MSBCS Life Line

AN INITIATIVE OF
MATS SCHOOL OF BIOLOGICAL AND CHEMICAL SCIENCES (MSBCS)
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From the Editorial Desk:

It is my privilege and honour as the Editor-in-Chief of the Newsletter "MSBCS LIFE LINE" published by MATS School of Biological and Chemical Sciences. I am sure that this initiative of the department under the mentoring of Honb'le Vice-chancellor and Management of the University will boost the thoughts of the student's mind for writing the news related to sciences and reading information as well. I thank from the members Editorial Board to the contributors of this newsletter.

Vishwaprakash Roy

Message from Hon'ble Chancellor

I am glad to note that the School of Biological & Chemical Sciences of MATS University, Raipur is releasing Newsletter entitled MSBCS Life Line. I believe that this Newsletter would provide an opportunity for transmission of knowledge based on latest research and are considered to be an essential part of academic programmes of all renowned universities. I am also glad to learn that many students and faculty members are contributing their short articles in this Newsletter. I would like to congratulate the MATS School of Biological and Chemical Sciences department for their commitment and sincerity. I strongly believe that this Newsletter would definitely be a foundation for the growth of new ideas towards a better tomorrow.

Message from Hon'ble Vice-Chancellor

I wish this newsletter a grand success, not just in these proceedings, but also in the objectives that it strives to achieve. I would like to congratulate MATS School of Biological & Chemical Sciences and Students of the department for conceptualizing this Newsletter. With continued support and trust, I am sure that the Newsletter - Life Line will help the Department to reach the pinnacle of higher education would definitely be achieved.

Message from Director General

I am extremely pleased to know that MATS School of Biological and Chemical Sciences of MATS University, Raipur is releasing Newsletter Life line. I appreciate the efforts of the Editorial Team for releasing this Newsletter – life Line. My Best wishes to The Editor in Chief, News letter Life Line and the entire Editorial Team of organizers for conceptualizing this Newsletter. As the Director General of MATS University, Raipur, I extend my good wishes and support in all manner for making this Newsletter Life line a grand success.

Message from Registrar

The Newsletter Life Line is being released by MATS School of Biological and Chemical Sciences. This will focus the attention of the Students and Faculties working in various disciplines of Applied Science from fundamental studies to research applications. It is expected that this Newsletter will provide a forum to the young students and entrepreneurs to interact on the recent developments and identify emerging feature areas of growth in the field of Biological and Chemical Sciences. I also thank all the Editorial Team Members of this Newsletter who worked diligently for the successful releasing of this Newsletter – Life Line.

Message from the Head of the Department

MATS school of Biological and Chemical Sciences is releasing a Newsletter MSBCS Life Line. The main objective of the Newsletter is to provide a brief introduction to the current trends in the field of research and its uses in the applied fields of Biological and Chemical Sciences. This is designed for faculty members, Research Scholars, Students, and in enhancing their knowledge in current research trends and future needs. I express my gratitude to all the persons who contribute their effort in this Newsletter Life- Line and all Editorial Team members who have worked hard to release this News Letter a successful one.

"VALUE OF TEACHER"

Teacher is just like a BRIDGE by the help of which we can cross the life. Teacher is just like an EYE by the help of which we can see the real world. Teacher is just like a PILLAR by the help of which a nation can stand. Teacher is just like a MOTHER by the help of which we can become educated person. Teacher is just like a LANTERN by the help of which we can light our life. Teacher is just like SKELETON by the help of which we can stand our life.

Krishnakant Dewangan
M.Sc. (Sem.- II) Chemistry

"MAJOR SCOPES IN BIOTECHNOLOGY AND MICROBIOLOGY"

Agriculture Sector	Industrial Sector	Environment	Instrument
Tissue Culture	Fermentation Products	Waste management	Bioreactors
Biofertilizers	Enzymes	Energy through Biomass	Fermenter
Biopesticides	Vaccines	Vermiculture	Cell counter
Transgenic Plants	Interferon	Pollution Control	Critical care instrument
	Fuels		Bioelectronics
	Mining		Biotech software
Health care Industries	**Security**	**Therapeutics**	**Technology**
Diagnostic	Biometrics	Hormone	Genetic engineering
Antibodies	BiochipsBiolo	Designer Drugs	Cloning
Biosensors	gical weapons	Gene therapies	Trans genic animals
		Organ transplantation	Nanotechnology

Vishwaprakash Roy
Assistant Professor

"EDITING A GENE IS NOW POSSIBLE WITH CRISPR GENE TECHNOLOGY"

One of the most cherished tools of today's Biologist is perhaps altering or editing a DNA and its function. Modifying a gene by inhibiting gene expression and function has opened enormous insight on understanding a disease and treating the same at genetic level is now a reality. Of all the new gene technologies, CRISPR/Cas 9 (Clustered Regularly Interspaced Short Palindromic Sequences) is the most promising one as it has proven to be effective in case of deadly disease like cancer. Francisco Mojica, in his doctoral studies in 1989 at the University of Alicante, accidently discoverd this already existing phenomenon in n Haloferax mediterranei, an archaeal microbe with extreme salt tolerance. This beautiful discovery, faced several rejections by reputed Journals like "Nature" and "Molecular Microbiology and Nucleic Acid Research" and finally the work was recognised after 15 years. This technology is useful in shutting on or shutting of a gene very precisely. The defence mechanism in bacteria laid the foundation of CRISPR technology's application in cell lines and animal models. Latest research has proven its worth by editing genes in mosquito carrying a pathogen, crops resistant to pathogenic micro-organisms, extending shelf life of vegetables and fruits, Cancer therapy etc. However this "Gene Drive" poses a threat of over-riding the traditional rules of inheritance.

Dr. Devyani Sharma
Assistant Professor

"11 PERCENT OF DISAPPEARING GROUNDWATER USED TO GROW INTERNATIONALLY TRADED FOOD"

A new study by researchers Carole Dalin at the University College London and NASA's Goddard Institute of Space Studies in New York City shows that 11 percent of the global non-renewable groundwater drawn up for irrigation goes to produce crops that are then traded on the international market. Additionally, two-thirds of the exported crops that depend on non-renewable groundwater are produced in Pakistan (29 percent), the United States (27 percent), and India (12 percent).

Wheat, rice, sugar, cotton and maize are among the essential internationally traded crops in the global economy. To produce these crops many countries rely on irrigated agriculture that accounts for about 70 percent of global freshwater withdrawals, according to the United Nations Water program. One freshwater source is underground aquifers, some of which replenish so slowly that they are essentially a non-renewable resource. Globally, 18 percent of all crops grown are traded internationally. The remaining 82 percent stays in country for the domestic market.

Countries that export and import these crops may be at risk in the future of losing the crops, and their profits, produced with non-renewable groundwater. Non-renewable aquifers are those that do not accumulate rainfall fast enough to replace what is drawn out to the surface, either naturally to lakes and rivers or in this case by people via pumping. Once that groundwater is depleted, it will effectively be gone for good on the scale of a human life-time, and will no longer be available for relief during crises such as droughts. More research needs to be done which considers population growth, changing diets, climate change, the implementation of irrigation technology and policy changes to understand when these aquifers may begin to run dry.

Dr. Anubhuti Koshle
Assistant Professor

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"MICROBIOLOGICAL ASSESSMENT OF INDOOR AIR QUALITY AT DIFFERENT HOSPITAL SITES"

Being sick is pretty lousy isn't it? It would be pretty difficult because not only are the terms invisible, but they expand outward as they enter the air. Poor hospital indoor air quality (IAQ) may lead to hospital acquired infections, sick hospital syndrome and various occupational hazards air control measures are crucial for reducing dissemination of airborne biological particles in hospital. The objective of this study was to perform a survey of bioaerosol quality in different sites in different hospitals namely OT, ES and the SW (operation theatre, emergency service, surgical ward). Aerobic mesophilic bacterial counts (BCs) and fungal load (FL) were assessed. The AD revealed the highest airborne microbial concentrations. Regular monitoring is essential for assessing air control efficiency and for detecting irregular introduction of airborne particles via clothing of visitors and medical staff or carriage by personal and medical materials furthermore microbiological survey data should be used to clearly define specific air quality guidelines for controlled environments in hospital settings.

Prashant Kumar Sinha
B.Sc. (Sem.- II) Microbiology

NANO IS THE NEW BIG PLATFORM FOR BIOTECHNOLOGIST

Latest technology and development has allowed us to study the behaviour, characteristics and potential application of matter in extremely small size i.e. nano form (10^{-9} meter). Nano form of material are naturally occurring particles or the manufactured form of any material which has one dimension less than 100 nanometer. In nature, nanoparticulate forms of various materials are mostly found in volcanic dust, natural water and soil particle ...etc. Natural nanoparticles also can be observed in many activities such as in the process of mining and various biological processes. These extremely small forms of materials have amazing potentials. It has been known that materials at nano size exhibit special characteristics and properties such as high surface area, optical properties, amazing catalytic properties ...etc. These properties have been widely explored in many fields of science and evolved as a special field known as Nanotechnology. In addition, nanotechnology has played a crucial role in the modern biology. The application of various nanomaterials and tools has significantly enhanced the knowledge for development of better products in different key sectors of biotechnology. In brief, uses of nanotechnology in health sciences have facilitated better diagnosis, prevention and treatment of many critical health issues. For example, in drug delivery system, use of nanotechnology facilitates interaction of drugs at molecular level ensuring maximum therapeutic effect with very limited adverse-effects by targeting cellular and tissue-specific drug delivery. Nanoliposomes, polymers and suspension are also being used in various clinical applications, where drugs with a protein are combined with nanopolymer or chemically synthesized nanostructure to deliver at targeted site. These nanomaterials based targeted drug delivery systems are currently being explored to deliver the drugs to specific cells, such as cancerous cells. In addition, the nanomaterial based drugs facilitates better pharmacokinetic and pharmacodynamic properties. Some of the nanoparticles itself show beneficial medical effects which can also be utilized in pharmaceutical industry to replace some small molecular drugs. These are some of the glimpses of nanobiotechnology in health sciences. Apart from these, applications of nanotechnology in other fields of biological sciences are also remarkable. The bactericidal properties of various nanoparticles has been utilized to develop modern age cost effective and quick water and air filtration systems; development of cost effective and skin friendly cosmetic products are being produced using nanomaterials; nanosensors for precise and accurate identification of particular cells or substances in the body; Nanomaterial based organic groups can be used as biomarkers & tracer; development of Nanopesticides for better agricultural yield are some of the most recent development in Nanobiotechnology. In a nutshell, nano-biotechnology has not only widened the ways of diagnostics and therapeutic approach by implementing various nanomaterial based devices and sensors in the health science sectors. It has also tremendous potential in commercial, environmental and agriculture sectors of Biotechnology. Thus, needless to say the small size nano world is the bigger platform for further studies, research and exploration of knowledge.

Dr. Prabodha Kumar Meher
Assistant Professor

"CHRONIC MYELOID LEUKEMIA (CML) AND ITS DIFFERENT TREATMENT OPTIONS"

Chronic Myeloid Leukaemia (CML) is a type cancer that affects the blood and bone marrow. In CML the bone marrow produces too many white cells, called granulocytes. These cells, sometimes called blasts or leukemic blasts, gradually crowd the bone marrow, interfering with normal blood cell production. They also spill out of the bone marrow and circulate around the body in the bloodstream. Because they are not fully mature, they are unable to work properly to fight infections. Over time, a shortage of red cells and platelets can cause anaemia, bleeding and/or bruising.

CML usually develops gradually, during the early stages of disease, and progresses slowly over weeks or months. It has three phases: the chronic phase, the accelerated phase and the blast phase. These phases are distinguished by the number of blast cells (immature white cells) in the blood and bone marrow, and the severity of symptoms.

How common

Each year in India around 330 people are diagnosed with CML. Overall, CML is a rare disease, accounting for around 0.03% of all cancers diagnosed.

Who gets

CML can occur at any age but it is more common in adults over the age of 50, who account for nearly 70 per cent of all cases. CML occurs more frequently in men than in women. It is rare in children (0-14 years) with around 4 cases per year diagnosed in this age group.

What causes

Most people diagnosed with CML have a genetic abnormality in their blood cells called the Philadelphia (Ph) chromosome. The Ph-chromosome causes the production of an enzyme called tyrosine kinase which leads to CML. It is unclear why this genetic abnormality occurs in the first place, but there are likely to be a number of factors involved. In rare cases it may result from exposure to very high doses of radiation, either accidentally (nuclear accident) or therapeutically (to treat other cancers).

What are

Because CML develops slowly many people don't have any symptoms, particularly in the early stages and the disease is picked up during a routine blood test.

As the disease progresses, symptoms arise from the increasing number of abnormal blood cells in the bone marrow and blood, and the decreasing number of normal blood cells. Possible symptoms may include:

- Anaemia, due to a lack of red cells; causing persistent tiredness, dizziness, paleness, or shortness of breath,
- Increased or unexplained bleeding or bruising, due to a very low platelet count,
- Frequent or repeated infections and slow healing, due to a lack of normal white blood cells,
- Pain or discomfort under the ribs on the left side, due to an enlarged spleen,
- Excessive sweating, or
- Unintentional weight loss.

How diagnosed

CML is diagnosed by a full blood count (FBC) and a bone marrow biopsy/examination.

How treated

Treatment will vary depending on the phase of disease, general health and age. During the chronic phase, treatment is used to control CML and keep your blood counts within a normal range. This can involve chemotherapy, usually taken in tablet form at home. Treatment is likely to involve the use of a type of tyrosine kinase inhibitor (TKI) - which blocks the leukaemia-causing effects of a substance called a tyrosine kinase, forcing the cell to then die. Commonly used tyrosine kinases available in India include: imatinib, nilotinib, and dasatinib. A stem cell transplant may be an option for some younger patients, or patients who are intolerant or resistant to TKIs - providing them with a better chance of cure.

In the accelerated phase, the disease starts to progress more quickly. Blood counts become more abnormal and symptoms develop. In the blast, or blast crisis phase, blood counts become very abnormal and the numbers of blast cells in the blood and bone marrow increase dramatically. The treatment of accelerated and blast phase CML usually involves a more intensive approach. This includes a combination of chemotherapy drugs given intravenously (into a vein). Patients need to be admitted to hospital for this type of treatment. The aim of treatment during the advanced stages of CML is to destroy the leukemic cells and allow the bone marrow to function normally again, or to return the patient to the chronic phase of their disease.

Some people are diagnosed with an extremely high number of white cells in their blood. A process known as leukopheresis may be needed to remove these cells, which could otherwise cause problems in the body by clogging up small blood vessels. This process is similar to dialysis, where all blood is passed through a special machine called a cell separator. This machine separates and collects the excess white cells and returns the rest of blood. Chemotherapy is also used to reduce a high white cell count at diagnosis.

What side-effects

All treatments can cause side-effects. The type and severity however will vary between individuals, depending on the type of treatment used and how an individual responds to it. In general, more intensive treatment is associated with more severe side-effects. It is important to report any symptoms are having to doctor or nurse. In most cases they can be treated and are reversible.

Dr. Amit Kumar Dutta
HOD, MSBCS