackling tuberculosis (TB) and malaria—the nation’s two most common health problems, though it will take several years before the breakthrough in the laboratory is translated into a medicine. A common drug against the two big killer diseases was a dream for scientists for years. But biologists have successfully tested the candidate, a peptide (type of protein) molecule called M5in the laboratory and found that it reduces the diseases load by 80 percent in TB and malaria.

“It is promising, but several years of research is required before we...
come anywhere close to trying this molecule as a drug,” said Anand Ranganathan at ICGEB.

When studied in the laboratory, M5 not only inhibits pathogen’s entry to human cells by 80 percent in case of TB and malaria, but it was also effective against drug-resistant strains of malaria causing Plasmodium Falciparum parasite that has emerged as a public health concern. Drugs available at present for treatment of both these infections have been failing in cases with resistant strains of pathogens, causing wide-spread alarm. While globally there was 8.6 million new cases of TB with 1.3 million deaths in 2012, the incidence of malaria, too, is equally staggering at 207 million cases with 627,000 deaths. The research findings have been published in the journal Nature Communications.

Source: http://www.deccanherald.com

**Novel model to customise psychiatric disorder**

Scientist from The Scripps Research Institute (TSRI), the United States, recently did a research on treating the effects of mutations to a gene known as ‘Syngap1’. “We hope that this will eventually lead to a therapy specifically designed for patients with psychiatric disorders caused by damaging Syngap1 mutations. Our model shows that the early developmental period is the critical time to treat this type of genetic disorder,” said Gavin Rumbaugh, associate professor at TSRI. Damaging mutations in Syngap1 that reduce the number of functional proteins are one of the most common causes of “intellectual disability” and are associated with schizophrenia and autism spectrum disorder.

Early estimates suggest that these non-inherited genetic mutations account for two to eight percent of these “intellectual disability” cases. Sporadic intellectual disability affects approximately one percent of the worldwide population, suggesting that several individuals with “intellectual disability” may carry damaging Syngap1 mutations without knowing it. Rumbaugh and his colleagues are now developing a drug-screening program to look for drug-like compounds that could restore levels of Syngap1 protein in defective neurons. The findings have been published in the journal Biological Psychiatry.

Source: http://www.zeeonews.india.com

**Stem cell therapy to treat heart attack in Spain**

Gregorio Maranon hospital, Spain, for the first time in world has successfully used stem cells culled from healthy donors to treat seven heart attack victims. The hospital plans to treat 55 patients in all with the technique in a clinical trial. “Seven patients have already been operated on and they have progressed very well despite having suffered serious damage to their heart tissue,” the officials said. It is the first time that allogeneic stem cells have been used to repair damage to a heart caused by a heart attack.

A heart attack happens when the organ is starved of oxygen, such as when a clot blocks the flow of blood to the heart. As the heart heals, the dead muscle is replaced with scar tissue, but because this does not beat like healthy heart muscle the ability to pump blood around the body is reduced. While patients with mild heart failure can live a relatively normal life with the help of drugs, those with severe heart failure can suffer prolonged pain and distress because everyday tasks such as doing the shopping or taking a shower leave them exhausted. Doctors around the world are looking at ways of “regenerating” the heart to replace the scar tissue with beating muscle.

Stem cells figure prominently in their plans although they have up until now involved the patient’s own stem cells. “While it takes 4-8 weeks to process a patients’ own stem cells to be used in therapy, donor cells can be processed and stored and are available for immediate use. This technique allows for the selection of donors whose cells show the greatest potential to repair heart tissue. Before being processed, only those allogeneic cells that functioned the best are selected. The cells are injected into the heart through a coronary artery,” said Francisco Fernandez-Avila at Gregorio Maranon hospital.

Source: http://www.news.yahoo.com

**Smartphone device that can diagnose HIV**

A team of researchers from Columbia University, the United States, has developed a low-cost smartphone accessory or dongle that can perform a test that simultaneously detects three infectious disease markers from a finger prick of blood in just 15 minutes. Led by associate professor of biomedical engineering Samuel K Sia, the device replicates for the first time all mechanical, optical, and electronic functions of a lab-based blood test. Specifically, it performs an enzyme-linked im-
Scientists herald new approach to neuro diseases
A team at Children’s Hospital of Philadelphia (CHOP), the United States, have debunked a common misconception in the role of mTORC1 pathway that it plays in the development of neurodegenerative diseases and come up with a new and better approach to mTORC1 which has proved promising in an animal model of Huntington’s disease. “The assumption is that by shutting down the signaling protein called mTORC1, which regulates cell growth and metabolism, you could positively influence the course of the disease. Instead, fine-tuning the activity of the pathway offers the best shot at targeting neurodegenerative conditions like Huntington’s, ALS, fragile X and autism. And preclinical evidence suggests that this new approach could also reverse the effects of Huntington’s,” said Beverly Davidson, at CHOP.

The team developed a gene therapy delivered by bioengineered viruses that spurred the development of regulatory proteins called Rheb and Rhes, which act along the pathway. And in animal models they found that the treatment increased brain volume, improved motor functions and ramped up a natural process that clears away mHTT. Investigators also tracked improvements in metabolic functions like cholesterol levels, dopamine signaling and mitochondrial activity. “It was particularly exciting to see plasticity in the neurons impaired by mHTT. This shows that brain cells are capable of responding even after disease onset, and hints at the potential for reversing Huntington’s disease,” said Davidson.

Stem cell drug benefits patients during trial
In a study BrainStorm Cell Therapeutics, Israel, have found that final results from a clinical trial of its adult stem cell treatment in amyotrophic lateral sclerosis (ALS) were positive, with most patients showing a slowing in the disease’s progression. According to the ALS Association, 5,600 people in the United States are diagnosed each year with the neurodegenerative disease, which has severely disabled British physicist Stephen Hawking. A single dose of the stem cell treatment called ‘NurOwn’ was administered in a mid-stage phase 2a trial in 14 patients with ALS, also known as Lou Gehrig’s Disease, at Hadassah Medical Center, Israel. According to the company, nearly all subjects in this study experienced clinical benefit from treatment with NurOwn.

Of the 12 patients with three or more months of follow-up, 92 percent experienced an improvement in disease progression. NurOwn slowed the progression of ALS using two different parameters and had a strong effect on the rate of decline in lung function. In 2014, the U.S. Food and Drug Administration (FDA) designated NurOwn as a “fast-track” product to treat ALS. “We observed not just a highly meaningful slowing of ALS progression on two different parameters, but subjects with prolonged stabilization and even improvements in function, and this was achieved with just a single dose of NurOwn,” said Tony Fiorino at Brainstorm. The company, now plans to move to a study in the next few months to see if the results can be amplified with repeated doses.

Source: http://www.firstpost.com

Source: http://www.fiercebiotechresearch.com

Source: http://www.news.yahoo.com

Laboratory Biosafety Manual
For more information, access: http://www.who.int
Researchers identify a new bioenergetic organelle

To date, it was thought that mitochondria and chloroplasts were the only plant cell components able to produce chemical energy. However, in a study, researchers Joaquín Azcón-Bieto and Marta Renato, from the Department of Plant Biology of the University of Barcelona (UB), Spain, and Albert Boronat and Irini Pateraki, from the Department of Biochemistry and Molecular Biology of the UB and the Center for Research in Agricultural Genomics (CRAG), Spain, have found that there is another organelle, the chromoplast, able to synthesize energy for its metabolism. A chromoplast is a plant organelle characterised by accumulating carotenoids, the pigments that confer yellow, orange and red colours to many flowers, fruits and roots.

Besides their role in carotenoid synthesis, the chromoplast is a very active organelle involved in different biosynthetic processes during fruit ripening. According to the new study, chromoplasts are also able to produce chemical energy— in other words, to synthetize molecules of adenosine triphosphate (ATP) by means of a respiratory process named chromorespiration. Professor Azcón-Bieto explained, “chromorespiration or respiratory activity in chromoplasts is a process of chemiosmotic ATP synthesis. In other words, it is a membrane process based on a respiratory chain that creates a proton electrochemical potential gradient and joins ATP synthesis like in mitochondria and chloroplasts.” The study has been published in the American journal Plant Physiology.

Chromoplasts are abundant in fruits like tomato, pepper and citrus. In the study, UB experts studied tomato (Solanum lycopersicum) fruit ripening, a process in which chromoplasts’ metabolic activity shoots up. During tomato ripening, energetic production (ATP) in chromoplasts is used to produce molecules (carotenoids such as lycopene and beta-carotene, scents, etc.) in order to improve fruit’s properties. Signs of chromoplasts’ energetic production have been also found in red bell pepper. Although it shares some characteristics with mitochondria and chloroplasts, chromoplasts’ ATP synthesis process has some particular traits. In the study, the researchers applied a reference protocol to isolate chromoplasts and measure ATP production; it is a model methodology which has been published in the journal Bio-protocol.

Source: http://www.ub.edu

Plant extract can help smokers quit

Researchers from University of Auckland’s National Institute for Health Innovation, New Zealand, recently conducted a fresh trial of ‘cytisine’, an alkaloid extract from the laburnum or golden rain tree (Laburnum anagyroides), which grows all over Europe. Like nicotine, cytisine is toxic when ingested in large amounts but is safe at low doses. It is produced commercially mainly in Bulgaria and Poland, and has been used as a quitting aid in eastern European countries since the 1960s. It works by blocking nicotine’s access to the brain’s pleasure receptors. Researchers recruited 1,310 smokers who intended to quit and gave exactly half of them cytisine as a course of tablets, taken daily in diminishing doses for 25 days. The other half received standard nicotine replacement therapy (NRT), either as patches, gums or lozenges for two months.

The researchers noted the number of people who managed to abstain from smoking at one week, one month, two months and six months into the trial. Throughout, they found that people taking cytisine were less likely to have smoked than those using NRT. After six months, 143 of the 655 cytisine recipients were still not smoking compared with 100 in the NRT group. People who received cytisine were slightly more likely to experience side effects, including nausea, vomiting and sleep disturbance, but these were never serious. Cytisine is more affordable than other quitting aids. For example, it costs just USD 20 to USD 30 for a 25-day course of treatment, versus USD 100 to USD 700 for a two-month course of NRT. Cytisine is sold as Tabex by Sopharma, Bulgaria, and as Desmoxan by Aflofarm Pharma, Poland.

Source: http://www.zeenews.india.com

GM crops driving monarch butterflies’ decline

Scientists from the Centre for Biological Diversity, the United States, have found that the iconic monarch butterfly, once common across the US, could soon end up on the Endangered Species List due to the growing use of genetically modified (GM) crops in the US. By some estimates, the population of the black-and-orange butterflies has declined by 90 percent over the past two decades, from about 1 billion butterflies in the mid-1990s to just 35 million individuals. That loss is “so staggering that in human-population terms it...
would be like losing every living person in the US except those in Florida and Ohio,” said Tierra Curry, a senior scientist at the Centre for Biological Diversity.

According to the scientists behind a petition that asked for including monarch butterfly in the list of endangered species, many crops are altered to be resistant to Monsanto’s Roundup herbicide which kills milkweed, the monarch caterpillar’s only source of food. The herbicide is so successful that milkweed plants have virtually disappeared in Midwestern corn and soybean fields, and monarch butterflies have effectively lost a Texas-size chunk of their habitat, according to the petition.

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

Plant extract fights brain tumour

Researchers from the Max Planck Institute of Psychiatry, Germany, have discovered in cell cultures, animal models and human tumour tissue that a harmless plant extract can be applied to treat Cushing Disease caused by a tumour. "Silibinin is the major active constituent of milk thistle seeds. It has an outstanding safety profile in humans and is already used for the treatment of liver disease and poisoning," said Marcelo Paez-Peredaat Max Planck Institute of Psychiatry. Cushing Disease is caused by a tumour in the pituitary gland in the brain.

The tumour secrets increased amounts of the stress hormone adrenocorticotropin (ACTH) followed by cortisol release from the adrenal glands leading to rapid weight gain, elevated blood pressure and muscular weakness. Patients are prone to osteoporosis, infections and may show cognitive dysfunction or even depression. After silibinin treatment, tumour cells resumed normal ACTH production, tumour growth slowed down and symptoms of Cushing Disease disappeared in mice. "We knew that Cushing Disease is caused by the release of too much ACTH. So we asked ourselves what causes this over production and how to stop it," Paez-Pereda said.

In their first experiments the researchers found tremendously high amounts of the heat shock protein 90 (HSP90) in tumour tissue from patients with Cushing Disease. In normal amounts HSP90 helps to correctly fold another protein, the glucocorticoid receptor which in turn inhibits the production of ACTH. "With silibinin we might have discovered a non-invasive treatment strategy not only for the rare Cushing Disease but also for other conditions with the involvement of glucocorticoid receptors such as lung tumours, acute lymphoblastic leukaemia or multiple myeloma," Paez-Pereda concluded.

The study has been published in Nature Medicine.

Source: http://www.indianexpress.com

Revealing the workings of a master switch for plant growth

According to a study done by the RIKEN Center for Sustainable Resource Science (CSRS), Japan, 'Brassinosteroids', a class of plant steroid hormones, play an important role in promoting plant growth as well as a host of development processes including cell elongation and division, development of the xylem, which is used for water and nutrient transport, and adaptation to differing light conditions. Though the importance of brassinosteroids is understood, the precise mechanisms through which they perform their functions in plants was unclear.

The important avenue of this research was to identify brassinosteroid signaling genes, and then use plant engineering to apply these genes to genetically modified (GM) plants in order to increase plant growth by up-regulation of these mechanisms, leading eventually to higher productivity for crop production as well as biomass production. This could provide ways to decrease CO2 by fixing it in plant body materials. With the tools of chemical biology, the group focused on the mechanism of BIL1, a master switch that regulates some 3,000 genes, making up fully 10% of the 30,000 genes of the model plant Arabidopsis. Through chemical biology they discovered a protein called BSS1, which interacts with BIL1 to negatively regulate brassinosteroid signaling.

BIL1 was known to be imported into the nucleus of the cell by brassinosteroid stimulation, but the molecular mechanism was not understood. As the scientists examined further, they were surprised to discover that the creation of a complex of large proteins suppressed plant stem elongation. They were able to determine the detailed mechanism through which BIL1 is captured by the formation of this protein complex with BSS1, and discovered, unexpectedly, that the breakdown of this complex by brassinosteroids seems to allow BIL1 to move into the nucleus. Thus, it appears that the interplay between BSS1 and brassinosteroids leads to the formation of the complex, resulting in shortened plant height, while conversely the breakdown of the complex leads to stem elongation and greater height.

Source: http://www.eurekalert.org
### Transgenic Cotton

This book provides a comprehensive collection of methods for creating and monitoring transgenic cotton and its application on agricultural and basic research. Divided into five convenient sections, topics covered include the current status and perspectives of transgenic cotton, the principle and methods for making transgenic cotton, the methods for detecting foreign gene copy and expression in transgenic plants, the improvement of cotton using transgenic technology, and finally the methods for monitoring the potential impact of transgenic cotton on the environment, including gene flow.

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### Genomics of Pattern Recognition Receptors

This book offers comprehensive information on the polymorphisms of genes encoding pattern recognition receptors (PRRs). Following a short description of the general role of PRRs in the immune system, the structure and function of Toll-like and NOD-like receptors are examined in detail. The main focus is on the role of inherited variation in PRRs and their correlation to cancer and cardiovascular diseases. A review of all epidemiological investigations is included, and a concept of genomic risk markers for the prevention of various diseases is also discussed.

**Contact:** Springer (India) Private Ltd., 7th Floor, Vijaya Building, 17, Barakhamba Road, New Delhi 110 001, India. Tel: +91-11-4575-5888; E-mail: customersupport.india@springer.com.

### Human Evolution—Genes, Genealogies and Phylogenies

This book identifies and explains these identifiable, rare and complex markers including endogenous retroviruses, genome-modifying transposable elements, gene-disabling mutations, segmental duplications and gene-enabling mutations. The new genetic tools also provide fascinating insights into when and how many features of human biology arose: from aspects of placental structure, vitamin C dependence and trichromatic vision, to tendencies to gout, cardiovascular disease and cancer.

**Contact:** Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013-2473, USA. Tel: +1-212-337-5000; E-mail: newyork@cambridge.org.
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