VATIS UPDATE

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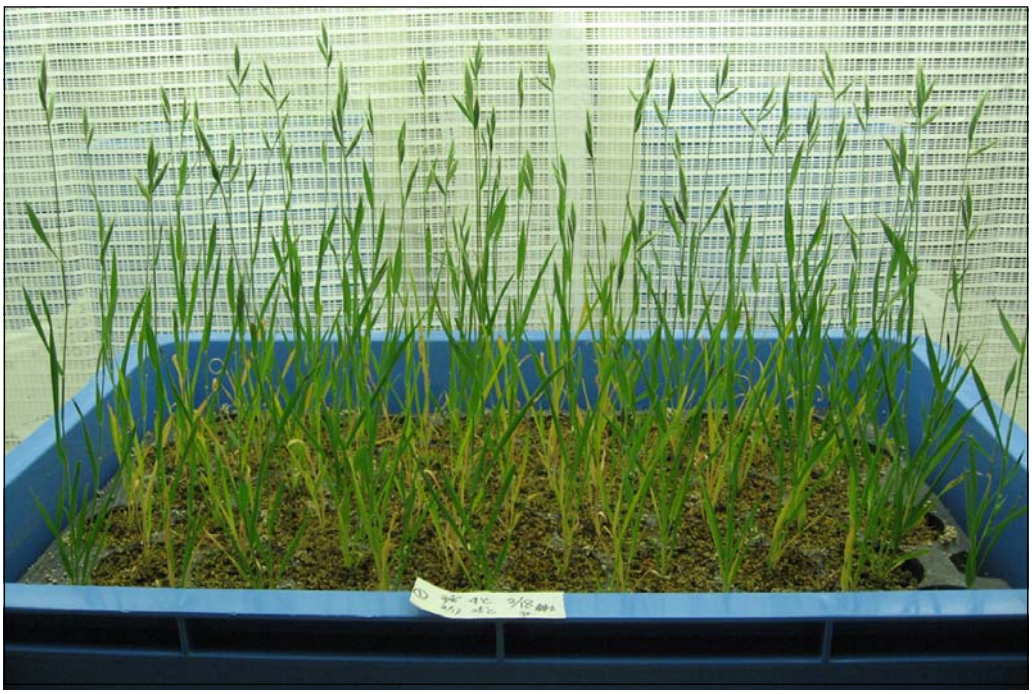

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Economic and Social Commission for Asia and the Pacific

ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY (APCTT)

BCIL

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

A model cereal plant *Brachypodium distachyon,* the seeds of which are available at the RIKEN BioResource Centre (BRC) in Japan

(Credit: RIKEN BRC, Japan)

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*** Value Added Technology Information Services**

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Europe ushers in single patent regime

The European Union has signed an agreement to introduce a Unitary Patent Court for 24 participating member states. The introduction of the single European Patent will ensure a one-door, one-key protection for intellectual property (IP) throughout Europe, cutting down on the cross-border administrative issues that have made patenting across Europe a burden. European Union's Internal Market Commissioner, Mr. Michel Barrier, opines that costs for patent application will be reduced by a staggering 80 per cent, bringing Europe closer in line with competing nations. The former European patent system was, for example, up to 60 times more costly than in China, leading to loss of revenue and competitiveness for the European Union.

Source: www.europabio.org

Global biotech industry attains financial stability

The global biotechnology industry showed a second straight year of increasingly stable financial performance in 2011, as its revenue grew by 10 per cent for the first time since the start of the global financial crisis, according to the E&Y report, *Beyond Borders: Global Biotechnology Report 2012.* The established biotech markets registered more than 10 per cent revenue growth for the first time since the start of the global financial crisis. Revenue of biotech industries touched US$83.4 billion in 2011 – a 10 per cent increase from 2010 on a normalized basis. Industry has modestly increased its R&D spending by 2 per cent in 2010 compared with slashing R&D spending in 2009. According to the report, global biotech companies raised US$33.4 billion in 2011, second only to the year 2000, when the genomics bubble was at its height.

However, the report puts the longer-term sustainability as challenging, with the conventional funding-and-innovation model for pre-commercial biotech firms putting it under unprecedented strain and the industry's practice of "do more with less" creating uncertainty in providing significant productivity gains. "In this capital-constrained environment, the inefficiency and duplication of the drug R&D paradigm is an indulgence we can no longer afford," says Mr. Glen Giovannetti, Ernst & Young's Global Life Sciences Leader. According to him, global biotech industry needs to avoid duplication, encourage pre-competitive collaboration, pool data and allow researchers to learn in real time to improve further.

Source: articles.economictimes.indiatimes.com

China to boost biotechnology industry

The Chinese government will give a boost to the biotechnology industry in order to tackle problems related to population growth, food safety, energy conservation and environmental protection, the State Council (China's cabinet) stated recently. The government aims to double the share of gross domestic product (GDP) that the sector's value-added output accounts for by 2015 from the 2010 level, according to a biotech industry development plan unveiled by the State Council.

The biotechnology sector will see its output surge at an average rate of more than 20 per cent per year from 2013 to 2015, according to the plan. The government also plans to improve the sector's innovation and technological prowess to make it a pillar industry by 2020. New medicines, crops, biofuels and environmental technology are needed to protect the health of an aging population, ensure food safety and save energy, the plan says. The government is targeting an annual production value of approximately US$24 billion by 2015 for the biofuel sector, according to the plan.

The biotechnology sector's overall output has risen at an annual average of more than 20 per cent since 2006, reaching around US$323 billion in 2011, according to the plan. The sector is one of seven emerging industries that the government is aiming to promote over the next few years in order to turn domestic consumption and technological innovation into forces that drive the economy.

Source: www.nanowerk.com

Irish science gets historic 300 million euro boost

The Irish government has outlined details of a 300 million euro (US$ 392 million) package of research funding that will establish seven new hubs through which industry will collaborate with academic researchers. Funded areas include data analytics, marine renewable energy, research into pregnancy and newborns, nanotechnology, functional foods, photonics and drug synthesis. Roughly one-third of the funding for the new centres, which are to run for six years, is expected to come from around 150 industry partners through cash and in-kind contributions.

Many of the new centres – including Ireland's Big Data and Analytics

Research Centre (INSIGHT) – bring together existing Science Foundation Ireland (SFI) centres. Other groupings include the Irish Centre for Foetal and Neonatal Translational Research (INFANT), led by University College Cork, which will focus on perinatal issues. One of the challenges now will be to coordinate existing funding mechanisms, according to Mr. Diarmuid O'Brien, Executive Director of the Centre for Research on Adaptive Nanostructures and Nanodevices in Dublin. The Centre is involved in one of the new hubs, the Advanced Materials and BioEngineering Research Centre (AMBER), which will develop biomaterials for novel medical devices.

Source: www.nature.com

India's biotech industry now at a critical juncture

Indian biotechnology industry is at a critical juncture, says Ernst & Young's annual biotech industry report. While the Indian biotech industry has been growing at a double-digit rate over the last five years (compound annual growth rate 19.2 per cent, 2007-2011), it has concurrently been facing diverse challenges that have prevented the industry from transcending to the next level. The industry size stood at US$4 billion for the financial year 2010/11. Indian biopharmaceutical industry constitutes 60 per cent of the biotech industry and grew at 21 per cent year on year to US$2.3 billion in 2010/11, which is approximately 15 per cent of the Indian pharmaceutical industry. Vaccines, erythropoietin, insulin and monoclonal antibodies have been the mainstay of the biopharma segment.

The key concerns that puts Indian biotech at critical juncture include:

Biopharmaceuticals account for the bulk of Indian biotech industry

the inability of Indian companies to launch new products at regular pace in the domestic market; delays caused by multiple regulatory bodies; funding constraints faced by companies, as investor community shies away from early stage ventures; lack of optimal trained human resources to cater to the biotech industry demand; and the lack of congeniality on the part of biotech parks across the country for pure-play biotech manufacturing companies.

India is already facing stiff competition from China, the Republic of Korea, Singapore and Malaysia in terms of attracting investments from multinational companies, said Mr. Ajit Mahadevan, Partner, Ernst & Young. Compared with India, all these countries have better technological and scientific competence, better infrastructure, tax and duty exemptions, and easier regulatory procedures.

Source: articles.economictimes.indiatimes.com

Support for research in biotechnology and bioenergy

The United Kingdom's Minister for Universities and Science, Mr. David Willetts, has announced £35 million funding to boost research in industrial biotechnology and bioenergy. The funding, coming from Biotechnology and Biological Sciences Research Council (BBSRC), will create networks and collaborative research between academia and industry, offering a channel for sustainable economic growth for the country and new 'green collar' jobs.

The funding will create two new schemes to develop the country's industrial biotechnology and bioenergy research community (such as biopharmaceuticals and biorenewables), as well as to support the translation of new ideas into commercial applications. The new schemes form the central part of BBSRC's strategy to support the development of industrial biotechnology and bioenergy as a major component of the country's bioeconomy. BBSRC's new strategy will support both networking activities and investment in important application-focused integrated research projects.

The first phase is a competition for networks, aimed at both emerging and established areas of importance to industrial biotechnology and bioenergy. BBSRC has committed up to £15 million to foster collaboration between academia and business at all levels, to find new approaches to tackle research challenges. The networks will work across the boundaries of biology, chemistry and engineering. They also encourage the participation of other disciplines such as mathematics, computational modelling, environmental science, economics and social science. In 2014, the second phase of the strategy will be launched with a funding of £20 million to support major integrated research projects in industrial biotechnology and bioenergy derived from the networking activities and involving the academic and business communities.

Source: www.bbsrc.ac.uk

Marine biotechnology market to cross US$4 billion by 2015

Marine biotechnology market is in a nascent stage and accounts for but a tiny percentage of the overall biotechnology market. During the years 2008 and 2009, the global marine biotechnology market witnessed a slowdown owing to the global economic meltdown. Nonetheless, the market gained momentum in 2010 with the recovery of economic situation and is expected to post substantial growth in ensuing years. Given the vast untapped potential, the marine biotech sector holds promising growth prospects for the future, says a research report titled "Marine Biotechnology: A Global Strategic Business Report", from Global Industry Analysts Inc., the United States.

The United States is currently the world leader in marine science research, and hosts highly developed international marine research centres specializing in marine biotechnology. Marine bioactive substances market is forecast to have the fastest growth rate of more than 4.0 per cent during the period 2009-2015. The marine biomaterials market is projected to reach US$1.7 billion by 2012. In terms of end-use, healthcare/biotechnology constitutes the largest as well as fastest growing end-use segment for marine biotechnology.

Marine resources have a significant impact on social safety and national economy. Despite this, marine biotechnology was not a significant area of investment until recently. Very few countries have initiated national research programmes to exploit benefits of biotechnology in the marine sector. However, research activity has gained momentum, fuelled by new technologies that address technical challenges. Underwater technology, chemical/analytical methods and remote sensing provide vital information on marine resources hitherto unexplored. In addition, advances in aquaculture, drug discovery and fisheries are expected to encourage application of biotechnology in marine industry.

Source: www.pml-applications.co.uk

ETH and Inbicon to partner on cellulosic ethanol

Brazil's ETH Bioenergia and Denmark's Inbicon will partner to find cheaper ways to produce second-generation or cellulosic biofuels, tackling one of the technology's biggest drawbacks. Brazil's vast ethanol sector, which produces fuel for the country's millions of flex-fuel cars, currently uses the first-generation process of fermenting sugary sap from sugarcane stalks to yield the biofuel. The second-generation method recovers sugars bound up inside the tough cellulosic plant matter. The technology to produce second-generation ethanol was known for several years. "Producing it in a competitive and economically viable way is our big challenge now," said Mr. Carlos Eduardo Calmanovici, ETH Director for innovation and technology.

The partnership with Inbicon also foresees the two companies joining forces for the actual production of second-generation ethanol, not just the discovery of lower-cost, second-generation technology that they hope to market in Brazil first. The first ETH-Inbicon plant is expected to commence operations in 2015. Technology sales will focus initially on Brazil, which has well-established market for ethanol. ETH Bioenergia has pursued research into second-generation fuel ethanol in partnership with other companies for the last two years. Investment in ventures should reach around US$100 million by 2016.

Source: www.reuters.com

Salk Institute gets US$42 million for drug research

In the United States, the Leona M. and Harry B. Helmsley Charitable Trust has donated US$42 million to the Salk Institute for Biological Studies, the largest single donation in the institute's 53-year history. The award is towards establishing the Helmsley Centre for Genomic Medicine and supporting research that paves the way to new therapies for chronic illnesses such as cancer, diabetes and Alzheimer's disease, the Institute said. "Millions of people suffer from chronic illnesses, and these diseases are placing an unsustainable burden on our healthcare system," said Mr. John Codey, a Trustee. The Helmsley Centre for Genomic Medicine will help address this by serving as an incubator for clinical therapies.

The Trust's latest gift is one of its several major contributions made to Salk. In 2009, the Trust issued a US$5.5 million grant to found the Salk Centre for Nutritional Genomics to study nutrition at the molecular level and its impact on the role of metabolism in diabetes, obesity, cancer, exercise physiology and lifespan. It also gave US$ 15 million in 2010 to create a stem cell project involving Salk Institute and Columbia University to fast-track the use of induced pluripotent stem cells to gain new insight into disease mechanisms and to screen for novel therapeutic drugs.

Source: www.bizjournals.com

AstraZeneca in research deal with Vanderbilt University

AstraZeneca, based in the United Kingdom, has signed a research deal with Vanderbilt University, the United States, to identify potential treatments for psychosis and other psychiatric symptoms associated with diseases like Alzheimer's and schizophrenia. AstraZeneca's Neuroscience Innovative Medicines Unit has exclusively licensed rights to compounds developed by Vanderbilt Centre for Neuroscience Drug Discovery (VCNDD) that act on a certain brain receptor. Vanderbilt will receive an upfront payment research funding for two years, as well as milestone payments and sales royalties of any drugs that are approved.

This is the second academic deal the neuroscience unit has entered into, since its creation in February 2012 to exclusively pursue outside collaborations to drive drug development in neuroscience disease areas that are hard to treat. The unit has also inked deals with two United States biotech companies – Axerion Therapeutics and Link Medicine Corp. – to lower AstraZeneca's internal R&D costs by leveraging discoveries at academic centres.

Source: www.bizjournals.com

BIND Biosciences gets US$8.7 million

Clinical stage biopharmaceutical company BIND Biosciences Inc., the United States, has received US$8.7 million in equity financing. BIND, which develops nanoparticle technology that concentrates a drug right at the site of cancer cells – which minimizes exposure to the healthy tissue and decreases side effects – received the funding from a total of 20 investors. The company's lead compound, BIND-014, is in Phase I clinical testing.

The financing will be used to advance BIND-014, the company's main Accurin drug candidate, in Phase II clinical studies for solid tumour cancers based on promising anti-tumour activity shown in a Phase I trial in patients with metastatic solid-tumour cancers, said Mr. Andrew Hirsch, the company's Chief Financial Officer. "In addition, the company plans to continue to advance the capabilities of its nanomedicine platform for novel Accurins, including identifying further opportunities for proprietary drug candidates as well as pursuing collaborative drug development programmes with pharmaceutical and biotech partners," he added.

Source: www.bizjournals.com

GSK granted speedy review for its new melanoma drug

The European Medicines Agency (EMA) has given the melanoma drug of GlaxoSmithKline (GSK), the United Kingdom, an accelerated review. The drug, a MEK inhibitor called Trametinib, is seeking a European licence as both a monotherapy and in combination with GSK's investigational BRAF inhibitor Dabrafenib, for the treatment of patients with unresectable or metastatic melanoma. EMA's Committee for Medicinal Products for Human Use has granted GSK's request for accelerated assessment of this application, meaning it may be on the market within six months if approved.

"We initiated a randomized study very early in the development programme to test whether the novel-novel combination could circumvent resistance to single agent anti-BRAF therapy and are encouraged by the results from this Phase I/II trial," stated Dr. Rafael Amado, Head of oncology R&D at GSK. "We are planning further regulatory submissions based on these data, in the United States and other countries in the coming months," he added. An application that has been granted accelerated assessment will have, normally, a maximum review time of 150 days.

Source: www.pharmatimes.com

Avitide attracts funding from venture capitalists

In the United States, Avitide – a start-up company in the United States co-founded by Mr. Tillman Gerngross and his colleagues at Adimab – has taken off with an undisclosed amount of Series A financing from the same venture financiers who backed Mr. Gerngross's previous companies. Avitide has emerged with affinity purification technology for improving the expensive and risky process of manufacturing protein drugs such as monoclonal antibodies and recombinant vaccines.

Mr. Gerngross's venture capital supporters have invested in Avitide, hoping for another winner. Borealis Ventures, which has invested in Glycofi and Adimab, led the first-round financing. Other supporters include SV Life Sciences, Polaris Venture Partners, Angeli Parvi and OrbiMed Advisors. Borealis's Mr. Phil Ferneau and SV's Mr. Michael Ross have joined the Board of Directors at the new venture. Avitide co-founder Mr. Kevin Isett, Head of high-throughput manufacturing at Adimab, has taken the helm of the new venture as CEO.

Source: www.fiercebiotech.com

Immortal line of cloned mice created

Japanese scientists have created a potentially endless line of mice cloned from other cloned mice. The technique used was the same that created Dolly the sheep, and 581 mice were produced from an original donor mouse through 25 rounds of cloning, the scientists report. "This technique could be very useful for the large-scale production of superior-quality animals, for farming or conservation purposes," said study leader Mr. Teruhiko Wakayama from the RIKEN Centre for Developmental Biology in Kobe, Japan.

The researchers used a cloning technique called somatic cell nuclear transfer, in which a cell nucleus containing one individual's genetic information is inserted into an egg cell whose nucleus has been removed. Dolly the sheep became the first cloned mammal in 1996 using this technique. Many other animals have been cloned since, but the technique has had a low success rate and attempts to "recline" animals have often failed. Genetic abnormalities that can accumulate over consecutive generations of clones may explain these failures, Mr. Wakayama said.

In their study, Mr. Wakayama and colleagues grew the cloned cells in a solution containing trichostatin, a compound that interferes with enzymes that alters DNA. Using this technique, the cloning process was five times more successful. The team successfully cloned the mice 25 consecutive times. All the 581 mice were healthy, fertile and lived a normal life span of about two years. The efficiency of cell cloning neither worsened nor improved over the generations. No abnormalities accumulated in the mice, even after repeated cloning, the scientists found. "Our results show that repeated iterative reclonning is possible and suggest that, with adequately efficient techniques, it may be possible to reclone animals indefinitely," the authors claimed in the study.

Source: www.scientificamerican.com

Humans and chimps share a genetic strategy

A genome-wide analysis search for evidence of long-lived balancing selection – where the evolutionary process acts not to select the single best adaptation but to maintain genetic variation in a population – has uncovered at least six regions of the genome where humans and chimpanzees share the same combination of genetic variants. The finding by researchers from University of Chicago, the United States and Oxford University, the United Kingdom, suggests that in these regions, human genetic variation dates back to a common ancestor with chimpanzees millions of years ago, before the species split. It also highlights the importance of the dynamic co-evolution of human hosts and their pathogens in maintaining genetic variation.

When the scientists searched for genetic clues pointing to ancient examples of balancing selection, they found strong evidence for at least six such regions and weaker evidence for another 119 – many more than what they expected, said study author Dr. Molly Przeworski, Professor of human genetics and of ecology and evolution at the University of Chicago. "We don't yet know what their functions are," she added, as none of the six regions codes for a protein. There are clues that they are involved in host-pathogen interactions, but it is not yet known as to which pathogens and what immune processes.

The researchers used genetic data from 10 chimpanzees from Western Africa and 59 humans from sub-Saharan Africa who were part of the 1,000 Genomes Project. They looked for cases in which genetic variations that arose in the ancestor of humans and chimpanzees have been maintained through both lines. The six new examples of balanced selection described in the study appear to play a role in fending off infectious disease. This requires a variety of evolutionary tools, including balancing selection. Balancing selection may have enabled humans and chimps to retain multiple lines of defence that can be called on when a pathogen evolves new weapons. "Our results imply that dynamic co-evolution of human hosts and their pathogens has played an important role in shaping human variation," said Dr. Przeworski.

Source: www.uchospitals.edu

Quadruple DNA helix found in human cells

Sixty years after Dr. James Watson and Dr. Francis Crick established that DNA forms a double helix, a quadruple-stranded DNA helix has turned up – in a range of human cancer cells. Quadruple helices that intertwine four, rather than two, DNA strands had been made in the laboratory, but were regarded as curiosities as there was no evidence that they existed in nature. The four-stranded DNA packages, dubbed G-quadruplexes, are formed by the interaction of four guanine bases that together form a square. They appear to be transitory structures, and were most abundant when cells were poised to divide. They appeared in the core of chromosomes and also

in telomeres, the caps on the tips of chromosomes that protect them from damage.

Because cancer cells divide very rapidly, and often have defects in their telomeres, the quadruple helix might be a feature unique to cancer cells. If so, any treatments that target them will not harm healthy cells. "I hope our discovery challenges the dogma that we really understand DNA structure because Dr. Watson and Dr. Crick solved it in 1953," says Mr. Shankar Balasubramanian of University of Cambridge, the United Kingdom.

Source: www.newscientist.com

Genetic variation that drives human evolution

A pair of studies published recently sheds new light on genetic variation that may have played a key role in human evolution. The researchers used an animal model to study a gene variant that could have helped humans adapt to humid climates, and they used whole-genome sequence data to identify hundreds of gene variants that potentially helped humans adapt to changing environmental conditions over time. "The two studies have uncovered two intriguing human adaptive traits and demonstrate the ability to go from an unbiased genome scan to a novel hypothesis of human evolution," says senior study author Ms. Pardis Sabeti of Harvard University and the Broad Institute in the United States.

Ms. Sabeti and her team found that a previously reported variant of the EDAR gene, which arose in central China about 30,000 years ago, increased the number of sweat glands in genetically modified mice and had other effects not reported previously in humans. The discovery shows that animal models can be used to investigate the biological changes expected to result from human genetic variation. This gene variant was also associated with an increase in the number of sweat glands in present-day Han Chinese population. By enhancing sweating, this EDAR variant could have helped humans adapt to humid climates that may have existed in China 30,000 years ago.

In the accompanying study, the researchers used data from the 1000 Genomes Project to analyse DNA sequence variations across the entire genome. They identified hundreds of gene variants, which potentially contributed to human evolutionary adaptation. One such variant, a mutation in TLR5 gene, changed the immune responses of cells exposed to bacterial proteins, suggesting that this variant could confer a fitness advantage by protecting against bacterial infections. The comprehensive list of possible adaptive mutations driving recent human evolution provides the groundwork for future studies.

Source: www.sciencedaily.com

Study shows viruses can have immune systems

A recent study reports that a viral predator of the cholera bacteria has stolen the functional immune system of bacteria and is utilizing it against its bacterial host. The study provides the first evidence that this type of virus, the bacteriophage ("phage" for short), can acquire a functional and adaptive immune system. Phages are viruses that prey solely on bacteria and each phage is parasitically mated to a specific type of bacteria. The study found that the phage used the stolen immune system to disable – and thus overcome – the cholera bacteria's defence system against phages. The phage can kill the cholera bacteria and multiply and produce more phage offspring, which can then kill more cholera bacteria.

Until now, scientists had thought that phages existed only as primitive particles of DNA or RNA and therefore lacked the sophistication of an adaptive immune system – a system that can respond rapidly to a nearly infinite variety of new challenges. This study – by a team led by Howard Hughes Medical Institute investigator Dr. Andrew Camilli of Tufts University School of Medicine, the United States – focused on a phage that attacks *Vibrio cholerae*, the bacterium responsible for cholera epidemics in humans. The study bolsters the possibility of using phage therapy to treat bacterial infections, especially those that are resistant to antibiotics, said Dr. Camilli.

First author Dr. Kimberley Seed, a post-doctoral fellow in Dr. Camilli's lab, was analysing DNA sequences of phages taken from stool samples of patients with cholera in Bangladesh when she identified genes for a functional immune system previously found only in some bacteria (and most *Archaea*). To verify the findings, the researchers used phage lacking the adaptive immune system (called CRISPR/Cas) to infect a new *V. cholerae* strain that is naturally resistant to the phage. The phage was unable to adapt to and kill the bacteria. They next infected the bacterial strain with the phage harbouring CRISPR/Cas, and observed that the phage rapidly adapted and thus gained the ability to kill the cholera bacteria. This work demonstrates that the immune system harboured by the phage is fully functional and adaptive.

Source: now.tufts.edu

First genome of diamondback moth decoded

An international research consortium – led by Fujian Agriculture and Forestry University (FAFU) and BGI in China – has completed the first genome sequence of the diamondback moth (*Plutella xylostella*), the most destructive pest of brassica crops. The work provides wider insights into insect adaptation to host plant and opens new ways for more sustainable pest management. *P. xylostella* preferentially feeds on economically important food crops such as rapeseed, cabbage and cauliflower. It has developed resistance to more than 50 insecticides, making the use of chemicals as a contra measure to become ineffective.

The completed genome sequence of the moth will lay a solid foundation for tracking the mechanisms by which the insect evolved to become a successful herbivore with resistance against many insecticides, hoped Professor Minsheng You, Vice President of FAFU and leader of the research team. In this study, researchers sequenced the genome of *P. xylostella* by whole genome shotgun (WGS) and fosmid clones technologies, yielding a draft genome with 18,071 predicted protein coding genes. The moth, compared with other sequenced insect species, possesses a relatively larger set of genes and a moderate number of gene families, suggesting the expansion of certain gene families.

The researchers investigated a set of genes preferentially expressed at the larval stage that contribute to odorant chemoreception, food digestion and metabolic detoxification. They found that the moth has a larger set of insecticide resistance-related genes than silkworm that had low exposure to insecticide over 5,000 years of domestication. They identified in the moth obvious gene duplications of four gene families that participated in xenobiotic detoxification in insects, including ATP binding cassette (ABC) transporter families, the P450 monooxygenases (P450s) glutathione S-transferases (GSTs) and carboxylesterase (COEs).

Adult diamondback moth

Source: www.genomics.cn

Rare form of 'jumping genes' found in mammals

Much of the DNA that makes up our genomes can be traced back to strange rogue sequences known as transposable elements, or 'jumping genes', which are largely idle in mammals. But researchers at Johns Hopkins University School of Medicine, the United States, report they have identified a new DNA sequence moving around in bats – the first member of its class found to be active in mammals. The discovery offers a new means of studying evolution, and may help in developing tools for gene therapy, says Dr. Nancy Craig, a professor of molecular biology and genetics.

Jumping genes move from place to place in the genome, sometimes even inserting themselves into the middle of another gene. Some work by replicating themselves and inserting the copies into new places in the genome. Another class of jumping genes, known as "DNA cut-and-paste", instead of making copies, cuts itself out of one site in the genome before hopping into another. Dr. Craig explains that in mammal genomes, most jumping genes are of the copy-and-paste variety, and most of these have mutated to the point where they can no longer jump. Although some remnants of cut-and-paste jumping genes have been seen in mammals, until now, all of them have been inactive.

Dr. Craig's team made its discovery while studying *piggyBac*, an active cut-and-paste jumping gene from insects. While studying how the jumping gene works, the scientists also used computational methods to search for *piggyBac*-like DNA sequences in the genomes of some species, including that of the little brown bat. There they found a sequence similar to *piggyBac*, one that didn't appear to have mutated enough to make itself inactive. Sure enough, near-identical copies were sprinkled throughout the genome, indicating that the sequence had jumped relatively recently. Dr. Craig named the find *piggyBat*. And her team also found that *piggyBat* can move within bat cells, other mammalian cells and yeast, showing that it is indeed a still-active DNA element. Many organisms have developed systems to decrease the frequency at which jumping genes move, Dr. Craig says. Such systems are a component of immunity, protecting mammals from retroviruses, as well as from the risk that jumping genes will wreak havoc by interrupting an important gene. Over time, the protective systems have made most mammalian jumping genes inactive.

Source: www.hopkinsmedicine.org

Protein balance key in preventing cancer

Two proteins that scientists once thought carried out the same functions are actually antagonists of each other, and keeping them in balance is key to preventing diseases such as cancer, according to new findings by scientists at Fox Chase Cancer Centre in the United States. The results suggest that new compounds could fight cancer by targeting the pathways responsible for maintaining proper balance between the proteins. The two proteins – Rpl22 and Rpl22-like1, which contribute to the process by which additional cellular proteins are made – are created from two similar genes, leading researchers to previously believe they have identical functions in the body. "What we are finding is that is absolutely not true," says study author Dr. David L. Wiest, a professor and Deputy Chief Scientific Officer at Fox Chase. "Not only are they performing different functions, they are antagonizing each other."

In the study, Dr. Wiest and his team knocked out Rpl22 in zebrafish, a common model of human disease. Without Rpl22, the zebrafish don't develop a type of T cells that helps fight infections. The same developmental defect was observed when they knocked out Rpl22-like1, indicating that both proteins are independently required to enable stem cells to give rise to T cells. But when the scientists tried to restore T cells in zebrafish that lacked Rpl22 by adding back Rpl22-like1, it didn't work. The reverse was also true – Rpl22 was not enough to restore function after the researchers eliminated Rpl22-like1. These results led the team to believe that, although the proteins are both involved in producing stem cells, they do not perform the same function.

To learn more about the proteins, the researchers looked at the levels of different proteins linked to stem cell production when either Rpl22 or Rpl22-like1 was absent. Without Rpl22-like1, cells had lower levels of a protein known as Smad1 – a critical driver of stem cell development. When Rpl22 disappeared, levels of Smad1 increased dramatically. Both proteins can bind directly to the cellular RNA from which Smad1 is produced, suggesting that they maintain balance in stem cell production via their antagonistic effects on Smad1 expression, explains Dr. Wiest.

Source: www.eurekalert.org

Modified protein could offer effective treatment for vitiligo

Researchers at Stritch School of Medicine, Loyola University Chicago, the United States, have developed a genetically modified protein that dramatically reverses the skin disorder vitiligo in mice, and has similar effects on immune responses in human skin tissue samples. The modified protein is potentially the first effective treatment for vitiligo, which causes unsightly white patches on the face, hands and other parts of the body. Loyola researchers are seeking regulatory approval and funding for a clinical trial in humans.

Previous studies have found that a protein called HSP70i plays a vital role in the autoimmune response that causes vitiligo. HSP70i consists of 641 amino acids. Dr. I. Caroline Le Poole, a professor in Loyola's Oncology Institute and in the departments of Pathology and Microbiology and Immunology, and her colleagues genetically altered HSP70i to create a mutant. This mutant protein supplants normal HSP70i, thereby reversing vitiligo's autoimmune response. The scientists gave mutant HSP70i to mice that developed vitiligo, and the results were striking. When the mice were injected with mutant HSP70i, the salt-and-pepper mouse fur affected by vitiligo turned black.

Source: www.newswise.com

Scientists identify *in vivo* protein interaction network

Protein interaction topologies are critical determinants of biological function. Large-scale or proteome-wide measurements of protein interaction topologies in cells currently pose an unmet challenge that could dramatically improve the understanding of complex biological systems. A primary obstacle includes direct protein topology and interaction measurements from living systems since interaction that lack biological significance may be introduced during cell lysis. Moreover, many biologically relevant protein interactions might not survive the lysis/sample preparation and many only be measured *in vivo.*

As a step towards meeting this challenge, scientists at University of Washington, the United States, used a new mass spectrometry method – Real-time Analysis for Cross-linked peptide Technology (ReACT) – to assign cross-linked peptides "on-the-fly". Using ReACT, 708 Unique cross-linked peptides pairs were identified from cross-linked *Escherichia coli* cells. The data allow assembly of the first protein interaction network that also contains topological features of every interaction.

Of the identified inter-protein cross-linked peptide pairs, 40 per cent

are derived from known interaction and provide new topological data that can help visualize how these interactions exists in cells. Other identified cross-linked peptide pairs are from proteins known to be involved in the same complex, but yield newly found direct physical interactors. ReACT enables the first view of these interactions inside cells, and the results acquired with this method suggest cross-linking can play a key role in future efforts to map the interactions in cells.

Source: pubs.acs.org

Structure of a key protein discovered

Using an innovative approach, scientists at The Scripps Research Institute (TSRI), the United States, have determined the structure of Ltn1, a recently discovered "quality-control" protein that is found in the cells of all fungi, plants and animals. Ltn1 appears to be essential for keeping cells' protein-making machinery working smoothly. "To better understand Ltn1's mechanism of action, we needed to solve its structure, and that is what we have done here," said Mr. Claudio Joazeiro, an associate professor.

In earlier studies, scientists including Mr. Joazeiro had found that an enzyme known as E3 ubiquitin ligase serves as a crucial quality-control manager for the cellular protein-making factories called ribosomes. Occasionally a ribosome receives miscoded genetic instructions and produces certain types of abnormal proteins, called "non-stop proteins", that jam the ribosomal machinery. They also found that Ltn1 fixes jammed ribosomes by tagging non-stop proteins with ubiquitin molecules, thereby marking them for destruction by roving cellular garbage-disposers called proteasomes.

Mr. Joazeiro and his colleagues set out to find how Ltn1 does this. Ltn1 was deemed too large for its structure to be determined by current nuclear magnetic resonance technology, and too flexible to allow the highly regular crystalline packing needed by X-ray crystallographers. Using advanced electron microscopy, Mr. Dmitry Lyumkis, a graduate student and first author of the study, took high-resolution images of yeast Ltn1 with an electron microscope. Mr. Lyumkis then used sophisticated image and data processing software to align and average individual images.

Data analysis revealed that Ltn1 has an elongated, double-jointed and extraordinarily flexible structure with two working ends – the N-terminus and C-terminus. The team then evaluated Ltn1's individual segments, which appear to be more rigid, using X-ray crystallography. It then determined the structure of Ltn1 when attached to a ribosome and operating on a non-stop protein. Mr. Joazeiro notes that a typical yeast cell has nearly 200,000 ribosomes but requires only 200 Ltn1 copies for adequate quality control under normal growth conditions. "Somehow this enzyme can efficiently sense which ribosomes are jammed," he says.

Source: www.scripps.edu

Protein strongest just before death

Researchers from Michigan State University, the United States, have discovered a protein that does its best work with one foot in the grave. The research focuses on the non-traditional lifestyle of Retinoblastoma tumour suppressor proteins, which are unique in that they use controlled destruction to do their jobs in a timely though restrained fashion, said Mr. Liang Zhang, a

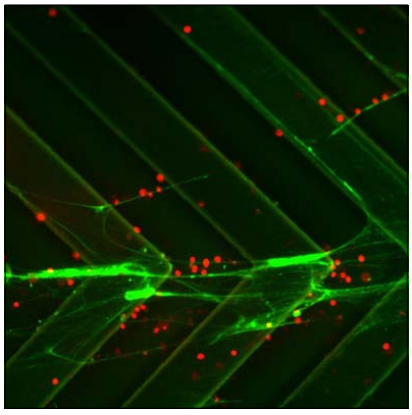
Mr. David Arnost and Mr. Liang Zhang in their laboratory

lead author and a graduate student of cell and molecular biology. "This is an unusual way for proteins to act," observed Mr. Zhang. As an organism grows, proteins essential for fuelling its prosperity typically toe a tight line, performing their jobs at the right place and time. If these proteins go rogue, disasters such as cancer could result. Retinoblastoma proteins perform acts of valour rather than destruction, saving their best work for the time they degrade. Further, their destruction is linked to their ability to efficiently control excessive cell growth – a potential tool in cancer therapy.

Using the fruit fly Drosophila, the researchers isolated the specific region that controls the protein's ability to degrade. Strikingly, this is the same region that the protein uses to exert its full power to suppress genes related to unrestricted cell growth. Mr. David Arnosti, a biochemist and Director of the University's Gene Expression in Disease Development initiative, noted: "By revealing the molecular details about the regulation of the fly Retinoblastoma protein, we can start to understand the possible roles of the human counterparts in cancer."

Source: www.proteomicsnews.com

Jellyfish-inspired device that captures cancer cells



Cells travelling through a microfluidic device can be trapped by strands of DNA (green)

Many scientists are now working on microfluidic devices that can isolate circulating tumour cells (CTCs), but most of these have two major limitations: it takes too long to process a sufficient amount of blood, and there is no good way to extract cancer cells for analysis after their capture. A new device developed by researchers at Massachusetts Institute of Technology (MIT) and Brigham and Women's Hospital, the United States, overcomes those obstacles. "If you had a rapid test that could tell you whether there are more or less of these cells over time, that would help to monitor the progression of a therapy and progression of the disease," says Dr. Jeff Karp, an associate professor of medicine at Harvard Medical School and Co-director of the Centre for Regenerative Therapeutics at Brigham. This type of device could also enable personalized treatments – once cells are isolated from a patient, doctors could test different drugs on them to determine the most effective one.

The new technology grew out of a collaboration between Dr. Karp's lab and that of Mr. Rohit Karnik, an associate professor of mechanical engineering at MIT. The researchers mimicked the tentacles of jellyfish, creating long strands of repeating DNA sequences. Those sequences, known as aptamers, target a protein found in large numbers on leukaemia cells. The DNA strands are attached to a microchannel with a herringbone pattern on its floor. Those patterned ridges cause the blood to swirl as it flows through the channel, improving the chances that individual cells will come into contact with the tentacles, which extend hundreds of microns into the channel. This allows the researchers to increase the rate of blood flow.

The combination of herringbone grooves used to mix the solution and bring the cells into contact with surfaces, and having aptamers that are sticking out into the solution, enable very high capture rates at very high flow rates, says Mr. Karnik. Flow rates in the new device are 10 times higher than those reported for previous devices, and the system can capture 60-80 per cent of the target cells. In the current model, which measures 1 cm^2, the flow rate is 1 ml per hour. By making the device larger, the researchers say they could boost the flow rate to 100 ml of blood per hour – fast enough to process the 10-20 ml samples that would be needed to get an accurate CTC count from an individual patient.

Source: www.sciencedaily.com

Reprogramming cells to fight diabetes

For years researchers have been searching for a way to treat diabetics by reactivating their insulin-producing beta cells, with limited success. The "reprogramming" of related alpha cells into beta cells may one day offer a novel, complementary approach for treating type 2 diabetes. Treating human and mouse cells with compounds that modify cell nuclear material called chromatin induced the expression of beta cell genes in alpha cells, according to a new study. "This would be a win-win situation for diabetics – they would have more insulin-producing beta cells and there would be fewer glucagon-producing alpha cells," says lead author Dr. Klaus H. Kaestner, a genetics professor and member of the Institute of Diabetes, Obesity and Metabolism at Perelman School of Medicine, University of Pennsylvania, the United States.

Both type 1 and type 2 diabetes are caused by insufficient numbers of insulin-producing beta cells. In theory, transplantation of healthy beta cells should halt the disease; yet, researchers have not yet been able to generate these cells in the lab at high efficiency, whether from embryonic stem cells or by reprogramming mature cell types. Alpha cells, another type of endocrine cell in the pancreas, are responsible for synthesizing and secreting the peptide hormone glucagon, which raises glucose levels in the blood.

The research team treated human islet cells with a chemical that inhibits a protein that puts methyl groups on histones (protein complexes around which DNA strands are wrapped in a cell's nucleus), which leads to removal of some histone modifications that affect gene expression. They then found a high frequency of alpha cells that expressed beta-cell markers, and even produced some insulin, after drug treatment. They discovered that many genes in alpha cells are marked by both activating- and repressing-histone modifications. This included many genes important in beta-cell function. In one

state, when a certain gene is turned off, the gene can be readily activated by removing a modification that represses the histone.

Source: www.eurekalert.org

Vitamin D, omega-3 may help clear amyloid plaques

A team of academic researchers has pinpointed how vitamin D3 and omega-3 fatty acids may enhance the immune system's ability to clear the brain of amyloid plaques, one of the hallmarks of Alzheimer's disease. In a small pilot study, the scientists identified key genes and signalling networks regulated by vitamin D3 and the omega-3 fatty acid docosahexaenoic acid (DHA) that may help control inflammation and improve plaque clearance. The new study extends the previous findings with vitamin D3 and highlights the role of omega-3 DHA.

For the study, scientists from University of California-Los Angeles (UCLA), the United States, drew blood samples from Alzheimer's patients as well as healthy controls, and then isolated critical immune cells called macrophages from the blood. Macrophages are responsible for gobbling up amyloid-beta and other waste products in the brain and body. The team incubated the immune cells overnight with amyloid-beta. They added either an active form of vitamin D3 called 1alpha, 25–dihydroxyvitamin D3 or an active form of the omega-3 fatty acid DHA called resolvin D1 to some of the cells to measure the effect they had on inflammation and amyloid-beta absorption.

Both 1alpha, 25-dihydroxyvitamin D3 and resolvin D1 improved the ability of the Alzheimer's patients' macrophages to consume amyloid-beta, and they inhibited the cell death that is induced by amyloid-beta. Each nutrition molecule used different receptors and common signalling pathways for this. While the researchers found that 1alpha, 25-dihydroxyvitamin D3 and resolvin D1 greatly improved the clearance of amyloid-beta by macrophages in patients in both groups, they discovered subtleties in the effects the two substances had on the expression of inflammatory genes in the two groups. In the increased-inflammation group (Group 1), macrophages showed a decrease of inflammatory activation; in Group 2, macrophages showed an increase of the inflammatory genes IL1 and TLRs when either resolvin D1 or 1alpha, 25-Dihydroxyvitamin D3 were added.

Source: newsroom.ucla.edu

Slow-release polymer film could beat vaccination

Most vaccines consist of inactivated viruses that prompt the immune system to recognize an invader and launch a strong defence if it later encounters the real thing. However, this approach can be too risky with certain viruses, such as human immunodeficiency virus (HIV). In recent years, many scientists have been exploring DNA as a potential alternative vaccine. Now researchers at Massachusetts Institute of Technology (MIT) in the United States, describe a new type of vaccine-delivery film that holds promise for improving the effectiveness of DNA vaccines and avoid the safety risks of using viruses to vaccinate against diseases such as HIV.

This type of vaccine delivery would also eliminate the need to inject vaccines by syringe, observes Mr. Darrell Irvine, a professor of biological engineering and materials science and engineering. He and Ms. Paula Hammond, the David H. Koch Professor in Engineering at MIT's David H. Koch Institute for Integrative Cancer Research, took a different approach to delivering DNA to the skin, creating a patch made of many layers of polymers embedded with the DNA vaccine. These polymer films are implanted under the skin using micro-needles that penetrate about half a millimetre into the skin – deep enough to deliver the DNA to immune cells in the epidermis, though not deep enough to cause pain in the nerve endings of the dermis.

Once under the skin, the films degrade as they come in contact with water, releasing the vaccine over days or weeks. As the film breaks apart, the DNA strands become tangled up with pieces of the polymer, which protect the DNA and help it get inside cells. The researchers can control how much DNA gets delivered by tuning the number of polymer layers. They can also control the rate of delivery by altering how hydrophobic the film is. DNA injected on its own is usually broken down very quickly, before the immune system can generate a memory response. When the DNA is released over time, the immune system has more time to interact with it, boosting the vaccine's effectiveness.

Source: www.sciencedaily.com

Mutation location is key to prognosis

Gene MECP2 is the most important factor in mutations. According to Dr. Huda Zoghbi, Professor of molecular and human genetics at Baylor College of Medicine and Director of the Jan and Dan Duncan Neurological Research Institute at Texas Children's Hospital in the United States, "Where a mutation occurs can affect the severity of

the symptoms of the disease." Dr. Zoghbi found the MECP2 gene and confirmed that deficiency in the protein causes Rett syndrome, a post-natal genetic disease that mainly affects girls. In the current study, Dr. Zoghbi and her team relied on data from rare male patients with disruptions in MECP2 that showed that severity of symptoms could be influenced by the location of the gene mutation. The few boys with this disorder fell into two broad categories: those who suffered severe brain disease and death before age 4 and those who lived for decades with symptoms similar to that of Rett or developmental delay and other disorders similar to those seen in autism.

The researchers noted that there was a distinct difference in symptoms seen in boys who had mutations at amino acid 270 and those who had mutations at amino acid 273. The protein is shorter in those with amino acid 270 mutation than those with the mutation at amino acid 273. The researchers found that mice that had mutations at amino acid 273 lived longer and developed symptoms later than the mice that had mutations at amino acid 270 or that lacked the MeCP2 protein (knock-out mice). A reason for the differences could be that the mutation at amino acid 270 disrupts a key topological feature of the DNA – an AT-Hook domain that is a DNA binding motif. By disrupting this domain, the mutation can affect the way the protein bind the DNA and make the already truncated protein much less effective.

Source: www.bcm.edu

Antibodies have protective role against Ebola virus

In the United States, researchers at the National Institutes of Health (NIH) and Oregon Health & Science University (OHSU) have found that an experimental vaccine elicits antibodies that can protect non-human primates from the often-fatal Ebola virus infection. There is presently no licensed treatment or vaccine for Ebola virus infection. Several research groups have developed experimental vaccine approaches that protect non-human primates from Ebola virus and the closely related Marburg virus. These approaches include vaccines based on DNA, recombinant adenovirus, virus-like particles, and human parainfluenza virus 3.

In the current study, scientists at NIH's National Institute of Allergy & Infectious Diseases and OHSU's Vaccine & Gene Therapy Institute built on earlier work with an experimental vaccine composed of an attenuated vesicular stomatitis virus carrying a gene that codes for an Ebola virus protein. They observed how cynomolgus macaques responded to a challenge of Ebola virus before and during treatment with the vaccine and in conjunction with depleted levels of immune cells. Their results showed that important immune cells – CD4+ T cells and CD8+ T cells – had a minimal role in providing protection, while antibodies induced by the vaccine appeared to be critical to protecting the animals. The scientists say this finding will help improve future Ebola virus vaccine development.

Source: www.bioquicknews.com

Knee cartilage repair success with new biomaterial

In the United States, researchers have reported increased healthy tissue growth after surgical repair of damaged cartilage if they put a "hydrogel" scaffolding into the wound to support and nourish the healing process. The hydrogel was implanted in 15 patients during standard microfracture surgery, in which tiny holes are punched in a bone near the injured cartilage. The holes stimulate patients' own specialized stem cells to emerge from bone marrow and grow new cartilage atop the bone. A pilot study indicated that the new implant worked as well in patients as it did in the lab, according to Dr. Jennifer Elisseeff, Jules Stein Professor of Ophthalmology and Director of Johns Hopkins University School of Medicine's Translational Tissue Engineering Centre (TTEC). For cartilage holes caused by injury, microfracture – a standard of care for cartilage repair – often fails to stimulate new cartilage growth or grows cartilage that is less hardy than the original tissue.

Dr. Elisseeff's group developed a promising hydrogel, after experimenting with various materials, and an adhesive that could bind it to the bone. After testing the combination for several years in the lab and in goats, with promising results, the group and their surgeon collaborators conducted their first clinical study on 15 patients with holes in the cartilage of their knees. For comparative purposes, three other patients were treated with microfracture alone. After six months, the researchers reported that the implants had caused no major problems, and scans showed that patients with implants had new cartilage filling an average 86 per cent of the defect in their knees, while patients with only microfracture had an average of 64 per cent of the tissue replaced. Patients with the implant also reported a greater decrease in knee pain in the six months following surgery, according to the researchers.

Source: www.hopkinsmedicine.org

Scientists decode watermelon genome

An international team led by Beijing Academy of Agriculture and Forestry Sciences, China, and BGI, China, has completed the genomic sequence of watermelon (*Citrullus lanatus*) and the resequencing of 20 watermelon accessions. The researchers resequenced 20 watermelon accessions that represent three *C. lanatus* sub-species. As expected, wild watermelon contains greater genetic diversity than the cultivars.

The results of the study showed that many resistance genes were located on chromosomes in clusters, indicating that tandem duplications may serve as the evolutionary basis of resistance genes in watermelon genome. Moreover, evidence from the study supported the previous hypothesis that a large portion of disease resistance genes have been lost during watermelon domestication. The watermelon phloem, the study found, contained 118 transcription factors (TFs), whereas in cucumber only 46 TFs were identified and 32 TFs exist in both. The research team also identified several genes associated with the valuable fruit quality traits, including sugar accumulation and citrulline metabolism.

Genome-wide duplication is a common event for angiosperms, and represents an important molecular mechanism that has shaped modern plant karyotypes. To access the origin of modern cucurbit genome structures, researchers analysed the syntenic relationships between watermelon, cucumber, melon and grape. They proposed an evolutionary model that shaped the eleven watermelon chromosomes from the seven-chromosome eudicot ancestors, through transition from the 21-chromosome eudicot intermediate ancestors involving 81 fissions and 91 fusions.

Source: www.eurekalert.org

Algal gene helps in better biofuel production

Researchers in the United States have engineered a plant with oily leaves – a feat that could enhance biofuel production as well as lead to improved animal feeds. The results show that researchers could use an algae gene involved in oil production to engineer a plant that stores lipids or vegetable oil in its leaves – an uncommon occurrence for most plants. Mr. Christoph Benning, Professor of biochemistry and molecular biology, Michigan State University, led a collaborative effort with colleagues from the Great Lakes Bioenergy Research Centre for creating better plants for biofuels. “It is a proof-of-concept that could be used to boost plants’ oil production for biofuel use as well as improve the nutrition levels of animal feed,” Mr. Benning said.

The researchers began by identifying five genes from the one-celled green algae. From the five, they identified one that, when inserted into *Arabidopsis thaliana,* successfully boosted oil levels in the plant’s leaf tissue. To confirm that the improved plants were more nutritious and contained more energy, the researchers fed them to caterpillar larvae. The larvae that were fed oily leaves from the enhanced plants gained more weight than worms that ate regular leaves.

The research team will now work to enhance oil production in grasses and algae that have economic value. “If oil can be extracted from leaves, stems and seeds, the potential energy capacity of plants may double,” Mr. Benning said. “Further, if algae can be engineered to continuously produce high levels of oil, rather than only when they are under stress, they can become a viable alternative to traditional agricultural crops.” Moreover, algae can be grown on poor agricultural land – a big plus in the food vs. fuel debate, he added.

Source: msutoday.msu.edu

How wild plants live with viral infections

A study of plant viruses in the wild may point to a more cooperative, benevolent role of the microbe, according to a virologist at Pennsylvania State University, the United States. “Most of these wild plants have viruses,” noted Ms. Marilyn Roossinck, Professor of plant pathology and environmental microbiology and biology, who examined more than 7,000 individual plants for viruses. “But they don’t have any of the symptoms that we usually see in crop plants with viruses.”

Most of the viruses Ms. Roossinck studied are new viruses, although they are related to viruses that have been studied in crops. According to the researcher, about half of the viruses that infect wild plants tend to be persistent. The viruses get passed from plants to their offspring through the seeds. Researchers are still trying to uncover exactly what these viruses are doing in the plants. Considering their wide prevalence, they may be playing some role in the life of the plant, Ms. Roossinck suggests. Studies indicate that viruses can be beneficial to some plants, making them hardier and helping them survive extreme temperatures and drought, said Ms. Roossinck.

On a research trip in Costa Rica, a biodiversity hot spot in Central America, Ms. Roossinck noticed

that unmanaged wild plants looked healthier than managed agricultural fields. During her research, she noted that most of the approximately 10,000 species of wild plants at the study site appeared healthy. However, the commercial crops – melons, oranges, pineapple and aloe – that were growing near the site were not as healthy. One plant virus that was found frequently in the forest was also found in nearby melon crops. In the melons it was causing severe disease, while in the wild plants there were no symptoms. Analysing the viruses suggested that they were moving from the crops into the wild plants, but somehow the wild plants remained healthy. Ms. Roossinck is trying to find out how the wild plants avoid disease.

Source: news.psu.edu

Scientists decode genomes of 90 chickpea lines

In a scientific breakthrough that promises improved grain yields and quality, greater drought tolerance and disease resistance, and enhanced genetic diversity, a global research team has sequenced the genomes of the CDC Frontier chickpea variety and genome sequence of 90 cultivated and wild genotypes from 10 different countries. The research, which provides a map of the structure and functions of the genes that define the chickpea plant, involved years of genome analysis by the International Chickpea Genome Sequencing Consortium (ICGSC) led by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) headquartered in India. The University of California-Davis (the United States) and BGI-Shenzhen (China) collaborated in the research, with key involvement of national partners in Australia, Canada, Czech Republic, Germany, India, Spain and the United States.

The global research partnership succeeded in identifying an estimated 28,269 genes of chickpea after sequencing CDC Frontier, a kabuli (large-seeded) variety. Resequencing of additional 90 genotypes provided millions of genetic markers and low diversity genome regions that may be used in the development of superior varieties with enhanced drought tolerance and disease resistance. The genome map can also be utilized to harness genetic diversity by enlarging the genetic base of cultivated chickpea gene pool.

Source: www.eurekalert.org

Sorghum's gene bank unlocked

A new study of sorghum, led by Mr. Stephen Kresovich and Mr. Geoff Morris of the University of South Carolina, the United States, promises to make this crop valuable asset in facing that challenge. A large international effort decoded the genome of *Sorghum bicolor,* the species cultivated for food, in 2009. The focus of the current effort was to establish the linkages between gene differences and physical differences. A detailed understanding of those connections will constitute a tremendous tool for plant breeders. The team included researchers from the International Crops Research Institute for the Semi-Arid Tropics (India and Niger), and the United States Department of Agriculture, Cornell University and University of Illinois (all in the United States). It used genotyping by sequencing (GBS) to determine the individual genetic make-up of 971 sorghum varieties from seed collections across the world. The scientists identified more than a quarter million single-nucleotide polymorphisms (SNPs) – single letters in the genetic code where individual sorghum variants can differ. One subject of particular scrutiny in the study was the genetic control of the panicle, the part that holds the grains, which is a critical consideration in commercial breeding. Closely packed grains are preferred for maximum crop yield in dry areas, but more spacing is desirable in places with abundant rainfall to allow grains dry more readily. The researchers identified genes that likely contribute to this physical feature, and they also mapped them geographically according to the source of the original seed.

Source: www.newswise.com

Tapping into the rubber plant genome

A group of international scientists has sequenced the draft genome sequence of the rubber tree *Hevea brasiliensis*. The team identified around 12.7 per cent of the almost 70,000 genes as unique, and outlined those associated with rubber biosynthesis, wood formation, disease resistance and allergenicity. The rubber industry is affected by rubber blight – a fungal disease – and natural rubber allergenicity, a global medical concern for those repeatedly exposed to latex products, such as gloves. Mr. Ahmad Yamin Rahman from the Centre for Chemical Biology, Universiti Sains Malaysia, Malaysia, and researchers from five other countries believe that this draft genome information will hasten the development of high-yielding rubber plants. This, the researchers hope will lead to assistance in latex production, wood development, disease resistance and allergenicity.

Source: www.sciencedaily.com

Methodologies for Metabolomics: Experimental Strategies and Techniques

Methodologies for Metabolomics provide a comprehensive description of the newest methodological approaches in metabolomic research. The publication highlights most important technologies used to identify and quantify metabolites, including nuclear magnetic resonance and mass spectrometry. It presents statistical and chemometric methods for evaluation of the resultant data. The broad spectrum of topics includes a vast variety of organisms, samples and diseases, ranging from *in vivo* metabolomics in human and animal to *in vitro* analysis of tissue samples, cultures cells and biofluids.

Contact: Cambridge University Press, University Printing House, Shaftesbury Road, Cambridge, CB2 8BS, United Kingdom. Tel: +44 (1223) 358331; E-mail: information@cambridge.org.

Tissue Engineering: Principles and Practices

Putting the numerous advances in the field of tissue engineering into a broad context, this publication explores current thoughts on the development of engineered tissues. With contributions from experts and pioneers, this book begins with coverage of the fundamentals, details the supporting technology, and then elucidates their applications in tissue engineering. It explores strategic directions, nanobiomaterials, biomimetics, cell engineering, gene therapy and much more. The chapters then explore the applications of these technologies in areas such as bone engineering, cartilage tissue, dental tissue, vascular engineering as well as neural engineering. The book provides a comprehensive overview of main research topics in tissue engineering. It examines the properties of stem cells, primary cells, growth factors, and extracellular matrix as well as their impact on the development of tissue-engineered devices. The book focuses upon those strategies typically incorporated into tissue-engineered devices or utilized in their development, including scaffolds, nanocomposites, bioreactors, drug delivery systems, and gene therapy techniques.

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