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BIOTECH EXPRESS

Quick Exit of FDA Commissioner Dr Scott Gottlieb

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Worldly Affairs: Dr Soumya Swaminathan appointed as Chief Scientist of WHO

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3 DAY EVENT

Dates: 26-29, December 2019

Venue: AIIMS, New Delhi

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CONTENTS

BEM inside...

Volume 6 Issue 68 March 2019

VOLUME 6 ISSUE 68
March 2019

Subscription and Article Submission

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CURRENT TOP NEWS

Press Release: 16th edition of BioAsia 2019 witnesses the highest ever participation

34 NEWS IN FOCUS

42 RESEARCH NEWS

Notices:

DST SwarnaJayanti Fellowships
Call for BioProcess development and commercialization Award

Events:

43rd Indian Biphysical Society Meet, March 2019
16th BRSI Convention, Kerala, Nov 2019
BioPharmaCon 2019, AIIMS Dec 2019

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Editorial

Quick Exit of FDA Commissioner Dr Scott Gottlieb

by Kamal Pratap Singh, Editor, Biotech Express

FDA is the world's largest healthcare agency of USA and is responsible for the development of Science all over the world. It is imperative by the fact that simply a rejection of manufacturing Unit of a company can lead to severe loss on stock exchanges all over the world.

But here we are discussing about the quick exit of FDA Chief Dr Scott Gottlieb(46) which is a reaction of several actions that he took and more to some personal reasons here which he think is the priority for him at this time.

According to latest reports by Time, CNN, Fortunately he is finally resigning from the post and seen as a good sign for the hounded growth of Tobacco industry.

Dr. Scott Gottlieb said in a letter to staff Tuesday that he will be leaving the agency.

"It's is hard for me to write this note to share with you the news that I'll be leaving my job as the Commissioner of Food and Drugs in the next month. There's perhaps nothing that could pull me away from this role other than the challenge of being apart from my family for these past two years and missing my wife and three young children," says the letter, which the FDA tweeted.

Dr Gottlieb is facing serious difficulty after his move on banning cigarettes even to replace them by e-cigarettes and Teen vaping. As head of the FDA, Gottlieb made crack down on e-cigarettes and vaping as a key part of his tenure. During his tenure as commissioner, Gottlieb approved a record number of treatments and drugs and advanced policies to confront opioid addiction and prevent youth e-cigarette use. He also faced the longest government shutdown in history. He has been particularly aggressive on the issue of e-cigarette use, targeting convenience stores that sell vaping products, aiming to limit the access and appeal these products have for children.

Move of Dr Gottlieb can affect many industries in the market, specially the pharmaceutical and medical device business. The one category is Biologics and biosimilars which he developed a lot in his regime. According to many he has approved record biosimilars in the market, and that is why the biologics drug manufacturers are looking forward curiously for the coming administration.

It's is hard for me to write this note to share with you the news that I'll be leaving my job as the Commissioner of Food and Drugs in the next month.

Alex Azar, secretary of the Department of Health and Human Services, the FDA's parent agency, said in a statement Tuesday that Gottlieb "has been an exemplary public health leader, aggressive advocate for American patients, and passionate promoter of innovation."

USA President Donald Trump also tweeted about Gottlieb's planned departure, saying he's done a "absolutely terrific job."

"Scott has helped us to lower drug prices, get a record number of generic drugs approved and onto the market, and so many other things. He and his talents will be greatly missed!"

Dr Gottlieb previously worked as a senior adviser to the Centers for Medicare and Medicaid Services and was appointed by the Senate to serve on the Federal Health Information Technology Policy Committee.
Before these appointments, he served as a clinical assistant professor at the New York University School of Medicine in Manhattan, where he also practiced medicine as a hospitalist physician.

He completed a residency in internal medicine at the Mount Sinai Medical Center in New York and is a graduate of the Mount Sinai School of Medicine and of Wesleyan University in Connecticut, where he studied economics.

Dr Gottlieb is also a cancer survivor, a venture capitalist and a government insider who long said he wanted to tear down the wall of FDA regulations that he believes is holding back innovation.

Not everyone is praising Dr Gottlieb's tenure. The advocacy group Public Citizen said in a statement Tuesday that his time as the agency's head "was marked by regulatory decision making regarding medications and medical devices that tilted further in favor of industry's financial interests rather than the interests of public health."

Guest Article

Bioactive peptides- a hidden treasure in native protein

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Abstract

Proteins are serving as source of energy and amino acids that contribute to growth and maintenance of the body. Along with nutritional role, proteins are responsible for various physiochemical and sensory properties of foods, and may act as functional and health-promoting ingredients. Many of the physiological and functional properties of proteins are attributed to biologically active peptides which are often encrypted in the native sequence. Native protein serve as a precursor for bioactive peptides which can be produced from the protein precursor by digestive enzymes (gastrointestinal digestion), during food processing (ripening, fermentation, cooking), storage, or by invitro hydrolysis by proteolytic enzymes. Bioactive peptides are short specific peptides that can alter body functions or conditions and may ultimately influence health positively. Bioactive peptides mainly contain 3–20 amino acid units, but in some cases the size can be larger.

Bioactive peptides Sources

Bioactive peptides may be obtained from plants, animal or marine sources. Plant peptides, having molecular weight less than 10 kDa, can essentially be divided into two categories: bioactive peptides that are produced by selective action of peptidases on larger precursor proteins and degraded peptides that result from the activity of proteolytic enzymes during protein turnover. Bioactive peptides such as hypogin (peanut), angularin (adzuki bean), lunasin (soybean and barley) have been shown to have medicinal properties.

Plant peptides also include glutathions and protease inhibitors such as mustard trypsin inhibitors. Interestingly, most of the therapeutic peptides initially discovered were sourced from animal venoms and toxins. Recently research has focused on discovery of new bioactive peptides from animal sources. Moreover, bio functionalities and isolation procedures of previously discovered bioactive peptides are

well documented in the literature. Peptides from animal sources possess biological activities such as antihypertensive, antioxidant, antimicrobial and antiproliferative activity. Sources such as milk, egg and meat have been given special consideration due to their abundance in the human diet and documented biological activities.

Enzymatic digestion is one of the common methods to obtain peptides from protein hydrolysates of meat products. In addition to this, fermentation of meat products is an alternate method to generate bioactive peptides by proteolytic enzymes during microbial fermentation. The marine environment provides half of the total global biodiversity. Marine derived biologically active peptides are reported to have a range of functionalities including enzyme inhibition, mineral binding, immunomodulatory, antimicrobial, antioxidant, antithrombotic, hypocholesterolemic, and antihypertensive actions. Bioactive peptides and depsipeptides with functional properties have also been isolated from tunicates, sponges, soft corals, sea hares, nudibranchs, bryozoans, sea slugs, tunicates, sponges, mollusks and other marine organisms.

Bioactive peptides function

BP's plays a significant role in human health by affecting the digestive, endocrine, cardiovascular, immune, and nervous systems. BP's are considered the new generation of biologically active regulators; they can prevent oxidation and microbial degradation in foods and also improve the treatment of various

diseases and disorders, thus increasing the quality of life. They display hormone or drug-like activities and can be classified based on their mode of action as antimicrobial, anti-thrombotic, anti-hypertensive, opioid, immunomodulatory, mineral binding, and anti-oxidative.

Bioactive peptides mechanism of action

Oxidation reactions within the body during respiration in aerobic organisms; particularly vertebrates and humans can product free radicals, as well as air pollutants and tobacco oxidantscan be absorbed to blood circulation and exert adverse effects. In addition, UV radiation can stimulate the generation of a variety of oxidants. Oxidative damage plays a significantly pathological role in human diseases like cancer, emphysema, cirrhosis, atherosclerosis, and arthritis.

When the mechanism of antioxidant protection becomes unbalanced by factors such as aging, deterioration of physiological functions may occur, resulting in diseases and accelerating aging. Antioxidant food supplements or bioactive peptides may be used to help the human body and animals to reduce the oxidative damage. Proteins and peptides can inhibit lipid oxidation through multiple pathways including inactivation of reactive oxygen species, scavenging free radicals, chelation of pro-oxidative transition metals, reduction of hydro peroxides, and contribute to the endogenous antioxidant capacity of foods.

Antioxidant activity of protein can be increased by their hydrolysis; peptides have substantially higher antioxidant activity than intact proteins. Dyslipidemia, characterized by the presence of one or more than one abnormal serum lipid concentration (total cholesterol-TC, LDL-C, triglycerides and HDL-C), is a prime risk factor for cardiovascular diseases (CVD). Atherosclerosis is a vascular chronic inflammation in the arterial wall that can lead to clinical manifestations including myocardial infarction, peripheral arterial disease and stroke. The mechanisms considered responsible for the hypocholesterolaemic activity of soy foods and its bioactive peptide involve stimulation of the secretion of bile acids, changes for cholesterol metabolism in the liver, hormonal effects and regulation of cholesterol receptors. Bio-functional activity of bioactive peptide in vitro does not always imply an effect *in vivo*. Even if it does, it is very difficult toestablish a direct relationship between in vitro and in vivo activity.This is mainly due to the bioavailability of the bioactive peptides,to exert a potential effect after oral ingestion, peptide have to reachthe target in an active form. Therefore, they need to remain activeduring digestion by human proteases and be transported throughthe intestinal wall into the blood.

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Press Release

16th edition of BioAsia 2019 witnesses the highest ever participation

Edition saw 2,400 delegates & visitors representing over 50 countries with 100 high profile speakers and 700 corporates; 1,700 partnering meetings were conducted on the sidelines

BioAsia, Asia's largest Biotechnology and Life-sciences forum and the annual flagship event of the Government of Telangana today concluded after 3-days of insightful deliberations by global leaders of Life Sciences and healthcare. The 16th Edition of the event also saw the highest ever participation of 2,400 delegates and visitors from Healthcare, Biotech, Pharma, Life-Sciences, IT, Academia and Startups representing over 50 countries. Over 100 high profile speakers and more than 700 Corporates participated in this edition. A record number of 1,700 partnering meetings in the history of BioAsia were conducted on the sidelines of this edition leading to key strategic collaborations.

In the Start-Up Stage event, BioAsia 2019 recognized selected startups from the healthcare industry for their innovative work in the sector. An eminent jury chose 76 startups from close to 300 applications from India and abroad, out of which the top 5 were showcased which received a cash prize of INR 25,000 each.

Top 5 Startups:

- Caredose (Mr. Kinshuk Kocher) – Tracks the medicine doses & helps in taking the medicine at the right time
- Spectral Insights (Mr. Nishant Jain) – A compact scanner
- Dozee (Mr. Pritish Gupta) – Monitors the sleep, heartbeat, respiration and notification on mobile
- Aura – Ekistics Solutions (Dr. Srikant Mohapatra) - Breakthrough medical technology designed by Ekistics, offers replacement and reconstruction of damaged and diseased valves avoiding artificial prostheses
- Azooka Life Sciences (Mr. Alex D Paul) – Helps in testing of DNA faster

A special Social Innovation award was presented to Adero Labs (Mr. Saaniya Mehra & Zane Barboza) which works in the field of citizen safety and women empowerment.

The event had attendance from the investor community with representation of 35 investors including, Lighthouse Canton, Fulcrum, 50K Ventures, 3one4 Capital, Unitus VC, Ah! Ventures, Anthill Ventures, RoundGlass, M&A division of Dr Reddy's., to name a few.

During the valedictory session of Bioasia 2019, Mr. Jayesh Ranjan, Principal Secretary, IT and Industries and Commerce Departments, Govt of Telangana said, "With the highest number of delegates and partnership meetings, this edition of BioAsia was the largest and most successful edition in the journey of 16 years of the event. We are also witnessing constant interest from corporates and start-ups in BioAsia with an increased number of participants each year. The event has been instrumental in getting many significant partnerships and strategic meetings organized between all stakeholders of the Healthcare and related areas. In its journey of 16 years BioAsia has provided platform to initiate partnerships and around 18,000 business meetings have been organized at BioAsia in last 16 years with delegates from over 90 countries participating in BioAsia so far. We are sure that the trend will continue in next edition of BioAsia in 2020 as well."

Mr. Shakthi Nagappan, Director of Life Sciences, Govt. of Telangana and CEO, BioAsia said, "This year BioAsia has continued its 16 years tradition of being the largest forum in Asia in the field of Healthcare, Life sciences and Biotechnology. The key deliberations during the course of this 3-day event emphasized on Disruption, key challenges and the prospective opportunities for the industry at global as well as domestic level."

The Lifetime achievement award was presented to Dr. BS Bajaj of Federation of Asian Biotech Associations for his outstanding contribution to the Healthcare industry and initiating International collaboration for Indian companies.

The last day of the event witnessed an MoU signed between Government of Telangana and Taizhou Medical Hi-Tech Development Zone (Taizhou Zone) supported by the Government of Taizhou, China. Under the MoU valid for 2 years, the Chinese Medical Zone and the State Government have discussed and agreed to share the know-how and offered to support and assist the research in the field of life sciences, biotechnology and medical devices along with identifying new technologies and industry requirements with a view to expand the public industrial service platforms in the industrial cities. They will support and facilitate matchmaking of companies and research institutes from their respective regions, in the related fields towards R&D, regulations, manufacturing practices, commercialization and other areas of mutual interest.

An elite panel shared their views and discussed on the importance of Data and how can Life Sciences can harness the same to achieve better patient outcomes leading to better service to the people at large. The panelists included Mr. Kris Gopalakrishnan, Chairman, Axilor Ventures, Dr. Bhaskar Rao, MD & CEO, KIMS, Dr. Sridar Natesan, VP - Head of Strategic Initiatives and Scientific Relations, Sanofi, Mr. Achim Plueckebaum, Global Head, Drug Development IT,

Novartis, Mr. Suresh Katta, CEO and Founder, Saama Technologies, Mr. Min Seob Lee, CEO of Eone Diagnomics Genome Center, Mr. Sriram Shrinivasan, Partner, National Life Sciences Leader, Emerging Markets LS Lead / Global Generics Lead, EY.

The 3rd and last day of the event started with an Oxford Style Discussion on How traditional Life Sciences companies are leveraging Technology vs how Technology companies are approaching Healthcare. The session saw an insightful discussion by Ms. Karenann Terrell, Chief Digital and Technology Officer, GSK, UK, Mr. Peter Lee, Corporate Vice President, Microsoft Healthcare, USA and Mr. Ambar Boodhoo, Partner, Americas Life Sciences Transactions Leader, EY who Moderated the session.

Another panel discussion deliberated on Life Sciences 4.0 and the Challenges and strategic opportunities for healthcare in India which had eminent experts including Prof. K. Srinath Reddy, President, Public Health Foundation of India, Dr. Krishna Ella, Chairman and MD, Bharat Biotech, Ms. Shobana Kamineni, Executive Vice- Chairman, Apollo Hospitals, Ms. Lara Bezerra, Chief Purpose Officer (MD) Roche India, Mr. Rohit Sathe, President – Philips Health Systems, Indian Subcontinent and Mr. Kaivaan Movdawalla, Partner, PI Advisory – Healthcare.

For the first time, an Experience zone was created at BioAsia exhibiting disruptive technologies including Artificial Intelligence, 3-D printing, Virtual Reality and immersive technology in healthcare, Augment Reality, and Nanotechnology applications in healthcare and how they can be leveraged to improve patient outcomes.

About BioAsia:

BioAsia is born with a vision to enhance, enrich and encourage newer innovations, path-breaking discoveries and effective solutions in the biotechnology industry by offering a vibrant global platform for convergence of the key stakeholders - Biotech &Biopharma Companies, research institutions, academia, investors, service providers, policy makers, regulators and analysts. BioAsia is focused in its efforts - to drive the growth of the industry by enabling an effective environment for fostering collaborations, JV's M&A's; ensure knowledge and experience sharing by global industry players to benefit all stakeholders; promote innovations and initiatives through appropriate awards and recognitions; play a pivotal role in advocating issues to the policy makers and chartering the road-map of bio-technology. BioAsia is a dynamic platform for companies -to exhibit, launch and showcase their unique strengths, products and services. BioAsia is playing the role of a key catalyst in mobilizing all elements that are required to drive the growth of the emerging industry of Biotechnology as well as optimize the immense business potential of biotech. On a larger level, BioAsia is working to drive a global transformation from the treatment of illness to wellness.

About FABA (Federation of Asian Biotech Associations):

The Federation of Asian Biotech Associations [FABA], is a non-profit registered society engaged in various activities related to promoting Biotechnology in Asian countries. FABA, headquartered at Hyderabad made its humble beginning in 2004 and has achieved a significant landmark in creating a common platform for interaction among member countries and discuss the issues of common interest for improving the biotech space including Technology Transfer, resource sharing, business collaborations, Industry-Academia linkage, cross border trade and investments, etc. among its member countries., FABA has a strong network base in 20 Asian countries including China, India, Bangladesh, Malaysia, Philippines, Russia, Kazakhstan, Pakistan, Israel, Iran, Indonesia, Nepal, Japan, South Korea, Singapore, Thailand, Sri Lanka and UAE. Besides, FABA has entered into working understandings with Non-Asian organizations like European Federation of Biotechnology, Biocat (Spain), Maryland India Business Round Table (USA), Bio Industry Park (Italy) and Association of German Biotech companies (Germany), etc.

Guest Article

Melatonin: A new player in plant growth regulation and stress tolerance

Shivani Nagar, Ajay Arora, Krishna Kumar G, Dipanker Barman, Rajkumar Dhakar, Sandeep Kumar
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Abstract

Melatonin (N-acetyl-5-methoxytryptamine) is a tryptophan derived indolic compound. Because of its widespread presences, conserved structure and diverse action it is been considered as new master regulator in living beings. In plants melatonin is establishing itself as new signaling molecule and plant growth regulator. It controls diverse function and physiological processes such as circadian rhythm, seed germination, tropic responses, growth promotion, rooting induction, cellular and cytoskeleton development, reproduction, abiotic and biotic stress protection and senescence regulation. Here in this article we have discussed about the discovery of molecule, its biosynthesis and role in plants with special emphasis on its role under as stress protectant.

Introduction

In year 1958, Lerner and coworkers first isolated an active factor from beef pineal gland. This compound was able to cause aggregation of melanin granules present in melanocytes of isolated frog skin. They named it as melatonin because of its ability to lighten skin color by inhibiting melanocyte stimulating hormone. Next year Lerner and coworkers successfully isolate melatonin from peripheral nerve of humans, monkey and cow using improved extraction methods. Later its presence was established in organisms as different as bacteria, algae, protozoans, fungi, dinoflagellates, invertebrates and vertebrates, vascular and non-vascular plants (Mayer et al., 1997; Arnao, 2014). Later when its biosynthesis pathway was exploited it was found that serotonin was precursor of melatonin. Presence of serotonin was well established in plant (West, 1958; Udenfriend et al., 1959) which increased the probability of presence of melatonin in plants. In higher plants, in 1993 van Tassel and O'Neill first published abstract in plant physiology congress on identification of endogenous melatonin in Pharbitis nil as potential dark signal in plants. In 1995 two independent scientific groups working in Japan and Germeny published full report on isolation of melatonin from plants (Hatoori et al., (1995); Dubbles et al., (1995)). It was discovered as source of melatonin for human. In animals it controls varied physiological process such as circadian clock, mood, sexual behavior, sleep regulation etc. Melatonin content in plant tissues varies from picograms to micrograms per gram of tissue weight. Consumption of food rich in melatonin can increase melatonin level in blood. Melatonin is used for treatment of depression, obesity, insomnia, reproductive disorders, aging, skin lightening, as antioxidant, antiaging, antidepressant;

antioxidant, circadian rhythm regulator, immunity inducer. In recent time many studies have focused on developing plants with improved melatonin for food and nutraceutical purpose as substitute for externally taken melatonin.

Biosynthesis of melatonin

Melatonin is synthesized from tryptophan amino acid both in plants and animals. Two pathways of melatonin biosynthesis have been deciphered in living beings. In plants tryptophan is first decarboxylated by tryptophan decarboxylase forming tryptamine followed by hydroxylation forming serotonin (5-hydroxy tryptamine) (Figure 1; Blue arrow). Methylation of serotonin gives 5-Methoxytryptamine and via its acetylation reaction by serotonin N-acetyltransferase melatonin is formed. In another pathway serotonin can also be acetlylated to N- acetylserotonine and followed by methylation forming melatonin. In second pathway which is present in animal's serotonin is formed by first hydroxylation followed by decarboxylation of tryptophan (Red arrow). Serotonin is acetlylated to N- acetylserotonine and followed by methylation forming melatonin.

Role of melatonin in plant growth and stress

Phytomelatonin is involved in multiple physiological process such as it regulates the growth of epicotyls, hypocotyls, coleoptiles, roots, shoots, tropic response, seed germination, lateral and adventitious roots induction, delaying induced leaf senescence similar to auxin activity and stress tolerance. In coleoptiles of canary grass, wheat, oat and barley 10 -55% of relative auxinic activity was observed for phototropic response of coleoptiles (Ruiz et al., 2005). Kolar et al., 1997 studied the change in melatonin level in Chenopodiumrubrum L. and first time reported the oscillating behavior of melatonin i.e. low melatonin levels during day and high levels during night which was similar to studies in animals. Later many workers confirmed it that endogenous content of melatonin shows circadian pattern. Thus this molecule may have role in regulation of physiological and metabolic process showing circadian rhythm. Role of melatoinin in reproductive development was studied by Murch andSaxena (2002), in Hypericumperforatum L on hormonal profiling they reported higher levels of IAA, serotonin and melatonin during flower development. Regeneration potential of isolated anthers containing high levels of melatonin was also more. Concentration dependent response for delaying the loss in chlorophyll content was observed on incubation of barley leaves in melatonin. Incubation in 1 mm melatonin was most effective in delaying the senescence (Arnao and Ruiz, 2009).

In many recent publication melotoinin is cited as key regulator under stress because of its ability to control diverse physiological function and considerable stress protecting ability against many biotic and abiotic stress condition. It reduces the reactive oxygen (ROS) and reactive nitrogen species (RNS) mediated damage in plants. It can directly act on ROS such as hydroxyl radical, singlet oxygen, peroxyl radical, hydrogen peroxide, peroxynitrite anion and nitric oxide and act as direct scavenger molecule. Single molecule of melatonin can scavenge two molecule of hydroxyl radical and generates cyclic 3-hydroxymelatonin as intermediate. Cyclic 3-hydroxymelatonin's ROS scavenging ability is higher than melatonin. Secondly, melatonin stimulates antioxidative enzymes such as superoxide dismutase, catalase, peroxidase etc. thus improving antioxidant defense system of plants. Melatonin also works synergistically with other antioxidants and stress protect, such as ascorbic acid and glutathione, ascorbic acid, carotenoids, tocopherols, phenolic acids, flavonoids, and anthocyanins. Overallits act very strong antioxidant because of its antioxidative capacity and ability to boost antioxidant defense system and ROS scavangers ability in plants. It is also able to increases the efficiency of mitochondrial oxidative phosphorylation and photo-phosphorylation thus reducing electron leakage and lowers free radical generation and their mediated damage in plants(Gitto et al., 2001; Galano et al., 2011; Arnao and Ruiz, 2019).

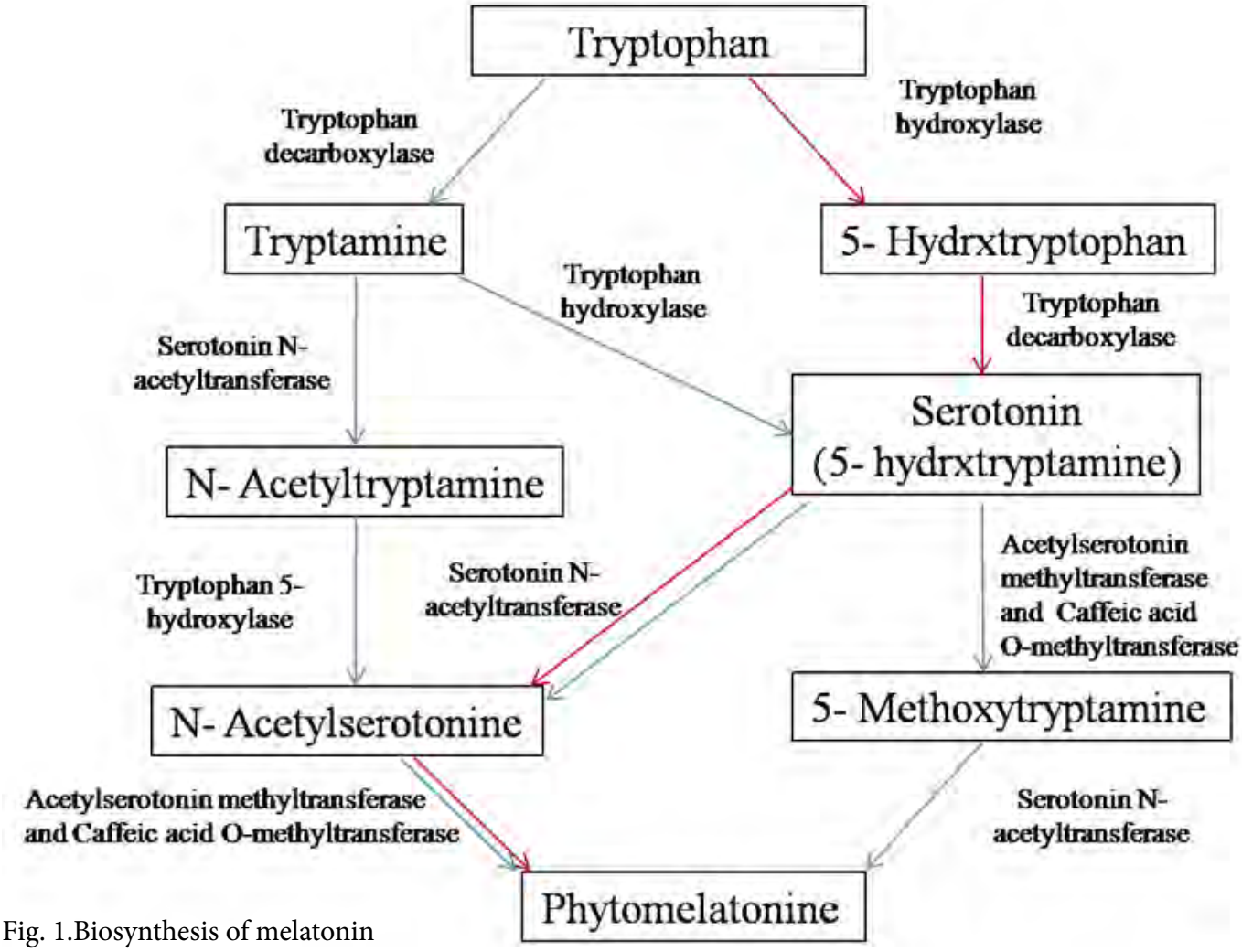

Fig. 1.Biosynthesis of melatonin

Melatonin is becoming increasingly popular because of diverse presence and roles played by it in living being. Melatonin appears to have a clear role in regulation of important physiological processes in plants and animals. Its role as plant stress signaling and stress protectant is also well established now. But still many areas of studies are open in plants such as its bioassay and signaling is not yet deciphered.

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Student Column

AN INVESTIGATION ON COCKROACHES HAS SHOWN THAT SENESCENCE IS AN EVOLUTIONARY TRAIT

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Abstract

Evolution has shown us many types of unique traits that help organisms to better survive in their environment. One such exotic creature, which has rapid adaption, is the common cockroach. Though it is hated by many, it is one of the arthropod ever to survive in any given conditions. This paper will be discussing about this hypothesis, which cockroaches have evolved to reduce their life span to almost 1-2 years. This is done to make them fast maturing and thus accelerating the evolution process. A studies conducted has proven that *Escherichia coli* can evolve to digest citrate within 68000 generations. Also recent antibiotics have become less futile towards these microbes. Thus our cockroach here needs to runs faster in the evolutionary race in order for the survival of its species. Being around unfit environment this natural stress is competed with short life span, thus making roaches early maturing to give rise to new and fit progeny to better adapt to the environment. If this hypothesis is true, then cockroaches are walking medicines which could help humanity to compete with antibiotic resistant bacteria.

Significance of cockroach

Studies have shown that cockroaches are a hub of antibiotics. It was found that roaches have antibiotics secreting from their heads. Scientists have extracted the brain as well as the neural tissue from the roach and have found molecules in the roaches' head that could kill *Staphylococcus aureus* and *Escherichia coli* (1). Also it was also proven that cockroaches have di-phase immune system. The study conducted has shown that, there are two types of immune responses, the first response is non-specific and the second one is more specific. The experiment was conducted with *P.aeruginosa* which roaches shown significant protection (2). *P.aeruginosa* is one of the leading causes of infections in humans, which in some cases can lead to death.

It was also exciting to find out that the milk of cockroaches has essential antibodies which can be used in therapeutics. A species known as, *Diploptera punctuate* was tested and has found essential amino acids. It suggests that the cockroach could become the next super food (3).

We all know we came from the pre-existing bacteria, which ultimately led to complex structures. But has evolution stopped? No. Still bacteria evolve and has adapted to certain antibiotics. A recent article published suggests that bacteria

can give rise to 2 million within just few hours, under right conditions (4). This is a major problem, not only for us but also for the cockroaches. Another article suggests that *Escherichia coli* was able to digest citrate after exposing it for 68000 generations(5,6), so think how fast it will adapt to anything in 2 million? So how does a cockroach cope up with this evolutionary race?

Evolution

Cockroaches belong to a group of species known as *Blattodea,* which link cockroaches, termites and even mantises (7). Scientists around the world believe that the first *Blattodea* came about around 300mya. This could mean that, the first cockroach came about before the splitting of the continents (From the super continent Pangea) (8, 9). The fossil record suggests that the first ancestor of today's roaches came about came about in late 245mya, and the ancestor of the common roaches around 140mya. There almost 4000 species of cockroaches within this short period of time. So it can evolve much faster to cope with the race of bacterial evolution.

A dilemma that led to the hypothesis

Though cockroaches have high immunity and radio resistance, the average life is between 1-2 years. How can such a creature with such massive adaptations were able to live up to only this long? Then evolution answered everything. The cockroaches have adapted to shorten their life span so they can grow and mature faster. This helps in the exponential growth rate in the cockroach populations. As new generations occur within this short span of time, new variation is added to the cockroach gene pool. A female roach lays an ootheca which has about 50 eggs in it (10). Also it is seen that the first arthropod came around 400 million years ago (mya), about 100my before the first *Blattodea,* also the first cockroach came in around 140mya. From that time onwards, cockroach species have diversified so much that we have around 4500 species. So it all add up to this:

1) The bacteria evolves faster
2) Being an unhygienic organism, cockroaches are more prone to these bacterial infections
3) Hence they are also in need to adapt faster.
4) Evolution can only occur in successive generations, thus cockroaches must also reproduce at large scale
4) Large scale reproduction can lead to early maturation, resulting in early **senescence**.

Future

If my hypothesis is true, then cockroaches can deal with the antibiotic crisis around the world. With faster adapting microbes, we could get faster and upgraded antibiotics to meet the demand.

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News In Focus

SPIE Translational Research Award 2019

by Biotech Express Bureau

Dr Aditi Sahu, post-doctoral research scholar at Memorial Sloan Kettering Cancer Centre (New York), has been recently awarded the SPIE Translational Research Award The award was sponsored by the renowned Wellman Centre for Photomedicine (Boston) at was presented at SPIE Photonics West BiOS conference which is organized annually at San Francisco. SPIE Translational Research 2019 highlighted papers from Photonics West BiOS that showcased the latest photonics technologies, tools, and techniques with high potential to impact healthcare with participation of almost 200 research papers.

Photonics West is the leading annual global event for the photonics and laser industries and took place in San Francisco from 2 to7 February 2019. This year, the attendees enjoyed a week full of cutting-edge research (over 5,000 presentations) and two world-class exhibitions (~1,300 companies), making is one of the largest conferences in the world.Photonics West is organized by **SPIE**, the international society for optics and photonics, which was founded in 1955 to advance light-based technologies.SPIE advances emerging technologies through interdisciplinary information exchange, continuing education, publications, patent precedent, and career and professional growth.**SPIE Mission and Vision:** SPIE partners with researchers, educators, and industry to advance light-based research and technologies for the betterment of the human condition.In 2018, SPIE provided $4 million in support of education and outreach programs.

The **Translational Research Program**—designed to facilitate the translation of biophotonics research into clinical practice—includes approximately 200 papers selected from SPIE BiOS, the premier biomedical optics symposium. Papers selected demonstrate outcomes-based optical and light-based solutions for healthcare challenges, particularly for diagnosis, assessment, and treatment of cancer, heart disease, and neurological disease.The program includes a special focus on outcome-based studies with potential for adoption in clinical practice in the near term with a potential to change clinical outcomes and improve the lives of patients. The program is organized around several topics such as:

- Photonic Therapeutics and Diagnostics
- Clinical Technologies and Systems
- Tissue Optics, Laser-Tissue Interaction, and Tissue Engineering

- Biomedical Spectroscopy, Microscopy, and Imaging
- Nano/Biophotonics

The award was given at a special Lunchtime Forum on 2nd February 2019 which included a presentation by Aditi and was followed by a panel discussion where apart from the session chairs, Prof Rox Anderson and several optical and dermatological experts were also present. They discussed various aspects including adaptation trends, application opportunities, clinical needs, and regulatory challenges in moving technology from the laboratory to the clinic.

Among several prestigious awards, PW awards **Translational Research Award**. Out of almost 200 abstracts focussing on biophotonics technologies with the, this year's award was given to Dr Aditi Sahu from Memorial Sloan Kettering Cancer Centre. She also received a cash prize of USD 500. Her work was titled "Combined reflectance confocal microscopy-optical coherence tomography for detection and deep margin assessment of basal cell carcinomas: a clinical study"

Aditi is currently undergoing her post-doctoral training under mentorship of Dr Milind Rajadhyaksha who is a senior SPIE member and a renowned scientist and engineer. Before that, she received her PhD from the prestigious Tata Memorial Centre's Advanced Centre for Treatment Research and Education in Cancer (ACTREC), Navi Mumbai. She has been working in the field of cancer diagnosis for the past 9 years and has published more than 20 research articles in reputed journals, including AACR's Cancer Research and JAMA Derm. Among her other achievements include talks at SPIE, SPEC and AACR conferences, several international travel grants, Junior and Senior Research Fellowships. She is a member of SPIE, New York Academy of Sciences, Indian Spectroscopy Society, Mumbai Immunology Group and several other organizations. Her long-term career goals including working towards cancer prevention, early diagnosis and non-invasive treatment of cancers, facilitated through multi-modal optical imaging approaches. Among her extra-academic activities, she is a noted proponent of veganism and she stands against animal cruelty.

SPIE Photonics West BiOS2019 Translation Research Symposium Chairs
Prof. Aaron Aguirre, Massachusetts General Hospital (United States)
Prof. GabrielaApiou, Harvard Medical School,Wellman Ctr. for Photomedicine, Massachusetts General Hospital (United States)

Program Committee
Prof. Darren Roblyer, Boston Univ. (United States)
Prof. Reginald Birngruber, Univ. zu Lübeck (Germany)

Worldly Affairs

Dr Soumya Swaminathan appointed as chief scientist of WHO

March 7, 2019

Dr Soumya Swaminathan was one of the three deputy director-generals supporting the director-general in overseeing all programmes. She was the first Indian to hold the position at WHO.

Dr Swaminathan will now be chief scientist in a newly created department in the WHO.

The revamp, laid out in an internal memo sent to staff and seen by Devex, includes the creation of new positions and divisions which will help WHO achieve its triple billion targets in its new five-year strategic plan.

Zsuzsanna Jakab, currently regional director at WHO in Europe, will be the new deputy director-general.

A globally recognised researcher on tuberculosis and HIV, Dr Swaminathan has been on several committees of WHO and global advisory bodies, including the WHO Expert Panel to Review Global Strategy and Plan of Action on Public Health, Innovation and Intellectual Property, the Strategic and Technical Advisory Group of the Global TB Department at WHO and as co-chair of the Lancet Commission on TB.

India's PM confers Shanti Swarup Bhatnagar Prizes for S&T

March 1, 2019

The Prime Minister, Shri Narendra Modi, attended

the award ceremony for the Shanti Swarup Bhatnagar Prize for Science and Technology, at Vigyan Bhawan in New Delhi, on 28 February 2019.

The Prime Minister confer the Shanti Swarup Bhatnagar Prizes for 2016, 2017 and 2018 to the awardees. He also addressed the gathering.

The Shanti Swarup Bhatnagar Prize is named after the founder Director of the Council of Scientific & Industrial Research, Dr. Shanti Swarup Bhatnagar. The Prize is given each year to recognize outstanding Indian work in various disciplines of Science and Technology.

List of receipients in the field of Biological Sciences and Medical Sciences-

Dr Rishikesh Narayanan, Indian Insitute of Science- 2016- Biological Sciences
Dr Suvendra Nath Bhattacharya, Indian Institute of Chemical Biology- 2016- Biological Sciences
Dr Niyaz Ahmed A S, University of Hyderabad- 2016- Medical Sciences

Dr Deepak T Nair, Regional Centre of Biotechnology- 2017- Biological Sciences
Dr Sanjeev Das, National Institute of Immunology- 2017- Biological Sciences
Dr Amit Dutt, ACTREC, Tata Memorial Centre- 2017- Medical Sciences
Dr Deepak Gaur, Jawaharlal Nehru University- 2017- Medical Sciences

Dr Ganesh Nagaraju, Indian Insitute of Science- 2018- Biological Sciences
Dr Thomas Pucadyil, Indian Institute of Science Education and Research- 2018- Biological Sciences
Dr Ganesan V, NIMHANS- 2018- Medical Sciences

London man seems to be free of HIV in second such case

A London man appears to be free of the virus that causes AIDS after a stem cell transplant, the second success including the "Berlin patient," doctors reported.

Photo: Timothy Ray Brown poses for a photograph in Seattle. Brown, also known as the "Berlin patient," was the first person to be cured of HIV infection, more than a decade ago.
AP Photo/Manuel Valdes

The therapy had an early success with Timothy Ray Brown, a U.S. man treated in Germany who is 12 years post-transplant and still free of HIV. Until now, Brown is the only person thought to have been cured of infection with HIV, the virus that causes AIDS.

Such transplants are dangerous and have failed in other patients. They're also impractical to try to cure the millions already infected.

The case, published online by the journal Nature, was presented at an HIV conference in Seattle.

Brown sat in the front row, stood for a round of applause and shook hands with lead researcher Ravindra Gupta of University College London after Gupta presented details on the London patient.

The patient has not been identified. He was diagnosed with HIV in 2003 and started taking drugs to control the infection in 2012. It's unclear why he waited that long. He developed Hodgkin lymphoma that year and agreed to a stem cell transplant to treat the cancer in 2016.

With the right kind of donor, his doctors figured, the London patient might get a bonus beyond treating his cancer: a possible HIV cure.

Doctors found a donor with a gene mutation that confers natural resistance to HIV. About 1 percent of people descended from northern Europeans have inherited the mutation from both parents and are immune to most HIV. The donor had this double copy of the mutation.

That was "an improbable event," said Gupta. "That's why this has not been observed more frequently."

The transplant changed the London patient's immune system, giving him the donor's mutation and HIV resistance.

The patient voluntarily stopped taking HIV drugs to see if the virus would come back.

Usually, HIV patients expect to stay on daily pills for life to suppress the virus. When drugs are stopped, the virus roars back, usually in two to three weeks.

That didn't happen with the London patient. There is still no trace of the virus after 18 months off the drugs.

Researchers from eight countries are tracking 45 pa-

tients with cancer and HIV who have or will soon have stem cell transplants. One of them, a Dusseldorf, Germany, man, is showing no signs of HIV several months after stopping treatment drugs, but it is too soon to tell if he, too, could be in remission.

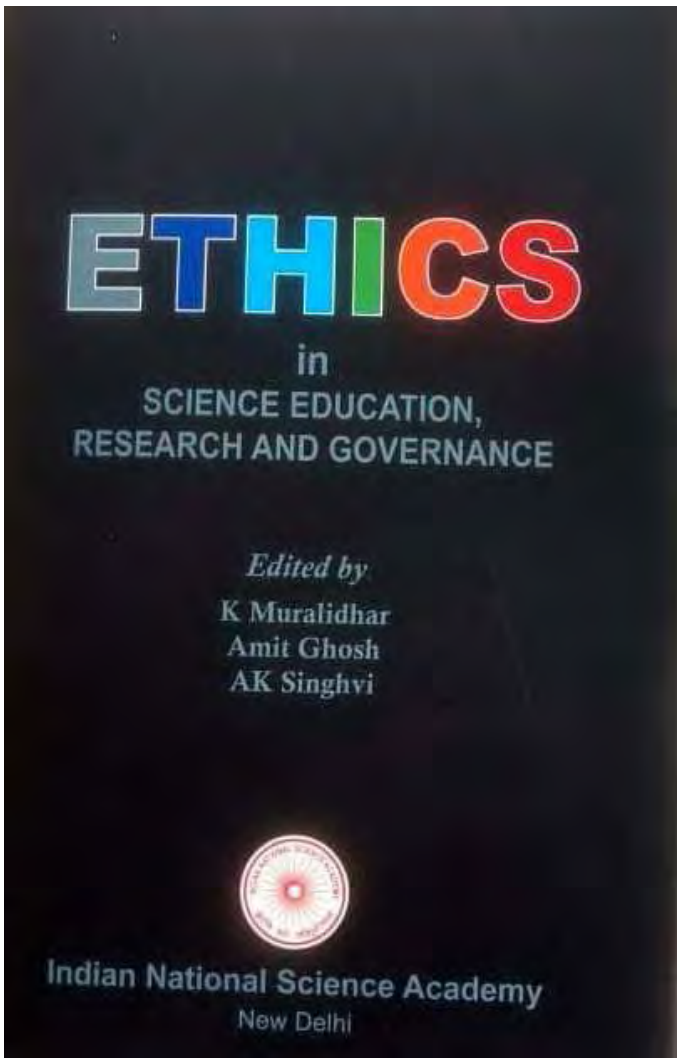
Calling the London patient "cured" is tricky, Gupta said, because there is no standard definition for how long someone must remain free of virus and off treatment drugs. "We are being cautious" to call it remission for now, he said.

Brown said he would like to meet the London patient and would encourage him to go public because "it's been very useful for science and for giving hope to HIV-positive people, to people living with HIV," he told The Associated Press Monday.

Stem cell transplants typically are harsh procedures which start with radiation or chemotherapy to damage the body's existing immune system and make room for a new one. There are complications too. Brown had to have a second stem cell transplant when his leukemia returned.

Compared to Brown, the London patient had a less punishing form of chemotherapy to get ready for the transplant, didn't have radiation and had only a mild reaction to the transplant.

Dr. Gero Hutter, the German doctor who treated Brown, called the new case "great news" and "one piece in the HIV cure puzzle."



New Book Release by INSA, New Delhi

Indian National Science Academy, INSA has recently released a book named Ethics in Science Education, Research and Governance. It has been edited by Prof Kambadur Muralidhar, Prof Amit Ghosh and Prof A K Singhvi. You may ask for the copy by making contact with INSA, New Delhi.

Research Article

Sequestration of heavy metals by live and dead biomass of *Aspergillus* spp.

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Abstract

The heavy metal pollution in water is a very serious problem which causes toxic effects on humans, animals and plants. The fungi are excellent biosorbent for heavy metals. The fungi used in this study were isolated from the compost and compost yard soil and identified as *Aspergillus clavatus*, *Aspergillus oryzae* and *Aspergillus fumigatus* and studied for their ability to sequester heavy metals from solution. The sequestration of metals was studied using live and dead biomass. The sequestration of Cd was 6.51 mg/g by the live biomass of *Aspergillus* spp. The sequestration of Zn, Cd and Pb was 29.37, 27.89 and 30.59 mg/g respectively from mixed metal solutions using the dead mixed biomass. The sequestration of Zn, Cd, Pb and Ni was 6.27, 3.58, 6.51 and 3.91 mg/g respectively from individual metal solutions using dead mixed biomass. In comparison to live biomass, dead biomass was found to be more effective in the sequestration of metals. Biosorption of heavy metals will be very easy and rapid for control of heavy metal pollution.

Keywords Biosorption. Pollution. Sequestration. Biomass. Heavy metals. Electroplating

Introduction

Heavy metal pollution usually arises from electroplating, plastics manufacturing, pigments, mining, fertilizers and metallurgical processes. Heavy metals of concern include Pb, Cr, Hg, Ur, Se, Zn, Cd, Ni, As, Ag, Au, etc. (Ahalya et al. 2003). Metals are mobilized and carried into food web as a result of leaching from waste dumps, polluted soils and water. The metals increase in concentration and are passed onto the next higher level, called as biomagnification (Paknikar et al. 2003).

Biosorption is non-directed physicochemical interactions that occur between metals and microbial cells (Shumate and Strandberg 1985). It offers several advantages over the conventional methods viz., clean and cost effectiveness, efficiency, and minimization of chemical or biological sludge, requirement of additional nutrients and regeneration of biosorbent with possibility metal recovery.

Fungal biomass has been found to be excellent biosorbent for heavy metals (Holan and Volesky 1994; Volesky and Holan 1995). Fungi are known to have good metal uptake systems with metabolism-independent biosorption being the most efficient. Potential of

filamentous fungi in bioremediation of heavy metal containing industrial effluents and wastewaters has been increasingly reported from different parts of the world (Gadd 1993). Biomass of fungi, such as *Absidia*, *Cunninhamella*, *Mucor*, *Penicillium chrysogenum* (Paknikar et al. 1993), *Streptomyces pimprina* and *Rhizopus* exhibit excellent metal ion uptake. Fungal biomass has been reported to sequester copper, lead, zinc, nickel, cadmium, gold, silver silver and various actinide elements, such as thorium, uranium and plutonium (Tsezos and Volesky 1981; Gadd and White 1989; Luef et al. 1991; Kapoor and Viraraghavan 1995; Kapoor and Viraraghavan 1998; Meyer and Wallis 1997).

The work focuses here on the use of fungal biomass (both live and dead) for the sequestration of heavy metals Zn, Cd, Pb and Ni from the aqueous solutions.

Materials and methods

Isolation of fungi from distillery spentwash-based composts and compost yard soil for sequestration of metals

The fungi were isolated by the viable count method from the distillery spentwash-based composts and compost yard soil obtained from the sugar factories viz., Theur, Malegaon and Baramati.

Characterization of fungi by slide culture technique

Half strength sterile Cdox agar medium was prepared. Agar blocks (1 cm^2) were cut and placed on sterile glass slide. The fungal isolates were inoculated to the four corners of the agar block. The slides were incubated at 28 °C for 3 days in the petriplate on the glass triangle kept on the filter paper moistened with 20% glycerol. Staining was done by lactophenol cotton blue containing following composition (g/L); phenol crystals 1000, lactic acid 1000, glycerin 2000, methylene blue 7.5 and observed under phase contrast microscope (Lawrence and Mayo, Pune) under 40X lens.

Preparation of live and dead biomass

The spore suspension (5 x 10^5 spores/mL) of the 3 fungi was used as inoculum for the preparation of biosorbents. The collected spores were aspectically transferred to 500 ml conical flask containing 100 ml Yeast Peptone Glucose (YPG) containing following composition (g/L); yeast extract 3, peptone 10, glucose 20, pH 4.5 and incubated on a shaker (125 rpm) at 28 °C for 3 days. After incubation, the biomass was harvested and washed with a copious amount of deionised water which was referred as the 'live biomass'. For preparation of 'dead biomass', the biomass was autoclaved at 121 °C for 15 min. The live and dead biomass was dried in oven at 50 °C and then further ground using a mortar and pestle. The prepared live and dead fungal biomass was used for the sequestration of heavy metals viz., Zn, Cd, Pb and Ni.

Sequestration of heavy metals by the fungal biomass

Sequestration of heavy metals by the live biomass

Biosorption from mixed metal solutions

The biosorption from the mixed metal solutions using mixed live biomass. The biomass of each fungus (2 g) was weighed and suspended in mixed form in mixture of heavy metal solutions (50 ml each) of 1000 ppm and pH 5.0 in 500 ml conical flasks and incubated at 28 °C under stationary conditions. After 20 min of contact time, the biomass were filtered through Whatman filter paper No.1 and analyzed for the metal content on Atomic Absorption Spectrophotometer (AAS) (Varian Spectra A, Germany). The amount of metal biosorbed g^{-1} of the biomass was calculated using the following equation (Yan and Viraraghavan 2000):

$Q = [(C_i - C_f)/m] \times V$ ------- (Eq.1)

Where, Q = metal ion biosorbed (mg/g)

C_i = initial metal ion concentration (mg/L)

C_f = final metal ion concentration (mg/L)

m = biomass in the reaction mixture (g)

V = volume of the reaction mixture, L

Sequestration of heavy metals by the dead biomass

Biosorption from mixed metal solutions

The biosorption from mixed metal solutions using mixed dead biomass was done as mentioned for the live biomass.

Sequestration of heavy metals by the live biomass

Biosorption from individual metal solutions

The biosorption from individual metal solutions using mixed live biomass was carried. The biomass of each fungus (2 g) was weighed and suspended in mixed form in individual heavy metal solutions (50 ml each) of 1000 ppm and pH 5.0 in 500 ml conical flasks and incubated at 28 °C under stationary conditions. After 20 min of contact time, the biomass were filtered through Whatman filter paper No.1 and analyzed for the metal content on AAS.

Sequestration of heavy metals by the dead biomass

Biosorption from individual metal solutions

The biosorption from individual metal solutions using mixed dead biomass was carried as mentioned for the live biomass.

Results and discussion

Fungi from distillery spentwash-based composts and compost yard soil

About 15 fungi were isolated from the distillery spentwash-based composts and compost yard soil (Gunjal et al. 2017). These fungi were further selected for the biosorption studies based on their lignocellulosic properties.

Characterization of the fungal isolates by slide culture technique

Slide culture technique and staining by lactophenol cotton blue showed the fungal species isolated from the compost and compost yard soil samples were *Aspergillus clavatus*, *Aspergillus oryzae* and *Aspergillus fumigatus* (Gunjal et al. 2017).

Biosorption from mixed metal solutions using live and dead biomass

The sequestration of Cd was 6.51 mg/g by the live biomass of *Aspergillus* spp. (Table 1). The sequestration of Pb and Ni from mixed metal solutions was very less using mixed biomass.

The sequestration of Zn, Cd and Pb was 29.37, 27.89 and 30.59 mg/g respectively from mixed metal solutions using the dead mixed biomass (Table 1).

There was direct competition for the binding sites between Zn, Cd, Pb and Ni in the mixed metal solution system where Cd uptake overtook the uptake of Zn, Pb and Ni under the same conditions, i.e. metal concentration 1000 ppm, pH 5.0 and temperature 28 °C. Zn biosorption by *A. clavatus*, *A. oryzae* and *A. fumigatus* was significantly affected due to presence of Cd, Pb and Ni metals because the binding sites on the biosorbents were limited due to which the metals competed simultaneously for the sites. There is a report which has shown that Zn removal is reduced in presence of Cd in dual metal solution (Ting and Teo 1994). The amount of suppression for Zn uptake depended on the affinity of these ions for binding sites and binding strength of the respective heavy metal ions to the biosorbent. Studies have been done on biosorption of Pb(II) and Cd(II) ions by the biomass of *Phanerochaete chrysosporium* using binary metal solutions where the effects of the presence of one metal ion on the biosorption of the other metal ion were investigated in terms of equilibrium isotherm and adsorption yield (Li et al. 2004). There is also a report on adsorption study of Ag, Cu and Ni by the biomass of *Chrysosporium* sp. using mixed metal solution where the heavy metals when mixed in water, the competition for adsorptive sites on the cell surfaces resulted in the biomass adsorption of Ag being increased by 10 to 50%, but Ni adsorption reduced by 10 to 80% and for Cu the adsorption reduced to 70% (Wu and Wang 1995).

Biosorption from individual metal solutions using live and dead biomass

The sequestration of Pb was 1.17mg/g using live mixed biomass of *Aspergillus* spp. (Table 2).

The sequestration of Zn, Cd, Pb and Ni was 6.27, 3.58, 6.51 and 3.91 mg/g respectively from individual metal solutions using dead mixed biomass (Table 2).

There are reports on study of *A. flavus* and *A. niger* for the biosorption of heavy metals (Akar and Tunali 2006; Dacera and Babel 2008). There is a report on study of single and binary biosorption of heavy metal ions by *Aspergillus versicolor* (Tastan and Donmez 2010). Study has been done on removal of Pb, Zn and Cd ions by *Curvularia lunata* biomass when the metal ions are present in binary and tertiary combinations (Paraszkiewicz et al. 2009). There is also a report on the study of biosorption of Ni, Cr and Cd by metal tolerant *Aspergillus niger* and *Penicillium* sp. using single and multi-metal solution, where total biosorption of metals was higher in multi-metal ion system (Ahmad et al. 2006). The ability of fungal biomass *Agaricus bisporus* to biosorb Pb(II), Cr(III), Cd(II) and Co(II) using

Sequestration (mg/g) of							
Zn		Cd		Pb		Ni	
Live	Dead	Live	Dead	Live	Dead	Live	Dead
-	29.37 ± 0.15	6.51 ± 0.01	27.89 ± 0.53	2.81 ± 0.00	30.59 ± 0.20	0.12 ± 0.01	-

Table 1 Biosorption from mixed metal solutions using live and dead biomass. All values are average of three readings ± SD.

single and binary mixtures has been reported (Al-Hares 2017). Study has been done on biosorption of binary mixtures of Cu and Co by *Penicillium brevicompatum*, where the adsorption of binary mixtures of heavy metal solutions on the fungal biomass was found to be competitive type and the adsorption capacity for any single metal decreased in the presence of other (Tsekova et al. 2007).

There is a report on the characteristics functional groups present on the fungal cellwall which are responsible for biosorption of metal ions. The Fourier-transform infrared spectroscopy (FTIR) has shown the band at 2900 attributed the C-H, at 1620 to 1590 cm^{-1} the C=O and amide group, at 1400 cm^{-1} N-H group and at 1025 cm^{-1} presence of alcohol and carboxylic groups on *Aspergillus fumigatus* and *Aspergillus tubingensis* (Ratnasri and Hemalatha 2015). There is a report where FTIR analysis revealed –NH (bending), C-H (stretching), C=O (stretching) and –OH functional groups were responsible for Ni (II) biosorption by using immobilized biomass of *Rhizomucor tauricus* (Kishore et al. 2012).

Till date there are no reports on the biosorption experiments using mixture of heavy metals and also no biosorption studies are done using mixture of biomass of *A. clavatus*, *A. oryzae* and *A. fumigatus*.

Conclusion

The mixture of biomass of *A. clavatus*, *A. oryzae* and *A. fumigatus* can be used to remove Zn, Cd, Pb and Ni from the aqueous solutions using multi-metal and individual metal solution. Biosorption of heavy metals will be very easy and rapid for the control of heavy metal pollution.

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Sequestration (mg/g) of							
Zn		Cd		Pb		Ni	
Live	Dead	Live	Dead	Live	Dead	Live	Dead
-	6.27 ± 0.01	-	3.58 ± 0.26	1.17 ± 0.00	6.51 ± 0.02	5.75 ± 0.00	3.91 ± 0.02

Table 2 Biosorption from individual metal solutions using live and dead biomass. All values are average of three readings ± SD.

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If you are interested in applying, you can find the details of the application process at: https://www.ncbs.res.in/events/9asjw.

The application deadline is May 10 , 2019.

Scan the QR Code to get this link

NEWS: Govt & Industry

Key missions launched on foundation day of Department of Biotechnology

Appeared in news on February 26, 2019

Department of Biotechnology in the Ministry of Science and Technology, Government of India, celebrated its 33rd Foundation Day today in New Delhi with the theme as "Celebrating Biotechnology: Building Indian as an Innovation Nation".

On the occasion Union Minister for Science & Technology, Dr. Harsh Vardhan gave away the Biotechnology Research Innovation and Technology Excellence (BRITE) awards. The Union Minister emphasized the role of Department of Biotechnology during the last 33 years in creating a large scale impact across the multiple sectors by development and commercialization of affordable solutions for healthcare, improved crop varieties, animal diagnostics

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and technology for generation of clean energy. Further, he highlighted the progress made in the area of capacity building, generation of new knowledge, translational research and in nurturing of Biotechnology startup ecosystem.
The Minister announced key missions at the foundation day ceremony including Atal JaiAnusandhan Biotech Mission – Undertaking Nationally Relevant Technology Innovation (UNaTI), which is expected to transform Health, Agriculture and Energy sectors during the next 5 years. This mission includes GARBH-ini – A Mission to promote Maternal and Child Health and develop prediction tools for pre-term berth, IndCEPI – A Mission to develop affordable vaccines for endemic diseases, Development of Biofortified and Protein Rich wheat – contributing to POSHAN Abhiyan, Mission on Anti Microbial Resistance for Affordable Diagnostics and Therapeutics and Clean Energy Mission – Innovative Technology interventions for Swachh Bharat.

Dr. Harsh Vardhan further informed that the Department has recently established Skill Development Centers at various institutions and also collaborated with State Council of Science and Technology for implementation of Skill Vigyan programme which aims to provide high quality hands on training in tools and techniques in multidisciplinary area of biotechnology for entry level students. On the occasion, the Union Minister also unveiled short film on DBT activities, launched new DBT website and released Coffee Table book.

The Science & Technology Minister also highlighted that Discovery research and generation of new knowledge of biological sciences is very important and is fundamental and foundation of innovation and Department's support to competitive R&D activities in biotechnology has resulted in more than 6000 publications.

Secretary, DBT, Dr. Renu Swarup, in her opening address laid impetus on strengthening the research and translation base and ensuring sustainability and scalability. The Secretary highlighted the role of (BIRAC) in promoting and nurturing innovation and entrepreneurship over the years which has resulted in support to more than 500 startups, 35 bioincubators spread across the country. "Approximately 175 IPs have been generated and 140 products and technologies commercialized; besides this, the Department has supported more than 15000 scientists and 5000 skilled research manpower." said Dr. Swarup.

On this occasion, Foundation Day lecture was delivered by Dr. Peter Goodhand, Chief Executive Officer, Global Allliance for Genomics and Health, Canada which was followed by panel discussion on Biotechnology @2025: Our Achievements; Our Aspirations and Young Investigators shared their scientific journey. Former Secretary, Dr. Manju Sharma also delivered a talk on celebrating Biotechnology "Building India as an Innovation Nation.

Zambia Lifts ban on GM Imports, saying they are safe

Appeared in news on March 6, 2019

GM food is safe for consumption, says Zambia Health Minister Dr. Chitalu Chilufya while presenting in Parliament the results of studies conducted about GM food consumption. He emphasized that the studies have shown that GM food had no effect on the health of human organs.

The Health Minister was speaking in response to a question raised by MP Tutwa Ngulube from Kabwe Central about the implementation of GM importation ban. Dr. Chilufya said that the government had lifted the ban and that supermarkets are already selling imported GM products in accordance with the provisions of the Biosafety Act.

He further explained that the ban on importation was implemented since the country had no capacity to handle GM products because of lack of qualified human resource and appropriate infrastructure, as well as absence of policy and legal framework for modern biotech applications. Thus, after the ban was implemented, the government initiated to have the biotech and biosafety policy in 2003 and enacted the Biosafety Act in 2007 alongside

the creation of the National Biosafety Authority.

Telangana government signs pact with China

Appeared in news on 28th February 2019

BioAsia 2019 Life Sciences 4.0
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The State government signed a pact with the government of Taizhou (China), and Taizhou Medical Hi-Tech Development Zone here on Wednesday to share the know-how, support and assist research in the field of life sciences, biotechnology and medical devices.

The agreement, singed on the concluding day of BioAsia 2019, will be valid for two years, during which period they will identify new technologies and industry requirements to expand public industrial service platforms within industrial cities. The MoU also allows both partners to facilitate matchmaking of companies and research institutes from their respective regions in the related fields towards R&D, regulations, manufacturing practices, commercialisation and other areas of mutual interest.

Biogen announced selling of biologics manufacturing operations

Biogen announced it is selling its biologics manufacturing operations in Hillerod, Denmark to Toyko-based FUJIFILM for up to $890 million in cash. The Hillerod subsidiary, Denmark Manufacturing ApS, has about 800 staffers, who are expected to continue working under Fujifilm.

Under the terms of the deal, Fujifilm will buy the shares of the Biogen subsidiary in cash, subject to minimum purchase commitment guarantees and other contractual terms. Biogen also will sign manufacturing services agreements with Fujifilm. Fujifilm will use the site to produce commercial products for Biogen, such as Tysabri, in addition to working with other companies to manufacture biologics.

The Hillerod plant includes a 90,000L biologics manufacturing facility with assembly, labeling and packing operations, quality control laboratories and warehouses.

After this deal closes, Biogen will continue to maintain manufacturing operations in Research Triangle Park, NC, and Solothurn, Switzerland. The Switzerland site is expected to be operational by the end of 2020.

Reuters notes that Fujifilm is attempting to boost its healthcare business as its legacy photocopy operations stagnate. In 2018, it committed to acquiring two biotechnology units from JXTG Hold-

Image Source: https://www.biogen-international.com/en/about-biogen/the-company/our-facilities.html

ings Inc. for about $800 million. Fujifilm's imaging and healthcare businesses both brought in about the same revenue for the nine-month period leading to December, but the healthcare businesses grew at a faster pace, 11 percent year-on-year growth compared to the imaging division's 2 percent growth.

"We will expand our contract development and manufacturing organization (CDMO) business with 20 percent growth rate which is higher than it has been," Kenji Sukerno, Fujifilm's president and chief operating officer, told reporters.

Fujifilm, after the deal closes, plans to hit its $900 million revenue target in its CDMO business by 2021, two years earlier than its previously stated goal. In fiscal year 2018, it expects to earn about 40 billion yen, or about $359.8 million (U.S.).

Just last week, Biogen announced it was acquiring Nightstar Therapeutics, a clinical-stage gene therapy biotech based in London, UK. That deal was for $25.50 in cash for each Nightstar share, coming to about $800 million.

Nightstar focuses on adeno-associated virus (AAV) treatments for inherited retinal disorders.

Haven is the new name of joint venture between Amazon, Berkshire Hathaway and JP Morgan Chase Healthcare

Appeared in news on Mar 07, 2019

In January 2018, Berkshire Hathaway's Warren Buffett, Amazon's Jeff Bezos and JP Morgan Chase's Jamie Dimon announced they were creating a joint venture to slash healthcare costs and improve services. For more than a year, it had no name other than "ABC," the first letters of each company's name. Now, more than a year later, the endeavor has an official name, Haven.

In June 2018, Atul Gawande came on as the chief executive officer of the joint venture. Gawande practices general and endocrine surgery at Brigham and Women's Hospital and is a professor at the Harvard T.H. ChFan School of Public Health and Harvard Medical School. He is also founding executive director of Ariadne Labs, a health systems innovation center.

Haven's three guiding principles are 1) being an advocate for the patient and an ally with anyone, including physicians, industry leaders, innovators and policymakers, who can improve patient care and contain costs, 2) create new solutions by changing "systems, technologies, contracts, policy" and anything else they can come up with, and 3) they will be relentless.

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Novo Nordisk Snags FDA Approval for Hemophilia A Treatment

Appeared in news on Feb 20, 2019

On Tuesday, Novo Nordisk said the FDA approved its Biologics License Application for Esperoct (turoctocog alfa pegol) formerly known as N8-GP, for the treatment of children and adults with hemophilia A. Esperoct, is an extended half-life factor VIII molecule for replacement therapy in people with hemophilia A, was approved for routine prophylaxis to reduce the frequency of bleeding episodes, on-demand treatment and control of bleeding episodes and perioperative management of bleeding.

Mads Krogsgaard Thomsen, executive vice president and chief science officer of Novo Nordisk, said

the company is excited about the U.S. approval of the new medicine. Thomsen said the company considers it to be an important expansion of treatment options Novo Nordisk can offer patients with hemophilia A. Hemophilia A affects 1 in 5,000 male births in the U.S.

"We are confident that Esperoct will provide people with hemophilia A a less burdensome and simple, fixed dosing regimen for prophylaxis and treatment of bleeding episodes, resulting in improved quality of life," Thomsen said in a brief statement.

Despite that confidence in the benefits of Esperoct, Novo Nordisk said the treatment will not be available in the United States for at least another year. The company laid the blame at the feet of third-party intellectual property agreements.

The Novo Nordisk hemophilia treatment was approved based on clinical trial results that included 270 previously treated people with severe hemophilia A and more than five years of clinical exposure. During the clinical trials, Esperoct was shown to provide "effective routine prophylaxis" in people with severe hemophilia A. The medication was delivered to the patients through a fixed dosing regimen of one injection every four days for adolescents or adults, or every three to four days in children. During the trial, Esperoct was shown to provide effective prophylaxis. Additionally, patients were able to maintain a low median annualized bleeding rate of 1.18 when dosing was maintained.

Also, Novo Nordisk said the clinical trial showed that Esperoct was found to be efficacious in treatment and control of bleeding episodes and perioperative management. Across the clinical trials and age groups, Esperoct was well tolerated and no safety concerns were identified. The overall safety profile of the newly-approved Esperoct is similar to what has been reported for other long-action FVIII products, Novo Nordisk said.

Last year Novo Nordisk launched Rebinyn, coagulation Factor IX (Recombinant), GlycoPEGylated, for patients with hemophilia B. Hemophilia B is a serious, chronic, inherited bleeding disease that affects about 5,000 people in the U.S.

Janssen's Controversial Esketamine Treatment for Depression OK'ed by FDA, the First in Nearly 50 Years

Appeared in news on Mar 06, 2019

The U.S. Food and Drug Administration (FDA) gave the green light to Janssen's Spravato, an esketamine-based treatment for major depressive disorder. Approval came one month after an FDA advisory panel overwhelmingly supported approval of the nasal spray treatment.

The approval marks the first new approach for treating refractory major depressive disorder in nearly 50 years. Spravato is meant to be taken in conjunction with another anti-depression medication, such as Zoloft or another product.

Janssen's esketamine nasal spray is a non-competitive N-methyl-D-aspartate (NMDA) receptor antagonist, which is also known as a glutamate receptor modulator. Janssen believes the treatment works by restoring synaptic connections in brain cells in individuals with major depressive disorder.

The approval of Spravato does not come without some concern, particularly over questions of the potential for abuse. Esketamine is related to the well-known party drug ketamine, also known by the street name Special K, which appears to induce a dreamlike sensation in some users. In addition to the potential for the dreamlike sensation, there were also some concerns that the treatment could increase blood pressure in some patients. While the FDA staff said ketamine abuse is "relatively uncommon in the general population," Spravato does come with a black box warning regarding a Risk Evaluation and Mitigation Strategy (REMS) and the risk of suicidal thoughts and behaviors in pediatric patients and young adults.

IIT Roorkee identify salivary protein biomarkers of breast, ovarian cancer metastasis

Published in The Hindu on Feb 23, 2019

Photo: Kiran Ambatipudi (right) and Kuldeep Giri.

IIT Roorkee researchers have identified certain proteins found in saliva that can be used as potential biomarkers indicative of breast and ovarian cancer metastasis. The composition and expression of salivary gland-derived proteins are altered in people with breast and ovarian cancer. So studying the salivary proteins may offer an easy alternative for screening cancer patients.

Using 10 samples each of healthy and stage IV breast and ovarian cancer patients, and from ovarian cancer patients who have undergone at least three cycles of chemotherapy (with paclitaxel and carboplatin) the researchers were able to identify 409 unique proteins.

"The proteins were selected only when we were able to identify at least two different peptides that are unique. And to eliminate false positives, we used higher (99%) statistical significance," says Dr. Kiran Ambatipudi from the institute's Department of Biotechnology and corresponding author of a paper published in the journal FASEB BioAdvances.

"The unique proteins that were found in breast and ovarian cancer patients were associated with progression of metastasis," says Kuldeep Giri from the Department of Biotechnology at IIT Roorkee and first author of the paper. There are also proteins that are 15-20 times differentially expressed in both types of cancers. "These proteins may be playing a critical role in metastasis. We don't know yet," says Dr. Ambatipudi.

Based on studies done by other groups, the team has zeroed in on six proteins, which would be taken up for detailed functional analysis and validation through in vitro and in vivo studies.

"We also plan to identify and validate the exclusive and differentially expressed proteins in a large patient sample for the development of salivary proteins as potential biomarkers for early detection of breast and ovarian cancers as well as their progression," says Dr. Ambatipudi.

India's first biodegradable plastic developed by IIT-Guwahati

Appeared in news on Feb 24, 2019

The centre has already developed kitchen cutlery, household furni-

ture and decorative items The centre has already developed kitchen cutlery, household furniture and decorative items.

For the first time in India, scientists from IIT-Guwahati have developed biodegradable plastic with the help of homegrown technology. In a country where rising pollution levels remain a serious areas of concern, the innovation comes as a major shot in the arm for solid waste management.

The biodegradable plastic has been developed by IIT-G's Centre of Excellence-Sustainable Polymers (CoE-SusPol), which is funded by the department of chemicals and petrochemicals under Union ministry of chemicals and fertilizers. The centre has already developed kitchen cutlery, household furniture and decorative items including flower pots and toys using this non-biodegradable plastic variant.

"Ours is the only centre in India which is carrying out research on biodegradable plastic. Though the US has been a major producer of biodegradable plastic, the production costs there are very high. But our team has managed to achieve this with lower costs by using homegrown technology. This is cutting-edge innovation and a remarkable achievement," CoE-SusPol coordinator and principal investigator of the project, Vimal Katiyar, told TOI on Saturday. He added that the biodegradable plastic, which has passed the hot-beverage test, is unique because it has no hazardous chemicals.

"The non-biodegradable plastic products, which are commonly used in households, cannot be recycled for 400 years. Products like plastic carry bags, if disposed unscientifically, are hard to decompose and are a massive threat to soil cultivation," Katiyar said.

As environmentalists battle to solve the problem of plastic pollution, the biggest challenge before scientists today is to come up with biodegrable plastic products. Katiyar pointed out that the IIT-G project is a major step in the direction, as their plastic variant is non-polluting and will help increase soil fertility. "The biodegradable plastic that we have developed can perfectly replace the non-biodegradable variant. Our biodegradable plastic does not come from petroleum, but bio-base, which is safe and environment-friendly. When products made out of the biodegradable plastic variant will be thrown in the garbage dump, they will degrade automatically and get absorbed in the soil. This plastic will help increase soil fertility," he said.

"The project has now found support in a Gujarat-based private company which has offered help to IIT-G to begin commercial production".

Till now, the IIT-G centre has been producing 7-8 kg of biodegradable plastic at one go. But Katiyar said that a pilot project, with a 100 tonnes per year capacity design, will go on till September this year. Successful completion of the pilot project will pave the way for commercial production, he added.

Roche's Tecentriq and Companion Diagnostic Gets FDA Nod for Triple-Negative Breast Cancer

Appeared in news on Mar 11, 2019

The U.S. Food and Drug Administration (FDA) granted accelerated approval to Roche's Genentech for Tecentriq (atezolizumab) plus chemotherapy, Abraxane, to treat unresectable locally advanced or metastatic triple-negative breast cancer (TNBC) in patients whose tumors expressed PD-L1.

The drug was granted accelerated approval based on progression-free survival (PFS). Under this approval process, confirmatory clinical trials have to be continued, or the approval can be canceled. The FDA's Accelerated Approval Program focuses on conditional approval for drugs that fill an unmet medical need for a serious or life-threatening illness.

The accelerated approval was built

on data from the Phase III IMpassion130 trial, showing that Tecentriq plus nab-paclitaxel significantly cut the risk of PFS by 40 percent compared with nab-paclitaxel alone in PD-L1-positive patients with TNBC who hadn't received previous chemotherapy. Genentech indicates that overall survival (OS) data were "immature," and more data would be provided to the FDA and presented at an upcoming medical meeting.

Tecentriq is a monoclonal antibody that binds with the PD-L1 protein expressed on tumor cells and tumor-infiltrating immune cells. It blocks interactions with both PD-1 and B7.1 receptors. When it inhibits PD-L1, it allowed the activation of T-cells, allowing these immune cells free rein to attack the cancer.

Voyager and AbbVie Forge Another Neurodegenerative Therapy Collaboration Worth More Than $1 Billion

Appeared in news on Feb 22, 2019

Voyager Therapeutics struck a deal with Illinois-based AbbVie to develop and commercialize vectorized antibodies directed at pathological species of alpha-synuclein for the potential treatment of Parkinson's disease and other diseases characterized by the abnormal accumulation of misfolded alpha-synuclein protein.

For Cambridge, Mass.-based Voyager, the strategic collaboration, could be worth more than $1 billion through Phase I development. Under terms of the deal, AbbVie will pay Voyager $65 million in upfront money. Voyager can earn an additional $245 million in preclinical and Phase I option payments. Voyager can also earn an additional $728 million in potential development, regulatory, and commercial milestone payments and royalties. Additionally, Voyager will be eligible to earn up to a total of $500 million in commercial milestones.

Per the details of the deal, Voyager will be responsible for the research and Phase I clinical activities and costs. Following completion of Phase I clinical development, AbbVie has an option to license the vectorized alpha-synuclein antibody program for further clinical development and global commercialization for indications including Parkinson's disease and other synucleinopathies, the companies said.

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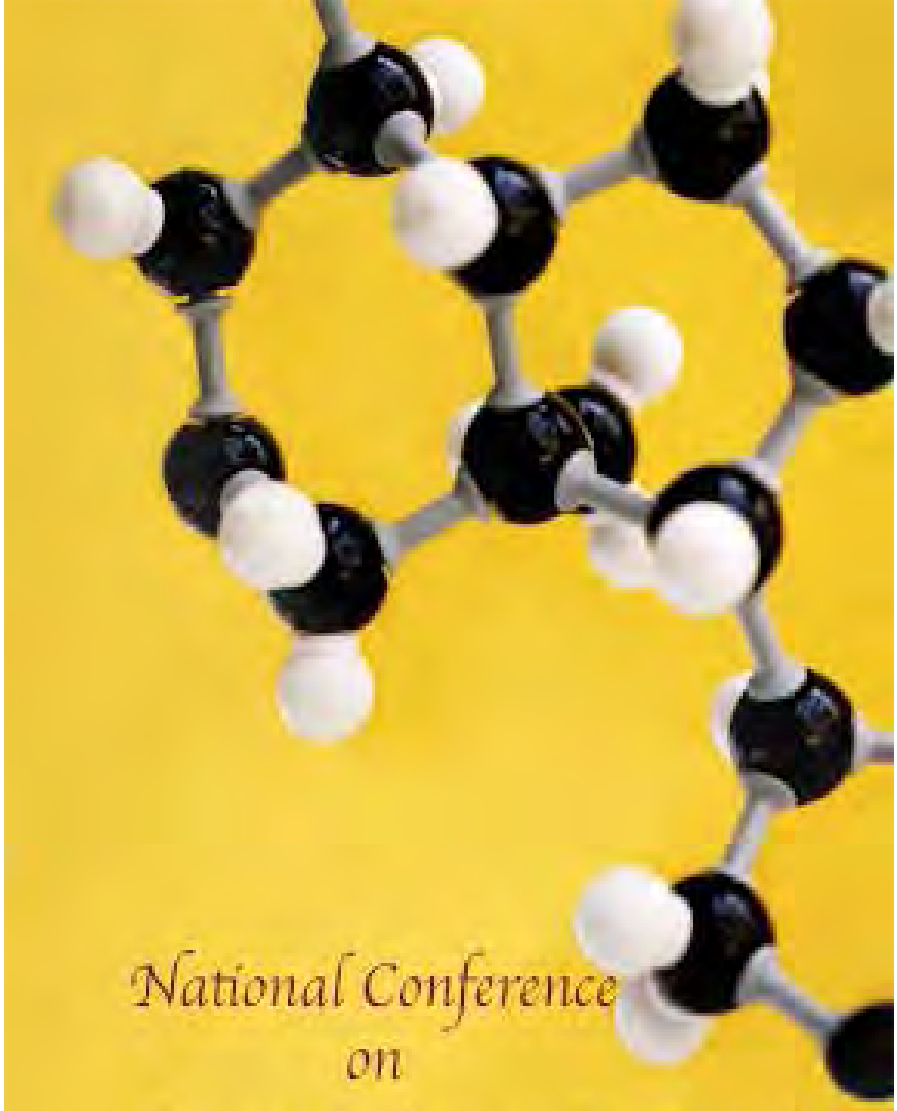

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Topics to be Covered

- Bioinformatics, computational and structural biology
- Biomolecular simulations, drug design
- Theoretical cell biology
- Biomolecular dynamics and spectroscopy
- Nucleic acid biology
- Lipid metabolism and model membranes
- Protein design, structure, folding, interactions and functions
- Nuclear mechanosensing
- Cellular and molecular mechanics
- Cellular and single molecule biophysics
- Biomaterials, microfluidics, and tissue engineering

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RESEARCH NEWS

From other High Impact Journals

Gene that increase risk of antibiotic reaction identified

March 8, 2019

Researchers have identified a gene that increases the risk for a severe and potentially life-threatening reaction to the commonly prescribed antibiotic vancomycin.

Vancomycin has been known to be a common antibiotic trigger for DRESS, however the genetic risk factors predisposing specific patients were not known.

This new finding shows that vancomycin-associated DRESS occurs in patients who carry specific variations in human leukocyte antigen (HLA) genes. HLA genes encode proteins that present foreign peptides (antigens) to T cells (a kind of white blood cell) to stimulate an immune response.

To better understand the HLA-DRESS connection, the researchers searched VUMC's biobank, BioVU, which contains nearly 250,000 unique, research-ready DNA samples linked to de-identified patient records.

Through a detailed search mechanism and review of the records they were able to identify that patients in the databank who developed DRESS while taking vancomycin had an over-representation of the genetic variant HLA-A*32:01.

The researchers confirmed their findings in a prospective cohort of patients from VUMC and Australia who had been diagnosed with DRESS.

Since many patients who develop DRESS are often exposed to multiple antibiotics and other drugs simultaneously, the researchers used a specific diagnostic test developed in their laboratories called gamma-interferon ELISpot, which exposed patients' white blood cells to vancomycin and other concurrently administered antibiotics.

This test enabled them to determine which drug was most likely causing DRESS.

Combining the BioVU and prospective data, the research-ers found that 86 percent of patients who developed probable vancomycin-associated DRESS carried HLA-A*32:01, compared to none of the matched control patients who received vancomycin for several weeks and did not develop a reaction to it.

By conducting a survival analysis of the BioVU patients with HLA-A*32:01 versus controls who did not carry the risk allele, the researchers determined that approximately 20 percent of patients who started vancomycin and who carried the HLA variant developed DRESS within four weeks.

In conjunction with this work, the group has developed a simple and inexpensive diagnostic test for HLA-A*32:01 that can be set up in routine diagnostic laboratories.

Journal Reference:

HLA-A*32:01 is strongly associated with vancomycin-induced drug reaction with eosinophilia and systemic symptoms. Journal of Allergy and Clinical Immunology, 2019; DOI: 10.1016/j.jaci.2019.01.045

Now a Genetic test to detect antimicrobial resistance

The new rapid test developed by the AU team determines if a person harbors bacteria carrying the Macrolide efflux gene A, or mef(A), which causes resistance to two antibiotics: erythromycin and azithromycin. Azithromycin (also known as Zithromycin or a Z-Pak) is among those commonly used to treat strep throat and is one of the most highly prescribed antibiotics in the United States.

"The test is able to detect the gene within 10 minutes of assay run-time," said John R. Bracht, assistant professor of biology at American University and corresponding author on the study. "Standard antibiotic testing requires at least an overnight culture and often isn't performed in routine diagnostic work. Instead, physicians guess which antibiotic to prescribe based on past experience and recommendations, and patients have to return if the treatment fails. We simplified the process of detecting antimicrobial resistance so a physician can determine whether or not a patient will be resistant to a prescribed drug while that patient is still in the waiting room. We think this is a game-changer for treating common illnesses."

"Our rapid genetic test can help doctors better assign medication on site, and improve point-of-care diagnostics, potentially leading to better outcomes without having prescribed a patient a useless antibiotic," she added. "There's a lot of trial and error with antibiotic use, so this is trying to take out some of the error."

The rise of antibiotic-resistant bacteria is a growing problem in the United States and the world. In the U.S. annually, more than 2 million people get infections that are resistant to antibiotics and at least 23,000 people die as a result, according to the Centers for Disease Control and Prevention. The U.S. National Institutes of Health, CDC, World Health Organization, and United Nations have prioritized the issue. However, tracking antimicrobial resistance is a significant challenge, the researchers write in the paper, precisely because the available culture-based methods are so slow and expensive.

The new rapid test addresses this challenge, making tracking antibiotic resistance quick, easy, and routine. It offers scientific researchers a way to monitor the prevalence and movement of antimicrobial drug resistance. The next step for the AU team to getting the test into doctors' offices is to seek approval of the test from the U.S. Food and Drug Administration.

Journal Reference:

Megan M. Nelson, Christopher L. Waldron, John R. Bracht. Rapid molecular detection of macrolide resistance. BMC Infectious Diseases, 2019; 19 (1) DOI: 10.1186/s12879-019-3762-4

Microfluidics device developed to detect cancer cells in blood

"This new microfluidics chip lets us separate cancer cells from whole blood or minimally-diluted blood," said Ian Papautsky, the Richard and Loan Hill Professor of Bioengineering in the UIC College of Engineering and corresponding author on the paper. "While devices for detecting cancer cells circulating in the blood are becoming available, most are relatively expensive and are out of reach of many research labs or hospitals. Our device is cheap, and doesn't require much specimen preparation or dilution, making it fast and easy to use."

Microfluidic technologies present an alternative to traditional methods of cell detection in fluids. These devices either use markers to capture targeted cells as they float by, or they take advantage of the physical properties of targeted cells -- mainly size -- to separate them from other cells present in fluids.

Papautsky and his colleagues developed a device that uses size to separate tumor cells from blood. "Using size differences to separate cell types within a fluid is much easier than affinity separation which uses 'sticky' tags that capture the right cell type as it goes by," said Papautsky. "Affinity separation also requires a lot of advanced purification work which size separation techniques don't need."

The device Papautsky and his colleagues developed capitalizes on the phenomena of inertial migration and shear-induced diffusion to separate cancer cells from blood as it passes through 'microchannels' formed in plastic. "We are still investigating the physics behind these phenomena and their interplay in the device, but it separates cells based on tiny differences in size which dictate the cell's attraction to various locations within a column of liquid as it moves."

Papautsky and his colleagues 'spiked' 5-milliliter samples of healthy blood with 10 small-cell-lung cancer cells and then ran the blood through their device. They were able to recover 93 percent of the cancer cells using the microfluidic device. Previously-developed microfluidics devices designed to separate circulating tumor cells from blood had recovery rates between 50 percent and 80 percent.

When they ran eight samples of blood taken from patients diagnosed with non-small-cell lung cancer, they were able to separate cancer cells from six of the samples using the microfluidic device.

In addition to the high efficiency and reliability of the devices, Papautsky said the fact that little dilution is needed is another plus. "Without having to dilute, the time to run samples is shorter and so is preparation time." They used whole blood in their experiments as well as blood diluted just three times, which is low compared to other protocols for cell separation using devices based on inertial migration.

Papautsky and colleague Dr. Alicia Hubert, assistant professor of surgery in the UIC College of Medicine, recently received a $125,000, one-year grant from the University of Illinois Cancer Center to develop a microfluidics device that can separate out circulating tumor cells as well as detect DNA from cancer cells in blood from lung cancer patients. They will use blood from patients being seen at the University of Illinois Cancer Center to test the efficacy of their prototype device.

Journal Reference:

Jian Zhou, Arutha Kulasinghe, Amanda Bogseth, Ken O'Byrne, Chamindie Punyadeera, Ian Papautsky. Isolation of circulating tumor cells in non-small-cell-lung-cancer patients using a multi-flow microfluidic channel. Microsystems & Nanoengineering, 2019; 5 (1) DOI: 10.1038/s41378-019-0045-6

Key differences studied between prokaryotic and eukaryotic RNA silencing Argonaute enzyme

The present study unravels key differences between prokaryotic Ago (pAgo) and eukaryotic Ago (eAgo) enzymes in the cleavage reaction and may provide important clues on their evolutionary past.

For Ago in eukaryotes, these two symmetric positively-charged residues play the identical role that is critical for cleavage. Hence, it was long speculated that the two analogous resides in prokaryotic Ago perform the same critical role in cleavage function. Surprisingly, this study showed that in pAgo, only one (Arginine 545) of the two residues is involved in cleavage function. When the other one (Arginine 486) was substituted with other amino acids, the enzyme was still able to maintain its cleavage activity. Based on these results, the study further suggested that R486 may play other roles such as assisting the insertion of the glutamate finger. The discovery of such striking differences in the roles of these symmetric resides between eAgos and pAgos provides novel insights on how the cleavage functions evolve during the evolution journey from prokaryote to eukaryote.

To achieve these results, computational methods combining Quantum Mechanics, Molecular Mechanics, and Molecular Dynamics (QM/MM) were applied to elucidate the cleavage reaction mechanism and identify functional roles of the amino acid residues. This research was made possible by large-scale high-performance computing resources, which were computed equivalent to 10,000 CPU cores for 25 weeks on the Shaheen II Supercomputer at KAUST in collaboration with Prof. Xin GAO's group.

"This research was made possible due to current day computing capabilities and the precision that QM/MM modelling allows for," said Prof. HUANG Xuhui. "Comparing which amino acid residues play a key part in the target DNA/RNA cleavage step in pAgo and eAgo sheds light on how Ago protein evolves from prokaryotes to eukaryotes to cleave DNA/RNA. This information may be useful in ultimately modifying the Ago protein for use as an enhanced gene editing tool in the future," Prof. Huang explained.

Journal Reference:

Jinping Lei, Gang Sheng, Peter Pak-Hang Cheung, Shenglong Wang, Yu Li, Xin Gao, Yingkai Zhang, Yanli Wang, Xuhui Huang. Two symmetric arginine residues play distinct roles in Thermus thermophilus Argonaute DNA guide strand-mediated DNA target cleavage. Proceedings of the National Academy of Sciences, 2019; 116 (3): 845 DOI: 10.1073/pnas.1817041116

Researchers invent a needle that knows where to go

Investigators from Brigham and Women's Hospital have developed a highly sensitive intelligent-injector for tissue-targeting (i2T2) that detects changes in resistance in order to properly and safely deliver medication in preclinical testing. Their results are

published in Nature Biomedical Engineering.
The i2T2 device was fabricated using a standard hypodermic needle and parts from commercially available syringes. Body tissues have different densities, and the intelligent injector harnesses differences in pressure to enable needle movement into a target tissue. The driving force, maximal forces and frictional force of the injector were tested using a universal testing machine. The feedback of the injector is instantaneous, which allows for better tissue targeting and minimal overshoot (injecting past the target tissue) into an undesired location.

The i2T2 was tested on tissue from three animal models to examine delivery accuracy in the suprachoroidal, epidural and peritoneal spaces as well as subcutaneously. Using both extracted tissue and an animal model, the researchers found that the i2T2 prevented overshoot injuries and precisely delivered medication to the desired location without any additional training or specialized technique.

In preclinical models, the researchers reported high coverage of contrast agent in the posterior section of the eye, indicating that the payload had been injected into the correct location. The researchers also showed the injector could deliver stem cells to the back of the eye that could be useful for regenerative therapies.

"The stem cells injected into the SCS survived, indicating that the force of injection and the transit through the SCS were gentle on the cells," said Kisuk Yang, a co-author and postdoctoral fellow in Karp's laboratory. "This should open the door to regenerative therapies for patients suffering from conditions of the eye and beyond."

"This intelligent injector is a simple solution that could be rapidly advanced to patients to help increase target tissue precision and decrease overshoot injuries. We have completely transformed needles with a small modification that achieves better tissue targeting," said first author Girish Chitnis, PhD, a former postdoctoral fellow in Karp's laboratory. "This is a platform technology, so the uses could be very widespread."

"The i2T2 will help facilitate injections in difficult-to-target locations in the body," said Miguel

A new method for developing artificial ovaries

An interdisciplinary team of researchers at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) led by Prof. Aldo R. Boccaccini from the Chair of Materials Science (biomaterials) and Prof. Dr. Ralf Dittrich from the Department of Obstetrics and Gynaecology at Universitätsklinikum Erlangen have taken an important step towards developing artificial ovaries for patients suffering from cancer.

In their study 'Electrospun patterned porous scaffolds for the support of ovarian follicles growth: a feasibility study', the scientists have been using a method called electrospinning that is used in materials science. This technique is based on applying a high electric potential between two electrodes with opposing polarity. This high voltage can overcome the surface tension of a polymer solution and thus enable the solution to vaporise completely and form a fibrous structure. 'Electrospinning is extremely versatile, as we can use a wide variety of natural and synthetic polymers', explains Dr. Liliana Liverani, who is the scientific project coordinator. 'In our current study, we used the biodegradable material polyepsilon caprolactone and a mixture of this material with gelatine for the first time and created a scaffold of very thin fibres that mimics the natural structure and shape of the ovarian cortex'. The researchers used this scaffold in their in-vitro tests as a substrate for the adhesion of follicles from the ovaries of pigs and assessed the viability of the follicles and oocytes after 10 days of culture on the scaffolds. The results of the live dead tests showed a high number of viable follicles that retained their characteristic shape.

'This is an important step towards an ideal artificial ovary that imitates the natural organ in terms of environmental conditions for the growth and maturity of follicles. These results are very promising, but further research is required before any further development towards clinical applications can be made', agree the teams led by materials scientist Prof. Aldo R. Boccaccini and Dr. Liliana Liverani and the gynaecologists and natural scientists at the Department of Obstetrics and Gynaecology, Prof. Dr. Ralf Dittrich, Nathalie Raffel and Dr. Amir Fattahi.

González-Andrades, MD, PhD, ophthalmologist co-author of the manuscript and collaborator with Karp's lab. "The next step toward human use is to demonstrate the utility and safety of the technology in relevant pre-clinical disease models."

Journal Reference:

Girish D. Chitnis, Mohan K. S. Verma, Julien Lamazouade, Miguel Gonzalez-Andrades, Kisuk Yang, Ali Dergham, Peter Anthony Jones, Benjamin E. Mead, Andrea Cruzat, Zhixiang Tong, Keir Martyn, Aniruddh Solanki, Natalie Landon-Brace, Jeffrey M. Karp. A resistance-sensing mechanical injector for the precise delivery of liquids to target tissue. Nature Biomedical Engineering, 2019; DOI: 10.1038/s41551-019-0350-2

Scientists identify genetic factors responsible for obesity in some people

Now, scientists at The Rockefeller University and collaborators have identified a genetic mechanism that may play a role in at least 10 percent of all obesity cases. The findings, which could help identify individuals with treatable forms of the condition, shed new light on the biology of the hormone leptin, which is produced in fat cells and controls hunger. The amount of leptin in the bloodstream, and how the brain responds to it, help determine how much weight a person will gain.

The scientists report this week in Nature Medicine that, in mice, alterations in the cellular machinery that regulates leptin production can lead to a form of obesity treatable with leptin therapy. Evidence from human genetics studies further suggests that a similar mechanism may contribute to obesity in a subset of patients.

Discovered 25 years ago by Rockefeller scientist Jeffrey M. Friedman, the Marilyn M. Simpson Professor, leptin has been the subject of many thousands of studies exploring its structure and function. "We've learned a lot about leptin," says Olof Dallner, research associate and lead author of the new report, "but we didn't actually understand the basic biology of what regulates the leptin gene."

The gene coding for the leptin hormone is regulated by adjacent DNA sequences and regulatory factors that turn the gene on in fat cells, and that also controls the amount of leptin being made. As they explored this process, Dallner and his colleagues zeroed in on one of these regulatory factors, called a long non-coding RNA, or lncRNA, which they identified together with colleagues at the University of Pennsylvania.

When the researchers engineered mice without this specific lncRNA and fed them a high-fat diet, the mice became obese, but their fat cells produced significantly lower amounts of leptin. This unusual finding suggested to the scientists that the leptin gene could not express normal levels of the hormone without the lncRNA to help it along. In comparison, a group of unaltered control mice fed the same diet gained weight and produced the expected amount of leptin.

Moreover, when these low-leptin mice were treated with injections of leptin, they lost weight -- in other words, the hormone essentially cured them. And that, the researchers say, raises the exciting possibility that some humans whose obesity is caused by a similar genetic anomaly could also lose weight with leptin therapy. (A pharmaceutical form of leptin was approved by the U.S. Food and Drug Administration in 2014.)

The fact that there may be obese people with such potentially leptin-curbing mutations was suggested by analyzing data from a large study, known as a genome-wide association study (GWAS), that included the complete genetic profiles of more than 46,000 people. Together with collaborators at the Mount Sinai School of Medicine, the Rockefeller team found that people with alterations in the human version of the lncRNA had lower leptin levels.

Journal Reference:

Olof S. Dallner, Jill M. Marinis, Yi-Hsueh. Lu, Kivanc Birsoy, Emory Werner, Gulya Fayzikhodjaeva, Brian D. Dill, Henrik Molina, Arden Moscati, Zoltán Kutalik, Pedro Marques-Vidal, Tuomas O. Kilpeläinen, Niels Grarup, Allan Linneberg, Yinxin Zhang, Roger Vaughan, Ruth J. F. Loos, Mitchell A. Lazar, Jeffrey M. Friedman. Dysregulation of a long noncoding RNA reduces leptin leading to a leptin-responsive form of obesity. Nature Medicine, 2019; DOI: 10.1038/s41591-019-0370-1

NOTIFICATIONS

Ministry of Science & Technology
Department of Science & Technology
SwarnaJayanti Fellowships Scheme 2018-19

Government of India had instituted a scheme titled "**SwarnaJayanti Fellowships**" to commemorate India's fiftieth year of Independence. Under this scheme a selected number of young scientists, with excellent track record, are provided special assistance and support to enable them to pursue research in frontier areas of science and technology. The fellowship is scientist specific and not institution specific.

Scientists selected for the award will be allowed to pursue unfettered research with a freedom and flexibility in terms of expenditure as approved in the research plan. The project should contain innovative research idea and it should have a potential of making impact on R&D in the discipline.

The duration of the fellowship along with the project will be for a period not exceeding five years.

The fellowship is open to Indian Nationals having a regular position in a recognized Indian academic/research organization. The applicant should possess Ph.D in Science/ Engineering/ Medicine and should not be drawing Fellowship from any other Scheme of GOI.

The fellowship is open to scientists between 30 to 40 years of age as on December 31, 2018. Applications from candidates who have completed 40 year of age as on or before 31.12.2018 will not be considered.

Applications for the "**SwarnaJayanti Fellowships Scheme 2018-19**" are invited from eligible candidates. Candidates may log on onlinedst.gov.in from 15-02-2019 to access the home page of the "DST e-PMS Portal" for details & downloading the format from SwarnaJayanti Fellowships Scheme and submit the application in online mode only. There is no need to send a hard copy.

The last date for submission of applications is March 31, 2019 by 1159 pm.

Recent Biotech Notifications

National Institute of Technology, Rourkela Recruitment for Faculty Positions 2019 (Last date: 30/04/2019)

CSIR-IMTECH Chandigarh Scientists Openings 2019 (Last date: 08/04/2019)

Nominations are invited for Shanti Swarup Bhatnagar Prize for Science and Technology 2019

The Council of Scientific and Industrial Research (CSIR) invites nominations for the Shanti Swarup Bhatnagar (SSB) Prizes in Science and Technology for the year 2019. The SSB Prizes are to be given for research contributions made primarily in India during the past five years. The age of the nominee for the SSB Prize 2019 should not be more than 45 years as on 31 December 2018.

The SSB Prizes are awarded for notable and outstanding research, applied or fundamental, in the following disciplines: (1) Biological Sciences, (2) Chemical Sciences, (3) Earth, Atmosphere, Ocean and Planetary Sciences, (4) Engineering Sciences, (5) Mathematical Sciences, (6) Medical Sciences and (7) Physical Sciences. The SSB Prize carries with it a citation, cash award and a plaque for each scientist selected for the award.

Nominations addressed to **The Scientist Incharge – SSB YSA Unit**, Human Resource Development Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012 should be sent as per the prescribed proforma (original + 2 copies) along with reprints of significant publications of the last 5 years period on or before **31 March 2019**.

Softcopy (in PDF format) of duly filled proforma, significant publications and photograph (in JPEG format) of the nominee is also required in a USB/Pen drive. The details of the SSB Prize and the prescribed proforma for nomination may be obtained from the above address or may also be downloaded from the website: **http://csirhrdg.res.in**

Recent Biotech Notifications

National Institute of Technology, Rourkela Recruitment for Faculty Positions 2019 (Last date: 30/04/2019)

CSIR-IMTECH Chandigarh Scientists Openings 2019 (Last date: 08/04/2019)

The India Science Media Fellowships 2019 of the Wellcome Trust/DBT India Alliance (India Alliance) and Nature India (Last date: 28/03/2019)

Aligarh Muslim University TEACHING POSTS for Professors Recruitment 2019 (Last date: 29/03/2019)

GOVERNMENT OF INDIA
MINISTRY OF SCIENCE & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

Department of Biotechnology, Ministry of Science & Technology, Government of India invites nominations for

Biotech Process, Product Development and Commercialization Award 2019

Who can Apply?

Nominations are requested from scientists/innovators/entrepreneurs/institutions/companies both in public as well as private sector for their outstanding contributions towards development and commercialization of a process/technology / product in Biotechnology/ Biological Sciences including agriculture, medical and environmental sciences

How to Apply?

Nominations (**3 copies**) in the prescribed proforma should reach on or before **20th March, 2019** to Dr. Kakali Dey Dasgupta**,** Scientist "E", Department of Biotechnology, Ministry of Science & Technology, Room No.814, 8th Floor, Block-2, CGO Complex, Lodhi Road, New Delhi - 110003. Soft copy of the nomination (single pdf document) should also be sent at hrdbppc@gmail.com

For details of the award and proforma for nominations please log on to DBT website (www.dbtindia.gov.in or www.dbtindia.nic.in)

Recent Biotech Notifications

ICMR-Vector Control Research Centre (ICMR-VCRC) Scientist B Recruitment (Last date: 08/04/2019)

IISER Mohali Summer Research Program 2019 (Last date: 25/03/2019)

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- Academic transcript(s)
- Two letters of recommendation

Questions- Savitha G Ananth, Program Manager: savitha_ananth@fas.harvard.edu

Deadline to Apply
March 24,2019

Selected participants will be notified by April 30, 2019

This course has been made possible through a collaboration between The Lakshmi Mittal and Family South Asia Institute, Harvard University, Cambridge, USA, IBAB, Bengaluru, and IISER, Pune, India and is funded by the Department of Biotechnology, Government of India.

Department of BioTechnology, Government of India

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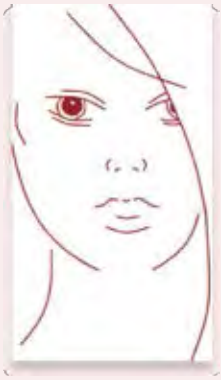

Call for Applications- 11th Batch

Women Scientists Scheme-C (WOS-C)

KIRAN-IPR

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Women Scientists Scheme (WOS) is a flagship programme of KIRAN Division of Department of Science & Technology (DST). Through one of its components- 'Women Scientists Scheme-C (WOS-C)'- it provides one year on-the-job training in the area of Intellectual Property Rights (IPR). Patent Facilitating Centre (PFC) of Technology Information, Forecasting and Assessment Council (TIFAC) has been entrusted with implementation of WOS-C.

Eligibility Criteria

- Women with Indian citizenship
- **Minimum essential qualification:** Master of Science; Bachelors in Engineering/Technology or equivalent.

Desirable :a) Proficiency in handling computerized database, collection, collation, analysis and report preparation, (b) Basic understanding of various IPR aspects & issues with logical aptitude towards scientific developments across the world and experience in research, preparation of project reports, term papers and similar activities.

Age : 27 - 45 years as on 20-03-2019

Note: a) Women in permanent position are not eligible to apply and

b) Those who have already undergone training (partially or fully) in any of the earlier batches or those who are undergoing training in the ongoing batch are not eligible to apply.

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For detailed information and online submission of application visit the website www.pfc.org.in. Applications should be submitted **through online mode** only.

Last Date for Online Submissions : March 20, 2019

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